Asymmetries in Prosodic Domain Formation[*]

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This paper presents an asymmetry in the prosody of Dutch, English, and German: if a functor precedes its complement, it is phrased separately; if it follows its complement or part of it, the two are phrased together and the functor is prosodically subordinated and 'affixed' to the preceding prosodic constituent. The prosodic asymmetry is first shown for the relation between predicates and their complements, and is then generalized to modification. A recursive algorithm is presented that derives the correct prosodic structure and nuclear stress in the three languages, exploiting only the syntactic asymmetry of projection and the left-right asymmetry of linear order.

1. Modifiers vs. Arguments

The prosody of a sentence is influenced by semantic, syntactic, and phonological factors, a fact that a fact that poses a challenge for modular theories of grammar. Data concerning relative prominence (stress), the distribution of accents, and facts about prosodic phrasing have shaped the development of generative theories ever since the outline of the transformational cycle in the grammar of English in Chomsky et al. (1957) and Chomsky and Halle (1968) (SPE). The key issue is the question of what type of syntactic or semantic information is necessary to assign the correct prosody.

One crucial factor that has been proposed to play a role is the distinction between modifiers and arguments (Gussenhoven, 1984; Krifka, 1984; Selkirk, 1984; Jacobs, 1992; Truckenbrodt, 1993; Zubizarreta, 1998). This paper presents prosodic asymmetries that show a close parallel between predicates and modifiers that has gone unnoticed in earlier studies. Two simple

principles, 'Sister-Matching' and 'Subordination' are proposed. They negotiate the prosody between sister constituents, and thus recursively map syntactic tree structures to prosodic structures.

The local decisions based on sister-constituents account for the global distribution of accents in general and the location of nuclear stress in particular.

1.1. The Modifier—Argument Contrast

Modifiers in Germanic differ from arguments with respect to their prosody relative to a following predicate (Gussenhoven, 1984; Krifka, 1984; Selkirk, 1984; Jacobs, 1992; Truckenbrodt, 1993). Consider first the case of arguments (the relevant predicates are in italics, the relevant arguments are underlined).[1]

(1) Arguments

  a. [Sie hát] [<u>einen Tángo</u> *getanzt*.]
        she has   a.acc Tango danced

      'She danced a tango.'

  b. [Sie íst] [<u>in den Gárten</u>   *getanzt*.]
        she is   in the.acc garden danced

      'She danced into the garden.'

Predicates following DP-arguments (1a) and PP-arguments (1b) are subordinated. Subordination means that they are realized with a reduced pitch range, if not altogether deaccented. They are prosodically 'affixed' to the preceding domain.[2]. Consider now the case of modifiers (again, I put the functor in italics, and I underline the argument of the modifier, i.e. the modified constituent):

(2) Modifiers

  a. [Sie hát] [*den ganzen Ábend*   ] [<u>getánzt.</u>]
        she has   the.acc entire evening   danced

      'She danced the entire evening.'

  b. [Sie hát] [*im Gárten*   ] [<u>getánzt</u>].
        she has   in.dat garden   danced

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[1]The orthographic accent marks the location of high tone accents—non-final accents are not always realized, due to rhythmic effects, as will be discussed later.

[2]One could say that the arguments 'incorporate' into the prosodic domain of the verb that selects them; or conversely, that the verb becomes affixed to the prosodic domain of the argument. Indeed, structures that involve actual incorporation or affixation in German show similar prosodic patterns. I will not explore this point further in this paper.

'She danced in the garden'.

Modifiers in (2) are mapped to their own accentual domain, separate from the accentual domain of the verb.[3] The difference between modifiers and arguments outlined so far is only one half of the pattern, however.

1.2. Linear Order Effects in Predication

Complements do not *always* induce the subordination of the predicate that selects them: When the predicate *precedes* the complement, two separate accentual phrases are derived. Consider the cases below in (3) that minimally differ from (1) in that the predicate has raised to second position and thus precedes their arguments.

(3) a. [Sie *tánzte*] [einen Tángo].
         she danced   a tango

     b. [Sie *tánzte*] [in den Gárten].
         he danced   into the garden

The examples contrast with (1) in that the predicate can have an accent in this environment, without requiring narrow focus on the verb. Consider also arguments that follow the final verb in German. Complement clauses usually follow the selecting verb, in constructions often described as 'extraposition' (4a); but they can also precede them (4b).[4]

(4) a. [Er hat *verspróchen*] [zu schwéigen].
         he has promised   to be silent

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[3]The following examples were presented in Cinque (1993, 250, 254) with nuclear stress on the adjunct—this, however, is not the appropriate prosody in neutral contexts. Unless the modifier is focused, nuclear stress in these examples falls on the verb, as was pointed out already in Truckenbrodt (1993), Jacobs (1999), and Ishihara (2001).

(1) a. ...[dass Kárl] [ein Búch] [mit Múehe] [lésen kann].
         that   Karl a   book with problems read

     b. ...[dass Frítz] [gút] [kóchen kann].
         that   Fritz well cook   can.

The word order in (1) actually seems to require marked focus on the predicate. The more neutral order is: 'dass Karl mit Múehe ein Búch lesen kann'. The example may then actually not be relevant for establishing the neutral stress pattern, since both word order and focus structure are not neutral.

[4]It is hard to test whether both (4a, b) are possible with neutral focus. In section 2 I will discuss ample examples illustrating the same asymmetry, with cross-linguistic data involving only all-new sentences with wide focus.

b. [Er hat <u>zu schwéigen</u> *versprochen.*]
   he has <u>to be silent</u>   promised

'He promised to be silent.'

While the selecting predicate is subordinated and accentless in (1) and (4b), it is accented in (3) and (4a), where it precedes its argument. The following generalization captures this asymmetry descriptively[5]

(5) Prosodic Asymmetry

- When a functor A *precedes* complement B, a sequence of two prosodic domains that are on a par: Á B́. The last domain counts as the nuclear domain.
- When a functor A *follows* (an element from) complement B, A is subordinated: B́ A (unless A is focused or B is old information)

This generalization points in a similar direction as the approach in Steedman (2001), who relates prosodic structure to the direction of composition in a categorial grammar framework.

      Note that it is sufficient if a part of the complement precedes a predicate, in order for the predicate to subordinate. Some complements can optionally follow a final predicate. In those cases, the predicate (here: *gewartet* 'waited') fails to subordinate (a), as expected; the predicate subordinates even when only part of the argument precedes (b), a case of partial extraposition:

(6) a. [Híer habe ich oft   *gewártet*], [<u>auf den Zúg</u>] [<u>der mich nach Háuse bringt.</u>]
         Here have I   often waited   <u>on the train</u>   that me to home takes

    b. [Híer habe ich oft   [[<u>auf den Zúg</u>] *gewartet*]], [<u>der mich nach Háuse bringt.</u>
        Here have I   often   <u>on the train</u>   waited   that me to home takes
        ]

'I waited here often for the train that would take me home.'

The generalization in (5) captures the data outlined so far. The subordination of predicates following their complement has the effect that both in the *predicate ≺ argument* order and in *argument ≺ predicate* order, the nuclear stress resides on the argument. This is because—as observed in Newman (1946)—the last accent is perceived as the nuclear stress. I will assume here that 'Nuclear stress' simply refers to the last of a sequence of accents within a given domain, which is perceived by native speakers as the main prominence.[6]

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[5]Compare observations about complement prominence in Schmerling (1976), Hayes and Lahiri (1991), Zubizarreta (1998). I can not review their respective proposals in detail here. I may also related to cases of cyclic subordination in wh-movement discussed in Ishihara (2003).

[6]The generalization about the asymmetry recalls incisive observations on sentence stress in Bierwisch (1968) and Bresnan (1971), which will be discussed later on.

1.3. Linear Order Effects in Modification

A closer look at the prosody of modifiers again reveals an asymmetric pattern depending on linear order—in fact, a pattern that is exactly parallel to the asymmetry observed between predicates and arguments. When a modifier precedes the modified constituent, two separate prosodic constituents are derived, as was illustrated in (2); however, when it follows the modified constituent, the modifier is subordinated. Consider as a first example the case of postposed sentential modifiers:

(7) Postposed Adjuncts

    a. [Sie hát] [<u>getánzt</u>, *den ganzen Abend*].
          she has   danced the.acc entire evening

       'Sie hat danced the entire evening.'

    b. [Sie hát] [<u>getánzt</u>, *im Garten*].
          she has   danced in.dat garden

       'She danced in the garden'.

