PART I

Surface Realization of Focus

1 Contrastive Stress, Contrariety, and Focus

KEES VAN DEEMTER

Abstract

Prosodically acceptable speech must contain accents at appropriate words. This chapter argues that many cases of accenting can be accounted for neither by a theory of given and new information nor by one that looks for syntactic and/or semantic parallelism. An account is attempted that makes use of the notion of *contrariety* that originates from traditional logic. It states, roughly speaking, that contrastive stress is required between sentences that stand in the relation of contrariety, modulo certain "identifying" substitutions.

1 Current Perspectives on Contrast

If speech generation systems are to generate prosodically acceptable speech, the generation of *accents*[1] is an important requirement. The importance of *information status* for accenting was demonstrated a long time ago (e.g., Halliday 1967, Chafe 1976). According to these accounts, which have now proved their validity for most Germanic languages, an expression that conveys new information tends to be focused by means of an accent. The exact place of the accent, within the focused constituent, is partly determined by syntactic structure. In this chapter, it is assumed that syntactic structure is accounted for through the mechanism of F*ocus-Accent Theory*.[2]

Given that the connection between accent and new information is now well established, it would be tempting to explain all accents as caused by informational newness. Unfortunately, this is not always possible. Cruttenden, for example, cites various kinds of cases in which *given* information must be accented. For example, someone may, at some stage of a dialogue, say *I didn't go after all*, and someone else may reply *You didn't* $^{+}$*go*?,[3] where the verb *go* is accented even though it constitutes given information (Cruttenden 1986). In monologues, cases such as the following come to mind:

(1) $^{+}$Mozart wrote $^{+}$few fugues, but $^{+}$Bach wrote $^{+}$many fugues.

Thanks are due to Bob Ladd, Willem Rump, and Jacques Terken for useful conversations on the topic of this chapter. An earlier version has appeared in the proceedings of the *Journal of Semantics* conference on focus: P. Bosch and R. van der Sandt (eds.), "Focus & Natural Language Processing," December 1994, and in the IPO Annual Progress Report 1994.

(2) John is neither $^{+}$eager to please, nor $^{+}$easy to please, nor $^{+}$certain to please.

In all such examples, the accents tend to be as indicated, whether or not the focused entities constitute new information. For example, *Mozart* and *Bach* must be accented even if they have occurred just prior to the utterance of (1).[4] In cases like (1) and (2), it is common to speak of contrastive intonation, or more specifically of contrastive stress or contrastive accent, even though the term *contrast* has also been used in a much wider sense (see, e.g., Steedman 1994). Intuitively speaking, the accents indicated in (1) and (2) express a *contrast* (cf. the notion of contrast in visual perception) between different expressions. For example, *Mozart* and *Bach* are such contrasted expressions, and likewise, the two sentential conjuncts of (1) are also said to be in contrast. Chomsky wrote in connection with (2) that "in 'parallel constructions' ... contrastive intonation is necessary," but he added that it had never been made quite clear what this notion of "parallel constructions" signifies (Chomsky 1971). Also, there is no obvious physical difference that forms the basis of the distinction between contrastive and other accents. All of this makes *contrast* a somewhat problematic notion, which has so far largely defied formalization. The present chapter will stick to the intuitive label *contrast* and try to formalize the intuition behind it. In addition, it is assumed that all the expressions that are designated as contrasted must be accented in speech, and this is where our formalization makes its actual predictions. The possibility of a practical application is briefly mentioned in Section 4.

Imagine two expressions, a and b, that are, in principle, contrastable. (See Section 3 for details.) For example, expression a is a proper name that refers to the person x, and it does so in the context of the sentence S_a, while expression b refers to another person y, doing so in the context of the sentence S_b. It seems clear that a proper theory of contrastive stress has to specify under which conditions a and b can be contrasted. Yet, not much work seems to have been done toward formalizing the conditions that determine whether two sentences are contrastable.[5] One possibility for a theory of contrastive stress is to turn to theories of parallelism, as have come up in relation to other linguistic phenomena. By now, some partial formalizations of parallelism have been proposed. For example, Prüst has proposed a notion of parallelism to account for VP anaphora and several related phenomena (Prüst 1992).[6] Characteristically, however, his proposal implies a rather strict *syntactic* parallelism. This is no coincidence. The notion of parallelism seems hard to conceive of in a completely nonsyntactic way. Thus it may be that parallelism can account for such cases of contrastive stress as Rooth's (3) and possibly even for such cases as (2).