Constituents following the final verb such as those in (7) are often called 'afterthoughts', as if they were simply added after a sentence as some external addendum. However, they are modifiers integrated into the phrase structure of the sentence, as cases of VP coordination illustrate:

(8) [Sie hat <u>getánzt</u>,] *den ganzen Abend*, [<u>und Cócktails getrunken</u>].
     she has danced   the entire evening   and cocktails drunk

    'She danced and drank cocktails the entire evening.'

Example (8) also illustrates that it is sufficient if part of the argument of the modifier precedes it in order to trigger its prosodic subordination, analogous to the case of the arguments of predicates (6).

      The prosodic relation between modifiers and modified constituent is similar to that between predicates and arguments. Earlier treatments (e.g. Krifka, 1984; Gussenhoven, 1984; Jacobs, 1992) focused on the contrast between modifiers and arguments, and thus missed out on the parallel between modifiers and predicates.[7]

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[7]It is not obvious whether it is legitimate to call a phrase like 'the entire evening' a modifier, and group it with complement taking predicates, since maximal projections are not usually taken to be able to take complements and project (but see Starke (2001) for a different view, discussed further in section 4). We can make sense of this if we adopt the analysis of adverbials proposed in Alexiadou (1997) and Cinque (1999), who view adverbials as specifiers of functional projections. It is not 'the entire evening' itself then, which is the modifier, but a functional head that takes the DP as its specifier.

1.4. A Complication: Rhythmic Effects

Rythmic effects sometimes blur the generalization about the asymmetry, in that they allow pre-nuclear accents to be omitted. The accent is then effectively 'switched-off'. This happens in situations where an accent falls too close to a following accent. The notion 'close' seems to depend also on speech rate. Consider the following example, where both a rendition with two accents (a) or only one accent on the direct object (b) seem possible in a wide-focus, all-new context:

(9) a. [Sie tánzte] [Tángo].
           she danced   tango

      b. [Sie tanzte Tángo].
           she danced tango

Modifiers are again similar to predictes. In (10a), it is possible to omit the accent on the manner adverb 'gut' in (10a) without changing the information structure of the sentence. This seems harder in the case of a longer adverb, that places more unstressed material between its main stress and the following verb (10b).

(10) Sie gláubt, dass er
       she believes that he

      a. [gut kóchen kann].
          well cook   can.

      b. [áusgezeichnet] [kóchen kann.]
          excellent   cook   can.

The extreme case of rhythmic deaccenting is to drop *all* but the last accent. It is the rhythmic component then that the present approach holds responsible for the pattern discussed in Chomsky (1971, 200): There is a rendition of the question in (11a) that only places an accent on 'shirt' with wide focus on the DP.[8]

(11) a. Was it <u>an ex-convict with a red shírt</u> that he was warned to look out for?

      b. No, it was an Áutomobile salesman.

Following ideas going back to Gussenhoven (1991), Hayes and Lahiri (1991), Ghini (1993), I view rhythmic effects as a phonological restructuring. In

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[8]The idea is that at least in fast speech this is possible without presupposing any of the deaccented material as being 'given'.

particular, rhythmic clash removal can erase prosodic boundaries and thus impoverish the prosodic structure. The rhythm principles have to be stated such that they never erase the domain that provides the last accent, but always the pre-nuclear domain. In the course of the paper, I will point to the effects of rhythm where necessary, but I will not discuss its grammar in any detail.[9]

1.5. Summary and Outlook

Predicates and Modifiers, jointly referred to as 'functors', are mapped to a prosodic domain independent of their complement when they precede it; they are prosodically subordinated and 'affixed' to their complement when they follow the entire complement or part of it. Assuming the analysis of adverbs and adjectives proposed in Cinque (1999), functors are generally the projecting element, be they predicates or modifiers. This close match between prosody and syntax breaks down when looking at cases of secondary predication and modification, as we will see. I will argue that the generalization about subordination has to be stated based on the asymmetry of syntactic projection.

The basic idea is that material that is higher in the structure but follows material that is lower in the structure is subject to prosodic subordination. When looking at two sister constituents, the sister that projects syntactically counts as 'higher'. If it precedes the non-projector, the two are mapped to their own prosodic domain and are on a par. If it follows the non-projector, it is prosodically subordinated. It is effectively affixed to the preceding prosodic domain.

For the representation of prosody, I use the bracketed grid notation introduced in Idsardi (1992), where unmatched brackets are used to delimit prosodic constituents. In the syntactic representation, I indicate which sister is the non-projecting element in the tree structures by interrupting the link to the spine of the tree. Branches that are subject to prosodic subordination are drawn with thinner lines than branches that are not. Two principles, sister-matching and subordination, negotiate the relative prosody between sisters:

(12) Two Basic Cases

    a. Head Intial Structure:
        Sister Matching

    b. Head Final Structure:
        Subordination

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[9]Other reasons for lacking accents, apart from rhythm, relate to the backgrounding of linguistic material as 'given' (Schwarzschild, 1999). I will not discuss these issues in this paper.

$$\begin{array}{ll} & (\times(\times \\ & (\times(\times \\ \alpha \qquad \beta & \alpha \;\; \beta \end{array} \qquad\qquad \begin{array}{ll} & (\times \\ & (\times(\times \\ \beta \qquad \alpha & \beta \;\; \alpha \end{array}$$

We can relate grid-sturcture with accent placement by stipulating that each and only top-line grid marks are realized as pitch accents. Newman (1946) observes that the last accent in a sequence of accents is perceived as the most prominent. The subordination principle has therefore the effect that the complement is more prominent than the functor even when it follows it.[10] Whether or not functors bear an accent when they precede their complement does not change prominence relations and is decided based on rhythmic considerations.

The proposed system maps trees to prosodic grid structures. The Nuclear stress is determined indirectly: The last element that is not subordinated is perceived as the nuclear stress within any given domain. We return to the details of the prosodic mapping in section 5, after confirming the basic asymmetry witha wider range of facts.[11]

2. Prosodic Asymmetry: Predication

This section presents evidence confirming the generalization about prosodic asymmetry in (5) with respect to predicates and their complements. I present data from different dialects of West-Germanic (Dutch, English, German), involving infinitival or nominal complements.

2.1. Predicates and Infinitival Complements

West Germanic languages differ in their prosody. However, once linear order is taken into account, most of the apparent prosodic differences actually reduce to syntactic differences. This section looks closely at sequences of predicates.[12] Consider first the case of Dutch:

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[10]This could just be stated as a teleological constraint on the syntax–phonology mapping (e.g. Truckenbrodt (1995), Schwarzschild (1999)), requiring complements to be more prominent than functors.

[11]The generalizations about the asymmetry of prosody outlined in this paper may ultimately relate directly to the asymmetry of syntax (cf. Haider (1993) and Kayne (1994)). It is beyond the scope of this paper to discuss the consequences of the prosodic facts for syntactic theory and vice versa.

[12]In presenting the cluster data I am tacitly assuming that they form constituents. These may have been derived via head movement—if we allow for head-movement in the first place. I will not explore the possibilities in detail. The numbers in the examples indicate the path of selection

(13) Dutch Predicate Cluster: Final Stress

...[dát hij] [wílde   ] [hélpen] [vérven].
    that he   wanted.to   help.to   paint

                                         1   *2*   *3*
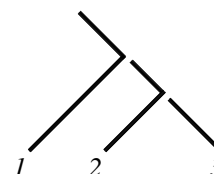
The predicates are ordered according to their embedding, starting with the highest predicate. The actual output for (13) contains less accents than given here: The accent on 'helpen' is dropped, as indicated in (14a). This seems to be due to rhythmic restructuring, which gets rid of clashes. One indication that this is the correct characterization of the data is example (14b). If a preposition separates the last two predicates, they are separated enough to both maintain their accents.

(14) a. ...[dát hij] [wílde helpen] [vérven]
     b. ...[dát hij] [wilde hélpen] [met vérven]

(14a,b) suggest that nuclear stress in the Dutch predicate clusters is final, pre-final predicates may also bear an accent. Predicate *2* in (14a) is in an accented position as indicated in (13), but gets rhythmically deaccented. The sentence in (13) can also be pronounced with only one accent on the last predicate. The rhythmic nature of accent-placement in the pre-nuclear domain is further evidenced by (15a vs. b) and (15c vs. d) respectively.

(15) Hij zéi dat hij...
     he   said that he....

     a. ...wilde   vérven.   b. ...wílde   helpen vérven.
        wanted.to paint   wanted.to help.to paint

     c. ...wílde   kunnen   helpen vérven.
        wanted.to be.able.to help.to paint

     d. ... wílde mogen kúnnen helpen vérven.
        ... wílde mogen kunnen helpen vérven.

        '...wants to be allowed to be able to help to paint.'

The following example illustrates that rhythm is evaluated rather globally. In a matrix sentence in Dutch, the first predicate is considered for the computation

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between the predicates, starting from the highest predicate '*1*', to the one selected by it '*2*' and so forth. The tree-representation encodes projecting constituents by uninterrupted lines. Predicates that receive an accent are indicated by a bold-faced branch. All sentences presented involve sentence wide focus.

of rhythm on the predicate sequence, although it has risen to first position and is not part of the cluster:

(16) Hij wílde mogen   kunnen   helpen vérven.
       he wants to be allowed to be able to help to paint.

       'He wants to be allowed to be able to help to paint.'

One way to make sense of this pattern is to say that the mapping to prosody places accents on *each* predicate, which are then rhythmically organized in the later eurythmic component resulting in the omission of certain accents. Consider now the German counterparts of the Dutch predicate clusters:

(17) German Predicate Cluster: Initial Stress

       ...dass er málen helfen wòllte.
       ...that he paint help want.   *3*   *2*   *1*
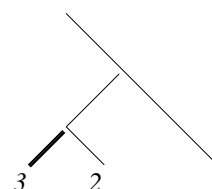
Main stress in German falls on the first predicate. No accents can occur in the post-nuclear domain unless one of the predicates is contrastively focused—in which case it would receive main prominence. There are secondary stresses after the nuclear one, but these cannot be realized as pitch accents. This is true independent of the number of predicates that follow:

(18) [Er ságte dass er] [málen helfen kòennen dürfen   wòllte].
        he said that he   paint help can   be.allowed wanted

The two languages also differ in the linear order of predicates, apart from the linear location of main word stress: while the predicates in Dutch are ordered according to embedding, the order in German is the exact inverse. The two differences, initial vs. final stress, embedding vs. inverse order, conspire to keep main stress on the *most deeply embedded predicate according to the path of selection*.

      The following paradigm shows three of the possible orders of a particular predicate sequence in German. When predicates are ordered according to embedding as in (a), this order is often taken to involve 'extraposition'. Different orders are possible, however, in so-called 'restructuring' environments (e.g. in b,c).[13]

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[13]There are many syntactic differences between 'extraposition' and 'restructuring' that I will not address in this paper—restructuring derives what appear to be monoclausal constructions

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(19) '...weil   er   ihr...
      '...because he...

   a. [versprách] [zu versúchen] [zu schwéigen].   1́≺2́≺3́

   b. [versprách] [zu schwéigen zu versuchen].   1́≺3́≺2

   c. [zu schwéigen zu versuchen versprach.]   3́≺2≺1

  be silent try promise
  '...promised her to try to be silent.'

The example (19a) is similar to predicate clusters in Dutch (15), in that main stress is rightmost and secondary accents precede the main one. The fact that the median predicate does not necessarily lose its accent rhythmically as in the Dutch example (13) (although it may in fast speech), maybe due to the fact that there is unstressed phonological material—the preposition—intervening, preventing a clash. Remember the similar pattern in the Dutch example in (14), where also a preposition separated two predicates. The prosody in Dutch extraposition constructions is generally equal to that of the German cases. Note also that the facts are equivalent in the relevant constructions in English[14]:

(20) He wánted to be áble to hélp to succéed.

That Dutch and German indeed do not differ in their prosodic systems becomes apparent in predicate clusters that are attested in both languages:[15]

(21)

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that, e.g. , facilitate scrambling between clauses, and allow pronouns that are arguments in the lower clause to be affixed on the matrix verb in second position, etc. (cf. Wurmbrand, 2003). Restructuring does not always result in a different word order between the predicates (Haider, 1994).

[14]Since English does not allow cluster formation and has a rather fixed word order between predicates, only the evidence from DP's preceding predicates discussed in the next subsection serves to show subordination in this language. A look at complex nominals, however, shows further evidence for the asymmetry at work:

  (1) a. [a tráiner] [of sláyers] [of vámpires]

       b. [a tráiner] [of vámpire slayers]

       c. [a vámpire slayer trainer.]

Each predicate preceded by its complement is subordinated, as expected.

[15]Here, the DP argument preceding the cluster is made 'given' (old information), in order to prevent subordination of the cluster.

a. ...dat Ján Maríe*given* kan₁ gezíen₃ hebben₂.
   that Jan Mary   could seen have

b. ...wéil sie ihn hat₁ málen₃ wollen₂.
   because she him has paint wanted
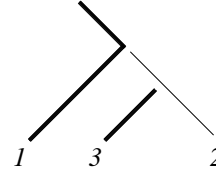
In this example, the second predicate 'hebben' is preceded by its complement 'gezien', which effects its subordination. The modal is unstressed, which is unsurprising since it in a position that loses stress via the rhythmic principles that disallow clashes. The next example illustrates again that it is in fact sufficient if a subconstituent from the complement precedes (this word order is not accepted by all native speakers of Dutch):

(22)

a. ...dat Ján Maríe gezíen₃ kan₁ hebben₂.
   'that Jan could have seen Mary.'

b. ...wéil er es káufen₃ wird₁ können₂.
   because he it buy will can
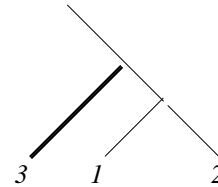
The distribution of accents so far follows the generalization in (5) plus rhythmic deaccenting. Consider the following cases of particle climbing, which further illustrates that each predicate preceded by part of its complement (the particle) is subordinated. Pre-nuclear predicates may lose the accent to avoid clashes:

(23) Climbing up the Cluster (cf. Evers, 2001, and ref. therein)
    Het labyrinth waar we hem niet over...

   a. zul len hoeven laten **ná** denken.   Ì≺2≺3≺Ś≺4
   b. zul len hoeven **ná** laten denken.   Ì≺2≺Ś≺3≺4
   c. **ná** zullen hoeven laten denken.   subordination Ś≺1≺2≺3≺4
     about will need let think
     'The labyrinth about which we won't let him reflect.'

The correlation between prosody and syntax in predicate clusters and extraposition constructions was already observed in Bech (1955/57). While the generalization that nuclear stress falls on the most deeply embedded constituent is already predicted based on the approach based on major and minor

projection lines in Cinque (1993, 269ff) and also in the approach pursued in Jacobs (1991, 1992), the linear asymmetry observed here is not: predicates are subordinated exactly when their complement or a subconstituent from their complement precedes.

2.2. Predicates and Nominal Complements

Predicates preceding their complement can receive an accent in English (a). This is also true for DP-complements (b).

(24) a. She wánted to hélp to succéed.
     b. She wánted to hélp to páint the hóuse.

The case of an infinitival complement preceding its selector is unattested in English, but consider DP-complements in contexts that show OV order in English:

(25) What did she want to change before moving in?
     She wánted to have the wálls painted.

Integration with *subjects* is in generally possible in English, both with unaccusative (a) and unergative (b) verbs[16]. Subordination is also observed when there is more than one predicate (c):

(26) a. [Gasolíne evaporated].
     b. [the déan/a télemarketer called]
     c. [The déan was expected to come.]

Subordination of predicates following arguments can also be observed in Dutch and German, even when multiple predicates follow an argument.[17]

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[16]It has been reported, however, that unaccusatives tend to phrase with the subjects whereas unergatives don't (Selkirk, 1995; Hoskins, 1996). This at least does not hold for *all* unergative and unaccusative predicates, as illustrated here.

[17]At this point, we can look at evidence that the asymmetry outlined in (5) also applies to accentual domains that are pre-nuclear. Consider the case of a complement of a predicate that is not the lowest predicate in a sequence:

(1) Sie hat María versprochen zu bléiben.
    she has Mary promised   to stay

The argument *Maria* is selected by *versprochen* 'promise', which then takes a second argument *zu bleiben* 'to stay'. This example illustrates that indeed only those predicates subordinate that are preceded by an element from its complement domain—not all predicates in a cluster blindly subordinate to a preceding DP argument. The nuclear stress falls on the rightmost accentual phrase, provided by the predicate 'bleiben'. This example illustrates that the distribution of secondary accentual phrases obeys the same principles and shows the same asymmetry. It is not simply guided by rhythmic principles.

(27) a. ...dat hij [een múur$_6$ wilde$_1$ mogen$_2$ kùnnen$_3$ helpen$_4$ vèrven$_5$.]
        that he a   wall   want   allow   can   help   paint

      'he says that he wants to be allowed to be able to help to paint a wall.'

   b. ...wéil er [ein Bíld$_6$ malen helfen kòennen dürfen wòllte.]
      because he a picture paint help can be.allowed wanted

The post-nuclear stresses, both in Dutch and German, cannot receive an accentual realization unless the relevant predicate is focused or the preceding argument constitutes given information. A focused predicate, however, would receive nuclear stress. All predicates following the direct object are subordinated, that is, they are at least severely reduced in pitch range, if not altogether deaccented.