(3) An $^{+}$American farmer talked to a $^{+}$Canadian farmer.

However, a theory based on parallelism cannot account for contrast between such syntactically dissimilar sentences as the two constituent sentences of the

following pairs:

(4) $^{+}$Seven has no divisors; $^{+}$eight is a power of two.

(5) $^{+}$Grandma drives 200 m.p.h.; $^{+}$daddy never violates the speed limits.

(6) I bought a $^{+}$novel from the bookshop, but Tom sold me an entire $^{+}$encyclopedia.

(Once more, the words that are marked as accented must be accented even if they constitute given information.) For example, consider (5). There is no more (syntactic) parallelism between the first and the second conjunct than there is between the first conjunct and, say, *daddy never knew that*, and yet the conjuncts in (5) require contrastive accent and those in (5′) do not:

(5′) Grandma drives 200 m.p.h.; daddy never knew that.

We will assume that a properly formalized notion of parallelism is a sufficient, but not a necessary condition for contrastive stress. In what follows, one other sufficient condition for contrastive stress, which will be able to account for such cases as (4)–(6), will be explored. Yet other sources of contrastive accent must wait for further research.

Rooth observed that "in many examples, theoretical accounts based on a semantics of contrast are in competition with ones based on a semantics of anaphora," that is, on a semantics of givenness. Consequently, it is desirable to deal with contrast, novelty, and givenness in one framework. Therefore, we will now first sketch a little theory of novelty and givenness, and then indicate how contrastiveness fits in.

2 Novelty and Contrastiveness as Sources of Accent

A proposal for how given/new status of information may be relevant for noun phrase accenting has been put forward in van Deemter 1994 and van Deemter et al. 1994. The general idea is as follows. Much of what is said in a discourse can be interpreted in basically two ways, namely, as true of the entire domain of discourse or as true of some contextually determined subdomain. This holds, among other things, for the descriptive information contained in a noun phrase. For example, consider (7):

(7) a. The children were upstairs.
b. The girls were having fun.

Here the descriptive information that is contained in the NP *the girls* (roughly: 'The set x contains all the girls') may be true of the set that is introduced by it, but it may also be that it is only true "against the background" of an earlier-introduced set, namely, that of all the children that are mentioned in the first sentence. In the latter case, what it says is that the set contains all the girls that are *also* elements of this set of children, and the predicate *were having fun* in (7b) is used to assert that all of

those (i.e., the elements of Girls ∩ Children) were having fun. Technically, this may be modeled through Dag Westerståhl's method of using *context sets* to restrict the first argument of a generalized quantifier (Westerståhl 1985, van Deemter 1992).

Let us stick to this second interpretation of the discourse for a while, and call it its "anaphoric" interpretation, stretching that notion somewhat beyond its traditional meaning. Now two possibilities may be distinguished: either all the children happen to be girls or some of them are boys. In the first case, we speak of *identity anaphora*, since the NP *the girls* refers to an already-introduced set of individuals. In the second case, we speak of *nonidentity anaphora*, because the set of girls is introduced through a relation with an already-familiar entity (hence the designation "anaphoric"), but this relation is not the relation of identity: the set of female children is carved out, so to speak, from the larger set of children. Now as it happens, there is a connection between having identity anaphora and appearing unaccented. More precisely, if an NP can be construed as standing in a relation of identity anaphora to another NP then it need not be accented, but in any other case (including the one where it has to be construed as standing in a relation of nonidentity anaphora), there is a strong tendency for the NP to be accented.