      The asymmetry relevant here is again that in a neutral context, *two* accentual phrases are derived when the predicate *precedes* the complement—while *one* accentual domain is derived in cases the predicate *follows* the complement. Relevant data were already noted in Newman (1946); Bresnan (1971), though only looking at the main stress:

(28) a. He had pláns to leave. (argument ≺ functor)
   b. He had pláns to léave. (functor ≺ argument)

For English is is reported that the verb phrases together with a *following* argument, contrasting with Dutch and German in the directionality of phrasing. But note that uncontroversially, English differs from Dutch and German in that the verb *can* bear an accent. The evidence for the phrasing of verb and direct object often given is the application of the rhythm rule:

(29) Evidence for Phrasing Kenesei and Vogel (1995)

   a. ...in English: Rhythm Rule:
     [They mánaged] [to óutclass] [Délaware's cantéen].

   b. ...in German: No Accent on Verb
     [Sie haben Délaware's Kantíne übertroffen].

In Dutch and German, the verb does not receive an accent due to subordination; in English, on the other hand, two adjacent accentual phrases (verb and object) are derived that are then phrased together into a higher prosodic domain—this domain allows rhythmic restructuring if there is a clash. Both Dutch and German show a similar prosody to English when the verb precedes a direct object:

(30) Sie tánzte Tángo
     she danced tango

Considering the evidence discussed, we can conclude that the three languages have a very similar if not identical mapping from syntax to prosody, and all show the asymmetry outlined in (5).

2.3. A Second Type of Predication

There are a number of cases that appear to contradict the asymmetry outlined in (5). As is well known, the subject in an intransitive sentence sometimes phrases separately from the verb, e.g. when it encodes information that counts as 'given' in the context. The following context is set up to facilitate wide focus in the embedded clause—but with a backgrounded or 'given' subject.

(31) What did you say the dean did?
     I just said that [The déan] [arríved].

The same is true in OV contexts, with the direct object preceding the predicate(s) in German and Dutch. If the direct object encodes 'given' information, the predicate(s) form phonological domain of their own:

(32) a. ...dat hij [de múur$_6$ wílde$_1$ mogen$_2$ kúnnen$_3$ helpen$_4$ vérven$_5$.]
          that he a wall   want allow can   help   paint
      b. ...wéil er [das Bíld$_6$ málen helfen können dürfen wollte.]
          that he the picture paint help able allowed wanted

          '...that he wants to be allowed to be able to help to paint a wall.'

These examples contradict the generalization in (5), since predicate clusters preceded by their argument are not subordinated but receive nuclear stress. But these sentences differ in their syntactic structure. Cases with nuclear stress on the verb in Dutch were argued in Neeleman and Reinhart (1998) to involve scrambling of discourse-old information, e.g. Counterexamples even exist where the argument does not constitute discourse-old information. Consider the following example:

(33) Why did they close the factory?
      a. [The fáctory] [went bánkrupt]
      b. [Gasolíne evaporated].
      c. [A wórker] [eváporated].

'The factory' is given in (33a) and thus the verb receives main stress. A DP containing new information (as in 33b) shows the normal pattern. 'A worker' in (33c) does not have to be 'given' but still nuclear stress falls on the verb. The indefinite is arguably treated as a member of a set inferred from the background (the workers of the factory). As in (a), the verb receives an independent accent. Also, unlikelihood/unexpectedness of the predicate may play a role.[18][19]

Similar contrasts as in the case of unaccusative verbs can be constructed with unergative verbs. In (34b), the subject is again an indefinite that is interpreted as a member of set made salient by the discourse (i.e. a partitive relating to a set in the background).

(34) Why did they interrupt the play?
    a. [A chíld was crying].
    b. [An aćtor] [was crýing].

The stage-level, individual-level distinction is directly reflected in prosody (Schmerling (1976); Diesing (1992); Kratzer (1995b)), and here discourse new-/oldness is not at stake. Individual-level predicates resist subordination:

(35)   a. [Your éyes are red].
      b. [Your éyes] [are blúe].

The cases where predicates that are preceded by their complement are not subordinated all seem to involve operators (focus, partitive, generic, topic...) that add further structure. I argue that this further layer of structure is responsible for the different prosody. The idea is that the predicates really take an empty category as their complement, either a trace or an empty operator, which is bound by the c-commanding actual argument which functions as the specifier of a functional projection (or alternatively as the complement/restrictor of the operator as in b):

(36) Predication without Subordination

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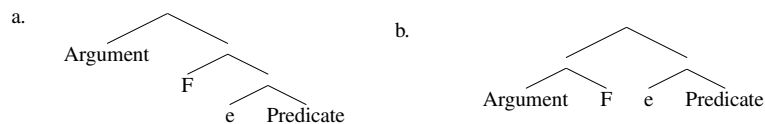
[18]This type of factor was in fact claimed in Bolinger (1972) to be sufficient to explain intonation patterns—this is clearly incorrect, given the fact that e.g. the differences that only relate to linear order but leave information structure unaffected (e.g. the comparison between Dutch and German predicate sequences) would not be explicable in terms of expectedness or similar considerations.
[19]A relevant factor may also be the thetic/categorical distinction Krifka (e.g. 1984, with respect to prosody.).

The same treatment is applied to secondary predicates. Consider the case of depictive predicates, which also fail to subordinate (cf. Pylkkänen (2002) on the structure of depictive predicates).

(37) Subject Oriented Depictive

```
            /\
          Sue  \
          /\    \
         /  \    XP
      Voice  YP  /\
            /\  tired  e
          see Peter
```

Súe$_i$ saw Péter tíred$_i$.
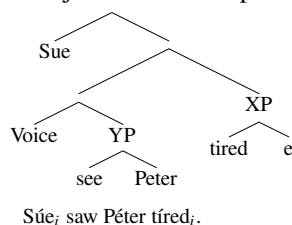
The counterexamples to (5) are then taken to be of one kind: cases in which the predicate is not really the projecting element, and there is no overt argument in complement position. The generalization about prosodic asymmetry can be restated in terms of projection as follows:

(38) Prosodic Asymmetry

- When a projector A *precedes* its complement B, a sequence of two prosodic domains that are on a par: Á B́. The last domain counts as the nuclear domain.

- When projector A *follows* an element from its complement domain B, A is subordinated: B́ A (unless A is focused or B is old information)

There are two syntactic ways to construct a predicate-argument relation, so the functor-argument relation is not sufficient to capture the prosodic asymmetry.[20] The generalization about prosodic asymmetry is syntactic in nature, and relates to the asymmetry of projection.

2.4. Summary

All evidence taken together shows that the asymmetry observed in (38) applies to all three languages. There is a single prosodic system, apparent prosodic differences reduce to syntactic differences.

---

[20]The generalization could be stated in terms for functor/argument if one adjusts the types of the VP and the depictive such that the VP takes the depictive as a complement. Within the framework of Heim and Kratzer (1998), the operation of predicate modification is used to combine predicates to form new predicates, preserving the type. Pylkkänen (2002) uses predicate modification to combine VPs with depictives to form complex predicates. It is not clear, however, that it makes sense to type shift the VP such that it takes the depictive as a complement. A discussion of the semantics of predication would be necessary at this point, but has to be postponed to future work (Thanks to Robert Truswell for brining up the issue).

3. Prosodic Asymmetry: Modification

This section shows evidence that modifiers are subordinated when they follow the modified constituent, unless they are focused. Again, there is a class of modifiers that fail to obey the generalization. These are analyzed as cases of 'secondary modfiication', with distinct syntactic properties.

3.1. Scrambling in Vitro

Determiner Phrases, especially definite descriptions, can be modified by restrictive modifiers. They are close in meaning to restrictive relative clauses. The following example refers to a man that was seen yesterday. This type of modifier in first position may have a colloquial ring to it, but is nevertheless acceptable to all speakers I consulted. A determiner phrase in first position with several restrictive modifiers allows various word orders—a nice testing ground for the effects of word order permutation on prosody.[21]

[21]The discussion of the modifier here is at odds with the discussion in Barbiers (1995, 132), who looks at similar modifiers in Dutch. Consider the example in (1). Since the conflicting time reference in the main clause renders this sentence reportedly ungrammatical, Barbiers analyzes the adverb in first position as a sentence adverbial. The derivation of the following sentence involves then scrambling of a DP to a specifier position of an adverbial, and subsequent movement of the adverbial phrase including the DP, a constituent he labels 'Pseudo-DP', to first position.

(1) Die man gisteren   vertelde (*vandaag) de waarheid.
    the man yesterday told   today   the truth

The star that Barbiers attributes to this example vanishes in a context that makes this sentence plausible, at least for two Dutch native speakers I consulted. Similarly, German native speakers tend to reject its German equivalent, but only if one does not motivate it by providing a context.

Quite generally, there is no problem in introducing a DP modifier with conflicting time reference in the first position in German, if the example is pragmatically plausible. I owe the following example to Paul Kiparsky (p.c.) (its Dutch equivalent was also accepted by two Dutch native speakers).

(2) [Der Bómbe gestern]   wird [mórgen] [einen Kríeg auslösen].
    the bomb yesterday will tomorrow a   war   unleash

    'The bomb yesterday will unleash a war tomorrow.'

Also, it is quite possible to coordinate two DPs, both modified, with conflicting time adverbials.

(3) Die Bombe gestern   und das Attentat   heute werden in Zukunft viele Probleme
    the bomb   yesterday and the assassination today will   in future   many problems
    verursachen.
    cause

Moreover, many adverbials that are sentential adverbials (e.g. *probably, unfortunately*) are strictly prohibited to occur together with a DP in first position (and again the same seems to hold

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(39) Restrictive DP-modifiers

    a. [Géstern$_1$] [dieser Mánn$_2$] war [ein Mársmensch].

    b. [Dieser Mánn$_2$ gestern$_1$] war [ein Mársmensch].
      'That man yesterday was a Martian.'

Depending on the order of the DP 'der Mann' relative to the modifier, there are either two (a), or one (b) accentual phrase in the first position preceding the verb in V$_2$ position. A modifier that follows the modified constituent is subordinated.[22]

      It is not the case that all 'extraposed' material in complex DP structures is subordinated. Complements that follow the head noun, e.g., do not subordinate. Consider the following examples, which involves both a post-posed DP modifier and an argument (example (without prosody) due to Drosdowski, 1995, 798):

(40) [seine Hóffnung gestern   ] [auf Hílfe].
     my hope   yesterday   for help

While the DP modifier 'yesterday' subordinates, since it follows part of the modifiee, the complement of the head noun remains accented.

---

true in Dutch). I take it then that there is not Pseudo-DP ([DP Adv]) movement to first position. All adverbial that do coöccur with a DP in first position are in fact DP modifiers—at least in German and possibly also in Dutch, and show the relative asymmetry in their prosody depending on word order with respect to the modifiee.

  This asymmetry may not be testable in Dutch, where sentences like the following are at least highly marked if not unacceptable (judgement Barbiers, 1995, 134):

(4) *Gisteren de krant meldde dit voorval niet.
    yesterday the paper reported this incident not

Again, this particular example sounds odd out of context in German as well, so it may be not the best test; but even cases like the acceptable one in (39a) were at least very marked for my Dutch informants.

[22]A similar asymmetry was pointed out to me by Henk van Riemsdijk. In indefinite DPs, it is possible to let an adjective follow the NP—but only if the determiner is 'doubled'. Again, the asymmetry can be observed:

(1) a. Álbert will ein schnélles Áuto (kaufen).

    b. Álbert will   ein Áuto (kaufen), ein schnelles.
      Albert wants a   car buy   a fast.one

Note that the post-DP modifiers in fact is postposed after sentence final verbs—the syntax of this construction would need some further discussion.

3.2. Repetitive Again

The adverb 'again' in English has many readings but not all of them are available in each syntactic position. Stechow (1996)) argues that the different readings arise by placing the same lexical item 'again' in different structural positions. Consider a case of wide-scope 'again':

(41) Wide-Scope 'again'
      a. [Agáin], [sómebody ópened an emérgency door]
      b. [Agáin], [somebody opened an emergency door] (focus on adverb)

The relevant reading of 'again' is the one where it has widest scope, and expresses that there was another event in which somebody opened an emergency door. In other words, 'again' takes scope over the entire proposition 'somebody opened an emergency door'.

Positioning the adverb in this position yields two intonational domains, the one containing the adverb and the one containing its complement, where the nuclear prominence is judged to be within the complement, which may include various accentual phrases. Deaccenting and subordinating the complement proposition is only possible when the adverbial itself is focused. Consider now a different linear position, in which the same scope is readily available:

(42) Wide-Scope 'again'
      a. [[Sómebody ópened the dóor], again]
      b. [[Sómebody ópened the dóor] agáin]

When the adverbial follows the modified sentence, it is subordinated, and seem to get affixed to the last accentual phrase in the intonational phrase of the complement proposition, as in (a). The pronunciation in (b) is available when the fact that somebody has opened an emergency door was just mentioned or is assumed to be salient information in the present conversation. Consider the following two contexts, which facilitate one or the other pronunciation.

(43) Why is the guard so upset?
      a. [[Sómebody ópened an emérgency door], again] (neutral)
      b. [[Sómebody ópened an emérgency door] agáin]
          (possible only if the fact that somebody opened an emergency door is taken to be part of the background)

Compare the following context:

(44) Yesterday there was an alarm, because somebody opened an emergency door. But why is the guard so upset now?

    a. [[Sómebody ópened an emérgency door], again] (dispreferred in this context)

    b. [[Sómebody ópened an emérgency door] agáin] (preferred in this context)

We conclude that the expected asymmetry is indeed attested.[23] If we analyze 'again' as an argument-taking predicate that leaves the type of the complement constituent unchanged, we can link this asymmetry to the generalization in (5).[24]

3.3. Frame-Setting Locatives

Locatives have different readings, again depending on where in the structure the locative is placed. Consider the following wide-scope locative, which Maienborn (2001) characterizes as setting the frame for the proposition expressed by the rest of the sentence. The presence of an additional sentential locative modifier forces the frame-setting reading (45), since two locatives of the same type would be contradictory:

(45) In Italy, Lothar bought his suits in France. (Maienborn, 2001, 197)

The intended reading is one where the frame setting locatives narrows the time under consideration to 'the time when Lothar was living in Italy', while the the lower locatives specifies where the events of buying suits took place. There are two possible linearizations of frame-setting locatives, and again the prosodic asymmetry is observed:

(46)   a. [In Ítaly,] [Lóthar bought his súits in Fránce].

---

[23]The data in German is more involved. It would take too long to discuss it here, but see some relevant discussion in the next section.

[24]It seems that some similar modifiers like 'for the third time' have a different prosodic pattern. Even without mentioning previous door openings, the following sentence receives preferentially stress on the adverbial:

(1) Why is the guard so upset?
Sómebody opened an émergency door for the thírd tíme.

Is this because it is a 'heavier' modifier (Lakoff, 1972)? The more material is in the modifier, the more a context may be made salient that involves a focus—so the problems of controlling information structuring surface again in this case; third, note that there is a scalar item in this adverbial: 'third'. Scalar items invoke a set of linguistic alternatives, a 'Horn scale'—this may motivate focus on the adverbial here.

b. [[Lóthar bought his súits in Fránce] in Italy].

Frame-setting locatives contrast with lower locatives, which receive an accent sentence finally (46b). How they can get an accent despite of the fact that they are modifiers apparently following the modifiee will be discussed in section 3.6. Lower Locatives cannot occur in sentence-initial position:

(47) a. *[[In Fránce,] [Lóthar bought his súits] in Italy].

     b. *[[In Ítaly] [In Fránce,] [Lóthar bought his súits].

Similar asymmetries exist in German. This type of postposing of an adverb after a final verb (as in 7) may in fact be restricted to frame-setting locatives in German.[25]

(48) a. [In Fránkreich hat] [Péter immer] [Tángo getanzt].

     b. [Péter hat immer] [[Tángo getanzt] in Frankreich].
         Peter has always   Tango danced   in France

Frame-setting locatives show the relevant asymmetry both in English and German. Jacobs (2001), Maienborn (2001) note that frame-setting modifiers are similar in syntactic position and their semantics to topics. The same parallel may apply to the intonational realization of these modifiers and topics. I will not explore this in any detail here. The crucial point here is the observed prosodic asymmetry.

3.4. Accented vs. Unaccented Adverbs

The proposal regarding modifiers and their prosody forward in this paper may throw some new light on a difference between 'accented' and 'unaccented' adverbials in the middle field in German. Lower type adverbs, such as manner adverbials, receive an accent of their own (a). Higher adverbs, such as the equivalents of 'unfortunately', 'probably', 'always', and wide-scope 'again' often do not receive an accent, even in neutral contexts.

(49) a. Sie hat háeufig gút geschláfen.
       she has often   well slept
       (stress on 'gut' can be rhythmically omitted)

     b. Sie hát leider/wahrscheinlich geschláfen.
       she has unfortunately/probably slept

---

[25]How the verb gets into place in second position will not be discussed here. The prosody of the modifier 'immer' will be discussed in the next section.