If a constituent is accented, Focus-Accent Theory offers rules that determine what word in the constituent the accent must trickle down to. These rules make use of so-called metrical trees, which represent the syntactic structure of a sentence in the form of a binary tree. For example, if the phrase *the author of a sonata* is used to introduce a new individual into the discourse, it needs to be accented. Focus-Accent Theory predicts that, normally, the accent will land on *sonata*. However, there can be several reasons why accent is prevented from going to that part of the syntax tree, and these are covered by the so-called *Default Accent* rule (Ladd 1980). In van Deemter 1994, it has been proposed that deaccenting of a word can take place for two reasons. The first is that the word is part of an NP that has identity anaphora to some other NP, as in (8), where it is assumed that *this sonata* refers to *this piece of music*:

(8) Look at this piece of music. [The $^{+}$composer of [this $^{-}$sonata]] must have been a funny guy!

Suppose *The composer of this sonata* constitutes new information, so it has to be accented. If only syntax were taken into account, this would mean that *sonata* is accented, but since *this sonata* has identity anaphora to some already-established discourse entity, the Default Accent rule will move the accent to *composer*. Note that this happens even if the word *sonata* has not been mentioned before. The second reason for deaccenting occurs, roughly, when the word that would normally receive accent has occurred in the very recent past, or when a subsumed (i.e., extensionally included) word has done that. Note that this makes concept-givenness a nonsymmetrical relation, since a word may now be deaccented because of a subsumed word, but not the other way round. For example, in (9a), *string instruments* can be deaccented because of the extensionally included *viola*. In (9b),

however, *viola* cannot be deaccented because of the subsuming (i.e., extensionally including) *string instruments*.

(9) a. Bach wrote many pieces for $^{+}$viola; he must have loved $^{-}$string $^{-}$instruments.
b. Bach wrote many pieces for $^{+}$string instruments; he must have loved the $^{+}$viola.

Note that some of the work that might be done by a theory of *contrast* can also be done by a theory of givenness, provided it allows for "anticipatory" deaccenting (Cruttenden 1986).[7] For example, consider (1), here repeated as (10).

(10) $^{+}$Mozart wrote $^{+}$few $^{-}$fugues, but $^{+}$Bach wrote $^{+}$many $^{-}$fugues.

The accent on *many* can be explained straightforwardly by making use of the Default Accent rule: *fugues* constitutes given information, and consequently, accent must land on *many*. Slightly harder to account for is the accenting on *few fugues*. It occurs earlier than *many fugues*, so *fugues* does not constitute given information yet. To account for the accent on *few*, one might define a notion of givenness that looks forward as well as backward. Note, however, that such a mechanism cannot account for contrastive accent in cases where there is little common material. One kind of case is illustrated by the occurrences of *Bach* and *Mozart* in (10), which are accented, but not as a result of an application of the *Default Accent* rule, since there is no common material to trigger this rule. Other kinds of cases are illustrated in (4–6). Once more, nothing is deaccented, and yet the accent lands on a word (*seven*, *eight*, *Grandma*, etc.) that might happen to express given information. This shows that, in addition to "givenness" accounts of accent, no matter how liberal, a genuine account of contrast has to be provided.[8]

Granted that both novelty and contrastiveness need accounting for, how are the two related? Space does not allow extensive discussion of this issue – and of the more general question of how all the different semantic factors involved in accenting interact – and these will be discussed elsewhere. What follows is a very rough outline.

I will assume that contrast is completely on a par with novelty: an expression can be marked as new (i.e., it is not identity anaphoric), and it can also be marked as contrasted with something. In either case, it is accented. Also in either case, the Default Accent rule may apply. For example, consider examples (1) and (2) again, with the phrases $^{+}$*few fugues*, $^{+}$*many fugues* and $^{+}$*eager to please*, $^{+}$*easy to please*, $^{+}$*certain to please*, respectively. In all these examples, the main accent has shifted away from the words (*fugues*, *please*) where it would normally go. As has already been noted, however, deaccenting occurs in both directions: In (10), the first occurrence of *fugues* is deaccented because of the second occurrence, just as the second occurrence is deaccented because of the first. Deaccenting has to become a bidirectional affair. The most interesting case is that of concept-givenness, where it seems that the nonsymmetry that has been noted in connection with (9a, b)

disappears when deaccenting applies between two expressions that are parts of contrasted expressions. For example, in (11) the lack of an accent on *viola* does not seem warranted, precisely because not all instruments are violas.[9]

(11)* Bach owned an $^{+}$old $^{-}$viola; Mozart owned a $^{+}$new $^{-}$instrument.