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One might attribute this fact to some inherent property of these adverbials—however, in first position, 'unstressed' adverbials are stressed and receive an accent:

(50) a. Wahrschéinlich hat sie geschláfen.
　　　probably　　　has she slept

　　b. Léider　　hat sie gelácht.
　　　unfortunately has she lauged

And moreover: 'stressed' adverbs are de-stressed in neutral V_2 sentences, where the main predicate has risen to second position instead of an auxiliary.

(51) Why did she want to buy a new bed?
　　a. Sie schlíef haeufig schlecht.
　　b. ...weil sie háeufig schlécht schlíef..

These facts relate to the on the generalization in (5). Manner adverbials modify the main predicate and a subordinated when they follow it. Higher sentential adverbials modify the entire sentence, and a subordinated when they follow (part of) their complement—as they do when they are not initial. Of course, as usual focus can override these generalizations.[26]

3.5. Subordinated PPs

Consider two linearizations of locative PPs in German:

(52) a. María wollte *in der Stádt* <u>ein Géige umtauschen.</u>
　　　Mary wanted in.the supermarket a violin exchange

　　b. María wollte <u>eine Géige</u> *in der Stadt* <u>umtauschen.</u>
　　　Maria wanted a violin in.the city exchange

The locative is subordinated only if it is preceded by an element from the event that it modifies (52b); if it precedes the entire event, it is not subordinated (52a), just as expected. This case has to be distinguished from resultatives, discussed in Krifka (1984), Uhmann (1991):

[26]Soh (2001) argues that adverbs that are heads are unstressed and adverbs that are phrases are stressed in Shanghai and Hokkien Chinese. One test for the status of the adverbs is modifiability. It seems that modifiability crosscuts the class in German at least in one direction, since both 'probably' ('sehr wahrscheinlich') and 'well' ('sehr gut') allow the addition of a modifier. However, it is true that 'higher' adverbs tend not to be modifiable (consider the contrast with subject oriented '(*sehr) clevererweise' (cleverly, not modifiable) and the manner adverb 'auf (sehr) clevere Weise' (ceverly, modifiable)—but note also the syntactic differences in realization (compound vs. PP). The modifier in fact appears *inside* of the PP. Further inquiry is needed here.

(53) a.   María hat <u>d</u>as Aúto *in die Garage* gefahren.
            Maria has the car   in the garage driven

      b.   * María hat *in die Garage* <u>d</u>as Aúto   gefahren.
            Maria has the car   in the garage driven

The subordinated PP in (53a) is a resultative predicate, and cannot precede the direct object (53b). The PP is the complement of the embedding verb *fahren*. According to Krifka (1984), the PP is interpreted as part of the predicate. This is responsible for the subordination in this example. When the direct object is pronominalized in either of the two types of examples, it is presumably moved to a higher projection and therefore will not interfere with the prosody of the lower domain. Then the difference between the two types of PP emerges:

(54) a. María wollte sie in   der Stádt   <u>úmtauschen</u>.
          Maria wanted it   in.the city exchange

      b. María wollte es <u>in die Garáge</u> fahren.
          Maria wanted it <u>in the garage</u> drive

Note the two different patterns with respect to the last predicate in the sentence: Since the locative PP in (54a) *im Supermarkt* modifies the entire event including the predicate *umtauschen*, nuclear stress now falls on the predicate. The goal PP *in die Garage* in (54b), however, is the complement of the predicate *fahren*, thus 'fahren' is subordinated. This pattern lends further support for the the asymmetry outlined in (5).

3.6. A Second Type of Modification

This section illustrates a second type of constructing a modification structure, analogous to the case of secondary predication (section 2.3).
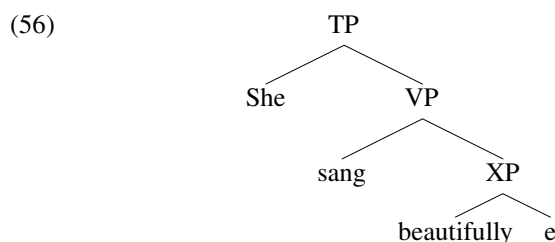
In order to derive the correct prosody for the modifiers discussed so far , we have to analyze the *modifier* as the projecting element. This view of adverbials may not be surprising, at least if we take adverbials to involve functional projections, and consider adverbs constituents in their specifier, following Alexiadou (1997); Cinque (1999). Modifiers involve projecting heads that select an argument—the modifiee. Whether the adverbs are the realization of this projecting feature or are in the specifier of the modifying projections is an independent issue that will be discussed in the next section.

There are modifiers, however, that fail to subordinate in cases where they follow the modifiee. Consider low sentence final adverbials in English.

(55) a. She sáng béautifully.

b. She arríved on Mónday.

c. Lóthar bought his súits in Fránce. (cf. example 45)

Pesetsky (1995) and Phillips (1996) show evidence that certain types of adverbials are really lower in the structure than the material that they modify. Larson (2004) argues that they are base-generated low within the VP. Haider (2000) presents evidence that they are within the VP and modify an empty constituent to their right, rather than being adjoined high. This is of course exactly what is needed to save the generalization in (38): If they are low in the structure, and do not project up, then they are non-projectors occurring to the right of the projecting material, thus they are not expected to undergo subordination:

(56)

```
                    TP
                   /  \
                She    VP
                      /  \
                   sang   XP
                         /  \
                  beautifully  e
```

These modification structures are then analogous to cases of secondary predication, and could be called 'secondary modification'.[27]

3.7. Summary

This section presented evidence for the claim that the prosody of modification shows the same asymmetries as the prosody of predicates and arguments, namely the one outlined in (38). Since earlier approaches compared arguments and modifiers, rather than predicates and modifiers, these parallels have gone unnoticed.[28]

---

[27]The nuclear stress in cases of secondary predication compatible with the approach that places nuclear stress on the most deeply embedded constituent along the major projection (Cinque, 1993, 269). The major projection line, according to Cinque, is the the line that connects the root of the tree with a terminal node, following $\bar{X}$-nodes, and cases where two XPs are sisters, follows the recursive side of the tree, which he assumes to be fixed for any given language (in Germanic, it's the right hand sister). The principle of subordination, cyclically applied, is an implementation of this idea, that does not invoke the concepts of $\bar{X}$ theory.

[28]A thorough look at all classes of adverbs defined by their position in the phrase structure (cf. Jackendoff, 1972; Cinque, 1999; Nilsen, 2002; Frey, 2003, for different views) is beyond the scope of this paper.
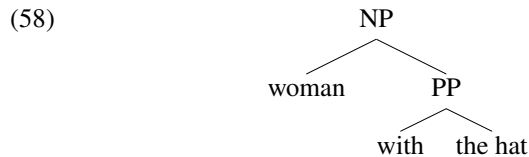
4. Specifiers, Heads, and Two-Place Functions

A notorious problem for the assignment of prosody in general (cf. discussion in Cinque, 1993) and for the present proposal in particular is the prosody of specifiers. Consider the nominal adjuncts involving 'with'. 'With' would have to be analyzed as a modifier taking two arguments:

(57) The wóman with the hát.

Given the analysis so far, the modifier should be the main projection of the construction. 'with' combines with 'the hat' forming the modifier 'with the hat', modifying the head noun 'woman'. We would expect then subordination of 'with the hat', since it follows the modifiee—a prediction that is quite apparently false. Why does the principle of subordination fail to apply?

  Note that even if 'with' is the main predicate, the entire constituent is not a PP, but an NP. The determiner 'the' selects a noun, not a prepositional phrase.

(58)

```
                         NP
                        /  \
                  woman     PP
                           /  \
                        with   the hat
```

Of course, if this is the correct structure and the projector is really the head noun 'woman', the problem with respect to the prosody disappear: the projector precedes the non-projector, so two accentual domains are expected.

  While 'woman' is the argument of the functor 'with the hat', the functor remains unsubordinated and receives its own accentual domain since it is its sister that projects. A similar rationale applies to coordination. Again, 'and' can be seen as a two-place function. The prosody is similar to the previous example:

(59) Coordination
      The wóman and the hát.

The analysis that I have to adopt in order to assign the right prosody is the following:

(60)

```
                         DP
                        /  \
                     DP      BP
                    /  \    /  \
                 the  woman and  the hat
```
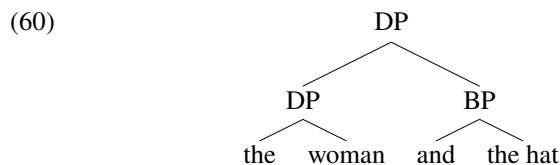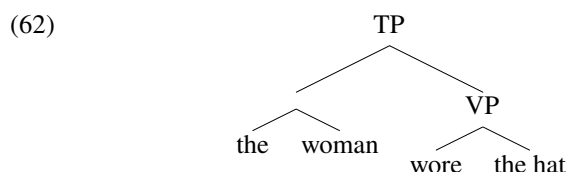
This type of analysis was proposed for coordination in Munn (2000). The first conjunct projects, and the second conjunct including coordinated is an adjunct to the first. Again, the prosody goes with the syntactic projection, and not with the functor/argument relation, it seems.

The preceding two cases involved what looked like two place functions (*with*, *and*), and prosodic problems that arise. This following case presents another case of a two-place functor which creates problems for the present system:

(61) The wóman wore the hát.

Under the assumption that it is 'wore the hát' that takes the subject 'the wóman' as an argument (Marantz, 1984), the asymmetry in (5) would predict subordination of 'wore the hát' under 'the wóman'—a patently false prediction of the system described so far. But uncontroversially, 'The woman' is not in its base position.

The problem can be resolved by positing that it is the specifier which in fact projects, following the proposal in Starke (2001), who takes specifiers to be complement-taking projectors. It has raised to a higher position in the extended projection, or, if we follow Starke (2001), the specifier itself projects a higher element of f-seq, say T, or maybe it realizes the functional head that introduces the argument position of the agent in the first place, say *voice* (cf. Kratzer, 1995a; Pylkkänen, 2002).

(62)

```
                    TP
                   /  \
                  /    \
                 /      VP
                / \    /  \
             the woman /    \
                    wore  the hat
```

This analysis is also compatible with the cases of modification and coordination discussed above. The three examples all posit similar challenges to the present analysis, and the tentative proposal is to resolve all of them by adopting the analysis of specifiers independently advocated in Starke (2001). But a generalization goes uncaptured here, it seems: In all three cases, binary functors taking two arguments are involved. Only one of the arguments seems to be allowed to stay in the basic projection. This may relate to a generalization about predicates not tolerating two arguments in their domain (Anagnastopoulou and Alexiadou, 2001).

Arregi (2002) offers a different solution to the specifier problem: in analogy to the compound rule (e.g. Libermann and Prince (1977)), he proposes that the reason specifiers do not receive nuclear stress is due to the

fact that the constituent they attach to is internally branching. 'Specifiers' are defined in bare phrase structure (Chomsky, 1995) as sisters of branching heads. The idea is then that the sister of a head is more prominent, unless the head is branching, in which case the head is more prominent. This makes the right distinction between complements and specifiers. But this solution does not work for cases where the complement of an embedded predicate is preposed (other relevant cases are discussed in (22), (23) and (27):

(63) Maria hat <u>zu</u> schwéigen *versucht zu versprechen*.
      Maria has to be silent   tried to promise

The condition that a sister constituent be branching is not sufficient. Only in cases where the non-projecting element is an argument of a two-place functor (such as 'with', 'and', transitive verbs) does the principle of subordination fail to apply, but not in cases where the complement of an embedded predicate is the sister of a branching cluster of predicates. The problem of the correct analysis of specifiers remains to be solved.

4.1. Some Apparent Mismatches

This section introduces some apparent counterexamples to the pattern described so far, and explains how they can be accounted for.

4.1.1. Arguments that Pattern like Modifiers

Some arguments pattern with modifiers and contrast with arguments in that they don't get nuclear stress in what appears to be an out-of-the-blue context. It is important to note that they also pattern with modifiers in that they can be extraposed without a resumptive pronoun:[29]

(64)   a. Du kannst dich auf María verlássen.

---

[29] Even for the type of argument in (64), it depends on the context whether these arguments are construed as receiving nuclear stress or not. In the following context, the argument receives nuclear stress and consequently cannot be extraposed:

(1) Warum dachte   er, dass er nicht zu lernen braucht?
     why   thought he that he does not learn   need
     'Why did he think that he doesn't need to learn?'

   a. Er hat sich auf seinen Náchbarn verlassen.

   b. ??Er hast sich   verlássen auf seinen Nachbarn.
       he   has himself relied   on his   neighbor
       'He relied on his neighbor.'

b. Du kannst dich   verlássen auf Maria.
   you can   yourself rely   on Mary

Other arguments, those that are eligible for nuclear stress assignment, generally cannot occur in this extraposed position without a resumptive pronoun:

(65) Du kannst *(die) grúessen die Maria.
     you can   (her) greet   the Mary

The important point to be made her is that precisely those constituent that do not receive nuclear stress—in general adverbials, but also some arguments—can also occur to the right of the verb and be subordinated. Arguments that do not receive nuclear stress may be structurally 'higher' than those which do receive nuclear stress, that is, they are not in the complement position of the verb, just like adverbs. This remains to be investigated in detail.

4.1.2. *Modifiers that Pattern like Arguments*

There are also some apparent modifiers that receive nuclear stress. Consider internal locatives (66a), discussed in Krifka (1984, 14), which receive nuclear stress, in contrast to external modifiers (66b):

(66) a. Er hat am   Schréibtisch gearbeitet.
        he has at.the desk   worked

       'He worked at the desk (carpenter).'

    b. Er hat am   Schréibtisch geárbeitet.
        he has at.the desk   worked

       'He worked (sitting) at the desk.'

Similar examples of internal locatives are discussed in and Maienborn (2001, 201):

(67) a. Pául hat in Stíefeln geduscht.
       Paul has in boots   showered

    b. Die Spíeler haben den Tórschützen auf den Schúltern tragen
       the players have the scorer   on the shoulders carried
       wollen.
       wanted

These locatives show a categorically different pattern from the frame-setting locatives discussed in section (3.3). The solution proposed here is that they modify unrealized constituents in the complement domain of the main predicate, in other words, they are in fact part of the complement domain of the

predicate. As expected, they are not allowed to follow the verb, just like true complements. The following can only be only be an external locative:

(68) Er hat gearbeitet, am   Schreibtisch.
      He has worked,   at the desk

The cases discussed in this section illustrate that the crucial relation relevant for prosody is structural height. The distinction functor vs. complement is used here only to determine which of two sisters counts as structurally 'higher', based on the asymmetry of projection: functors are assumed to project.

5. Deriving the Asymmetry

How does the syntax–phonology mapping work? The claim proposed here is that prosody can be derived using exactly one type of syntactic information: the information of which of two sister constituents projects,[30], by a recursive mechanism following the transformational cycle in SPE, similar to the proposals in Jacobs (1991, 1992); Cinque (1993); Arregi (2002).[31] I will illustrate how the syntax-to-prosody mapping works based on the cases involving predicates and their arguments.

Relative prominence can be represented by a metrical grid (Liberman, 1975; Libermann and Prince, 1977). The prosodic foot structure imposed on the grid marks prosodic phrasing. I assume a version of the bracketed grid as outlined in Halle and Idsardi (1995). Higher grid marks are introduced by grid mark projection:
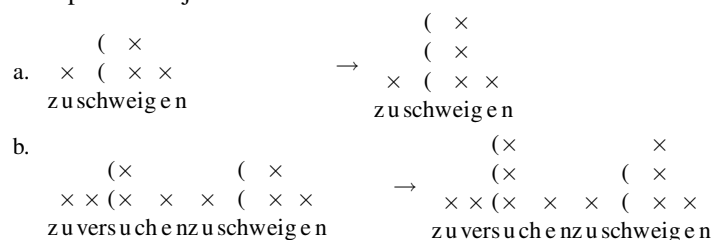
(69) Projection: Project all top-line grid-marks of a constituent to a new top grid-line, and foot them.

Projection as proposed here leaves relative prominence within the projected material intact, contrary to projection in the literature on the metrical grid, where only the head of a foot projects. This is a necessary modification of the theory, since the claim is that subordination is only negotiated via syntax.

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[30]Following (Wagner, 2002), where evidence from phrases, compounds and derivatives is presented. Johnson (2002) posits an asymmetric operation MERGE (essentially, the formation of an ordered pair), argues that focus projection and island conditions can be derived from properties of recursive Merge. This proposal contrasts with Chomsky (2001), who assumes a symmetric operation of set-merge. I assume that the relation between sisters is asymmetrical at least at the interface to phonology.

[31]For evidence against the algorithm based on depth of embedding in terms of the number of cycles or node-counting as in Cinque (1993) see Truckenbrodt (1993) and Arregi (2002).