On the other hand, we have seen that bidirectional deaccenting within contrastive constructions does apply between words that have *the same* denotation. Thus, we will make the following hypothesis. Deaccenting of a word occurrence w that is part of an informationally new constituent c applies if w *subsumes* a recent word occurrence w', unless c is also contrasted with some other constituent. Deaccenting of a word occurrence w that is part of a constituent that is contrasted with some other constituent applies only if the word is extensionally *identical* with a recent word occurrence w'. (The precise meaning of *recent* is one of the things that have to be made more precise.) If a variety of this hypothesis is correct, it may be accounted for by taking the notion of 'anticipatory deaccenting' seriously, and by looking at w and w' separately: For w to be deaccented, it has to subsume w', but for w' to be deaccented by the future occurrence of w, w' has to subsume w. Consequently, bidirectional deaccenting is (correctly) predicted to occur only if w and w' are extensionally equal, as is the case in (10), for example.

After these remarks on deaccenting, we now turn to a formalization of the conditions under which two expressions are contrasted.

3 Toward a Formalization of the Notion of Contrast

We have seen that syntactic parallelism is one possible source of contrastive accent. I will now try to show how another source of contrast is related to the Aristotelian notion of *contrariety*. Two propositions are *contraries* if it is impossible for them to be true at the same time. Thus, *Mozart wrote (exactly) 23 string quartets* and *Mozart wrote (exactly) 24 string quartets* are contraries. Note that this definition causes contraries to include *contradictories*, which can be neither true at the same time nor false at the same time. Thus, *Mozart wrote at least 23 string quartets* will also be called a contrary of *Mozart wrote fewer than 23 string quartets*. Formally, if S denotes p and S' denotes p', we will write $C[S, S']$ (read: 'S and S' are contraries') to say that $\models p \rightarrow \neg p'$. In other words, $C[S, S']$ holds if $p \rightarrow \neg p'$ is a logical truth.[10]

Using contrariety as a direct formalization of contrast would account for some cases of contrastive accent, as in

(12) It's not true that Mozart wrote $^{+}$24 string quartets; he wrote $^{+}$23 string quartets!

But when two propositions are contrasted, it is usually not these propositions themselves that are logical contraries, but some related propositions. For instance,

in (13) the propositions expressed by the two conjuncts do not stand in the relation of contrariety.

(13) $^{+}$Bach was an organ mechanic; $^{+}$Mozart knew little about organs.

Note, however, that when *Mozart* replaces *Bach*, the two conjuncts do express contraries, at least under some plausible assumptions about organ mechanics (see section 4). Likewise, in (14) the propositions that are expressed in the two conjuncts do not stand in the relation of contrariety, but if *John* and *Peter* are replaced by an arbitrary constant as in (15), then the resulting conjuncts do express contraries at least in a monogamous society.

(14) $^{+}$John is married to $^{+}$Mary and $^{+}$Peter is married to $^{+}$Sally.

(15) a is married to Mary and a is married to Sally.

More precisely, the two propositions p_1 and p_2 that are expressed by the two conjuncts of (15) are contraries given the assumption of monogamy (m). Thus, $m \models (p_1 \rightarrow \neg p_2)$. Now consider a polygamous society of the type where a man can have several wives but not the other way round. Then no contrariety is expressed by (15), and yet (14) would still tend to be uttered with contrastive stress as indicated. This is explained by the fact that another substitution can be made, resulting in (16).

(16) John is married to b and Peter is married to b.