(70) Examples of Projection

a.
```
            (   ×                          (   ×
      (   ×                                (   ×
      ×  (   ×  ×            →        ×  (   ×  ×
      z u schweig e n                 z u schweig e n
```

b.
```
                                                      (×                         ×
        (×              (   ×                          (×                   (   ×
        × × (×    ×    ×  (   × ×          →      × × (×    ×    ×  (   × ×
        z u vers u ch e nz u schweig e n           z u vers u ch e nz u schweig e n
```

The conventions about what to project when computing the relative prominence between two sisters constitutes the phonology-syntax interface. 'Equalize' is a different version of the stress equalization principle proposed in Halle and Vergnaud (1987).[32]

(71) Projection convention for $< \alpha, \beta >$, where α projects:

    a.   'Sister-Matching': if α precedes β, Project α and Project β.

    b.   'Prosodic Subordination': if β precedes α, Project β.

The two types of cases that have to be distinguished are the following:

(72) Two Cases

    a. Head Intial Structure: b. Head Final Structure:
        Sister Matching   Subordination

```
                            (×(×                                            (×
                            (×(×                                            (×(×
    α        β              α β                  β        α                  β α
```
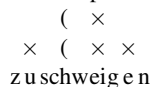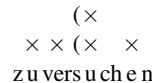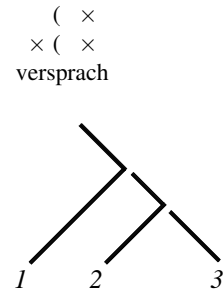
To illustrate how this works, consider first a right-branching structure.

(73) versprach zu versuchen zu schweigen
       promised to try   to be.silent

    'promised to try to be silent'

    a. First Step: Create γ b. Second Step: Create β
```
        (   ×                                       (×
     ×  (   × ×                               × × (×   ×
     z u schweig e n                          z u vers u ch e n
```

---

[32]The reason why I adopt a different version relate to the pre-nuclear rhythmic pattern. The approaches to stress in SPE, Libermann and Prince (1977), and Halle and Vergnaud (1987) are modeled based on the assumption that in the pre-nuclear domain, prominence is declining. In terms of relative prominence: 2 3 4 5 1, whereas the present proposal derives a sequence of equal stresses that are rhythmically organized. The output of the algorithm here is similar to the output of Libermann and Prince (1977) *after stress leveling has applied*. The last or nuclear accent is special in that it is not subject to rhythm, and is followed by a boundary.

c. Third Step: $< \alpha, \beta >$

```
(×            (   ×
(×            (   ×
× × (×    ×    ×    (   × ×
z u vers u ch e nz u schweig e n
```

d. Fourth Step: Create γ

```
(   ×
× ( ×
versprach
```

e. Fifth Step: $< \gamma < \alpha, \beta >>$

```
(   ×         ×              ×
(   ×         (×             ×
(   ×         (×        (   ×
× (   × × × (×    ×    ×   (   × ×
versprachzuvers u ch e nz u schweig e n
```



```
1        2              3
```

The representation derived has a crucial property: Three accents, i.e. top-level grid marks, are derived, which are essentially on a par. They count as the heads of three accentual domains. There are several lines in the grids that would seem superfluous. Why would the simpler version not suffice?

(74) versprach zu versuchen zu schweigen
      'promised to try   to be silent'

```
(   ×      (×          (   ×
× (   ×  × × (×    ×    ×   (   × ×
versprachzuvers u ch e nz u schweig e n
```

When two complex right-branching structures are put together, e.g. in co-ordination, the need for further structure becomes apparent. Otherwise, the expectation would be a sequence of accents on a par.

(75) Two complex Right-Branching Structures

      'promised to try to be silent and asked to allow to whisper'

```
(  ×        ×            ×        ×     ×          ×
(  ×        ×            ×       (×     ×          ×
(  ×        (×           ×       (×     ×          ×
(  ×        (×       (   ×       (×    (×          ×
× (  ×  × × (×    ×    ×   (   ×   ( × (× × ×(×  × × (× ×
versprachzuvers u ch e nz u schweigenundbatzuerlaub e n z ufl ü stern
```

The additional grouping in (75) is necessary, since the pitch level is reset at the break between the two predicate sequences. Within each predicate sequence downstep (or declination) between the three accents can be observed. The relative pitch level of the six accents in the structure can be approximated by looking at the left brackets: the highest left bracket in the column represents the relative pitch level. The grouping arises through the brackets that delimit feet at the relevant grid line. For discussion of the phonetic realization of
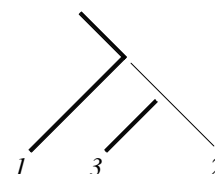
hierarchical structures see Ladd (1986, 1988). Consider now two different linearizations:

(76) $1 \prec 3 \prec 2$

versprach zu schweigen zu versuchen
promised to be silent   to try

'promised to try to be.silent'

```
   (   ×       (   ×
   (   ×       (   ×               (×
 × (   ×  (×   (   × ×    × ×(×    ×
 versprachz u schweig e nz u vers u ch e n
```
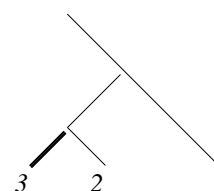

The next example illustrates the case of a completely inverted structure.

(77) $3 \prec 2 \prec 1$

zu schweigen zu versuchen versprach
to be silent   to try   promised

'to promise to try to be silent

```
   (   ×
   (   ×              (×         ( ×
(×   (   × ×    × ×(×   × ×( ×
z u schweig e nz u vers u ch e n v ersprach
```


The recursive projection mechanism outlined here derives the correct prominence relations between constituents. The foot structure imposed on the grid marks models intuitions about prosodic domains, serves to mark domains for down-stepping and reset, and captures mismatches in constituency between syntax and prosody.[33]

The linear order effect was stipulated here: ultimately, the very mechanism that fixes linear order should be linked to the prosodic differences. I will return to this problem in the conclusion.[34]

6. Conclusion and Outlook

The first part of the paper presented an asymmetry in prosody: if a functor *precedes* an argument it is phrased separately; if it *follows* an element from

---

[33]For arguments against a mechanism based on XP-alignment see Wagner (2004).

[34]Whether or not phonological and syntactic derivations apply cyclically as was suggested in Bierwisch (1968), Bresnan (1971), and Adger (2003) is not apparent from the data discussed here, and requires further research.

its argument or the entire argument, it is subordinated. The asymmetry was first illustrated based on predicates and infinitival and nominal complements. It was then generalized to cases of modification, again using the asymmetry between functor and argument, similar to approaches to prosody in categorial grammar (Steedman, 2001).

A look at secondary predication and modification provided evidence that the generalization is really syntactic in nature and has to be stated based on the asymmetry of projection, rather than on the asymmetry based on the functor-argument relation. Just like linear order, prosody is by and large determined by the architecture of syntactic trees and syntactic relations. Eurythmic effects further complicate the picture and by deleting prosodic structure they create prosodic constituents that cannot be determined based on syntactic relations alone.[35]

One important difference to alternative ways of determined nuclear stress is that the prosodic subordination observed after the nuclear stress is not an effect of placing the nuclear stress on a preceding constituent, but conversely it is cyclic subordination that causes that nuclear stress to be perceived on that last non-subordinated constituent.

A question not touched upon in this paper so far is how the different linear orders between functors and their complements come about. Under an asymmetric view of syntax (e.g. Haider, 1993; Kayne, 1994) one order is basic and the other order is derived.

Remember that predicates that precede their complement receive an independent prosodic domain, and those that follow their complement or part of it are affixed to the prosodic domain of the complement, unless the predicate is focused, in which case it does receive an accent:

(78) a. [Sie tánzte] [einen Tángo.]
          she danced   a.acc Tango

      b. [Sie hát] [einen Tángo *getanzt*.]
          she has   a.acc Tango danced

      c. [Sie hát] [einen Tángo [*getánzt*]$_{Fokus}$.]
          she has   a.acc Tango danced

          'She danced a tango.'

Now consider the following prosodic pattern of VP remnant fronting in German:

---

[35]The general idea of tying phonological domains more closely to syntactic structure is widely pursued at the moment (Legate, 2001; Marvin, 2002; Arregi, 2002; Adger, 2003; Kahnemuyipour, 2003). Elaborating the differences and parallels would go beyond the scope of this paper.

(79) a. [Péter [hat der María] [einen Kúss gegeben]
         Peter   has the Mary   a kiss given

      b. [[Einen Kúss gegeben] hat Peter der Maria.]
           a kiss given   has Peter the Mary

      c. [[Einen Kúss gegeben] hat Peter der [Mariía]*Focus*]
           a kiss given   has Peter the   Mary

The fronted VP receives an accentual domain, the remaining part of the sentence is subordinated—unless there is a focused constituent in the remnant material. This, of course, is exactly the asymmetry observed earlier for predication and modification. It seems tempting then to analyze the reorderings at stake as cases of remnant movement. A comprehensive syntactic account of the derivation of linear order in tandem with prosody remains to be developed.

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