As is easy to see, (16) contains a contrariety, even in the new situation. Only in a society that allows several marital partners to both men and women would the substitution trick fail to predict the indicated accents, and then no accents are predicted, except of course as a result of other 'accent triggers' than contrariety, such as novelty of information or strong emotional involvement. Thus, we will consider contrastive stress as legitimized in a pair of sentences that are associated – through a substitution that causes a position in one sentence to be identical to one in another sentence – with a pair of sentences that stand in the relation of contrariety. The case in which the sentences themselves are contraries falls out as a boundary case.

Observe that, in the situation of a male-dominated polygamous society, (14) does not only have accents on *Mary* and *Sally*, but on *John* and *Peter* as well. The latter will be viewed as side effects of the contrariety induced by the substitution in (16). Our main task, at this point, is to predict in which cases two sentences are in contrast to each other. The question of where the accents will land will be briefly taken up at the end of this section.

An important question is, at what level the relation of contrast should be defined. Two options present themselves: the level of the actual sentence and the semantic level (i.e., that of the propositions expressed). We take it that the sentence level is the appropriate level, since this contains all kinds of details that are lost in semantic analysis, such as the words that are used. However, meaning *is* relevant, so let us assume that a sentence comes with a unique analysis, through which it

is disambiguated. Thus, we assume that the syntactic constituents of the sentence are known, and so is its intended interpretation. Let $S_{x_1,\ldots,x_k}$ be a way to partition a sentence S into nonoverlapping constituents $x_1, \ldots, x_k$. We will assume that there are very few limitations as to what can count as a constituent. At one end of the scale, even *morphemes* can be contrasted (e.g., *The farmers practiced* (+*in*)*tensive*, *rather than* (+*ex*)*tensive agriculture*).[11] At the other end of the scale, there are entire sentences. We will assume that these, too, can be contrasted, but since the effect is probably indistinguishable from ordinary sentence stress, this is a less than crucial decision.

Now let $\bowtie$ denote the relation of contrast, and let $\bowtie$ be superscripted by the pair of expressions that stand in contrast to each other. Let a be an arbitrary constant of the right category. Then:

Contrastable sentences:

$$\left(S_{m_1,\ldots,m_i,\ldots,m_k} \overset{\langle m_i, n_y\rangle}{\bowtie} S'_{n_1,\ldots,n_y,\ldots,n_l}\right)$$

$$\Leftrightarrow_{Def} C\left[S_{m_1,\ldots,a,\ldots,m_k},\ S'_{n_1,\ldots,a,\ldots,n_l}\right]$$

In other words, $(S_{m_1,\ldots,m_i,\ldots,m_k} \overset{\langle m_i, n_y\rangle}{\bowtie} S'_{n_1,\ldots,n_y,\ldots,n_l})$ means that a contrariety can be achieved between $S_{m_1,\ldots,m_i,\ldots,m_k}$ and $S'_{n_1,\ldots,n_y,\ldots,n_l}$ by means of an *identifying substitution* for the constituents m_i and n_y. An example is (13), here repeated as (17) with Bach $= m_i$ and Mozart $= n_y$.

(17) +Bach was an organ mechanic; +Mozart knew little about organs.

As has been indicated in section 1, conditions on contrastable *sentences* are not enough. A theory of contrastive stress must also say which expressions are contrastable *expressions*, or items. For example, two occurrences of the name *Mozart* are not normally contrastable. It will be assumed that *inequality of denotations* is the sole condition that determines whether expressions are contrastable. For example, two occurrences of the same name are not contrastable unless they are used as names for the same person. Likewise, a name and a pronoun cannot be contrasted if they corefer. Contrastability is tantamount to inequality of denotations. To save this claim from being falsified in epistemic contexts, however, one has to make the Fregean assumption that in such contexts, denotation equals meaning (or intension) rather than extension. Thus, in (18), *Bach* and *the composer of The Musical Offering* are contrastable items, because (18) is an epistemic context, even though Bach was the composer of *The Musical Offering*.

(18) Mary knows that the composer of *The Musical* +*Offering* was a genius, but she does not know that +Bach was a genius.

Something analogous holds in a number of other contexts, including various kinds of quotation, as in (19) where *Theophilus* refers to the name "Theophilus," and *Amadeus* refers to the name "Amadeus."