Discourse structure, topicality and questioning

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In this paper we present an alternative approach to discourse structure according to which topicality is the general organizing principle in discourse. This approach accounts for the fact that the segmentation structure of discourse is in correspondence with the hierarchy of topics defined for the discourse units. Fundamental to the proposed analysis is the relation it assumes between the notion of topic and that of explicit and implicit questioning in discourse. This relation implies that (1) the topic associated with a discourse unit is provided by the explicit or implicit question it answers and (2) the relation between discourse units is determined by the relation between these topic-providing questions.

1. INTRODUCTION

This study takes topicality as the general organizing principle of discourse structure.[1] The structuring function of topics has been, directly or indirectly, an important or even a central point of investigation in several theories and views about discourse structure (for example, Daneš 1974, Grimes 1975, Schank 1977, Van Dijk 1977, Grosz 1978, Hinds 1979, Longacre 1979, Joshi & Weinstein 1981, Hobbs 1982, Johnson-Laird 1983, Grosz & Sidner 1985, Polanyi 1988, Hovy 1990). Differences exist between them with regard to the assumed topic notion, its explicitness and the generality of the structuring function assigned to topics, both with regard to structural different levels and different types of structures. The purpose of this study is not to discuss and compare these different points of view. Instead it proposes an alternative theory in which a uniform topic notion, comprising both the notions of sentence topic and of topic of larger discourse units, is taken as the general basis of discourse structure.

The central hypothesis is that a discourse derives its structural coherence from an internal, mostly hierarchical topic-comment structure. As far as discourse production is concerned, this structure is the result of what is considered to be an essential part of the discourse production process, namely the process of the contextual induction of explicit and/or implicit

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topic-forming questions.[2] It is argued that the questions answered by a speaker (writer) are not always explicitly formulated but remain implicit, especially in monologues. These so-called IMPLICIT QUESTIONS are characterized as questions which the speaker anticipates to have arisen with the addressee as the result of the preceding context.

Our analysis provides an alternative solution to the traditional though hardly well-defined distinction between the notions of topic and comment. This assumes a dynamic, context-dependent and question-based topic notion, according to which a (sub)topic is constituted as the result of a (sub)question and, if no disturbance of the discourse process occurs, a (sub)topic is closed off when (the speaker assumes) the corresponding (sub)question has been answered satisfactorily. We will explain the way in which this topic notion is mainly responsible for a topic hierarchy in discourse which corresponds to the hierarchy of structural units into which a discourse can be segmented.

We start the analysis with both a formal and operational characterization of the notions of topic and comment (section 2). After discussing two research-programmatic restrictions (section 3), an explication is given of our main subject of investigation, namely the way in which discourse structure results from the process of questioning. This is illustrated mainly by examples involving a succession of explicit question-answer pairs as they appear in question-answer dialogues.[3] All principles which hold for explicit questioning are claimed also to apply to implicit questioning. However, an explanation of how implicit questions are reconstructed lies beyond the scope of the present paper.[4] As will be explained in detail, the process of questioning involves the following three functional parameters: FEEDERS (section 4), TOPIC-CONSTITUTING QUESTIONS (section 5) and SUBTOPIC-CONSTITUTING

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[2] A paradigmatic hypothesis about discourse production is that speaking and writing have an instrumental function in the process of information exchange in discourse. As for spoken discourse, this hypothesis is formulated by Clark & Clark (1977: 223–224) in the following way: 'What is speaking? – Speaking is fundamentally an instrumental act. Speakers talk in order to have some effect on their listeners. They assert things to change their stage of knowledge.... Speakers begin with the intention of affecting their listeners in a particular way, and they select and utter a sentence they believe will bring about just this effect.' However, this hypothesis does not give an answer to the question of the STRUCTURAL WAY in which a speaker realizes his intention. The present study assumes that, among other things, the information exchange in discourse is realized by explicit and/or implicit questioning.

[3] In this paper we abstract from so-called TOPIC NARROWING and TOPIC BROADENING processes initiated by questions replacing a preceding questioning and having an effect on the cardinality of the set of possible answers to the original question, as well as from processes involving INTERVENING (META) DIALOGUES between question and answer. Both processes are natural phenomena in question-answer dialogues.

[4] In Van Kuppevelt (1991) an outline is presented of an algorithm for the reconstruction of implicit questions. However, until now only strictly contextual factors have been taken into consideration, without involving factors related to the process of the interaction of given contextual information and assumed knowledge of background and situation.

SUBQUESTIONS (section 6). After a discussion of these parameters and related subjects, a definition is given of the notion of DISCOURSE TOPIC (section 7). This notion is defined in terms of (sets of) main, higher order questions belonging to the category of topic-constituting questions. In terms of the notion of discourse topic a distinction is made between BOUND DISCOURSE on the one hand and FREE (UNBOUND, SPONTANEOUS) DISCOURSE on the other hand (section 8). We will argue that only the development of a discourse belonging to the former category is bound programmatically by the set of topic-constituting questions defining its discourse topic. Given then the distinction between discourse topics, topics and subtopics it is claimed that the topic hierarchy in discourse corresponds with the hierarchy of structural units into which a discourse can be segmented (section 9). Finally (section 10) we discuss the way in which topic shifts realized at structural different levels are accounted for in the framework outlined.

2. THE NOTIONS OF TOPIC AND COMMENT

2.1 *Formal characterization*

As is often noticed, topic-comment research is characterized by the absence of uniformity in terminology. Beside the fact that in the literature different terms are used to refer to the same topic notion, for example the terms TOPIC, THEME and PSYCHOLOGICAL SUBJECT, the absence of uniformity in terminology also follows from notional differences in term designation. Many times terms like topic and theme are used to refer to notions that differ categorically from the notion of sentence or discourse 'aboutness'. Chafe, for example, reserves the term topic for 'the frame within which the sentence holds' (1976: 51). The topic 'sets a spatial, temporal or individual framework within which the main predication holds' (1976: 50). Chafe applies the term topic primarily to specific structural phenomena in so-called topic-prominent languages. Certain temporal adverbs, which occur in English in sentence-initial position, are also considered to be equivalent manifestations to which this term applies. Thus, in the English sentence *Tuesday I went to the dentist*, the adverb *Tuesday* is 'topic' (1976: 51). The grammatical subject *I*, on the other hand, is identified with what the sentence is about: 'the subject is what we are talking about' (1976: 43). Similar uses of either the term topic or the term theme are found in Dik (1978) and Li & Thompson (1981). In this paper, however, the term topic will be used in its most usual sense, namely to refer to a topic notion which concerns the 'aboutness' of (sets of) utterances.

The intended topic notion is formally characterized in the following way.[5]

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[5] In this article the term FORMAL CHARACTERIZATION (or FORMAL DEFINITION) is not used in its mathematical or logical sense, it rather indicates the essential, though not per se operational, characteristics of (the definiendum or) that which is characterized.

The notion presupposes that a discourse unit U – a sentence or a larger part of a discourse – has the property of being, in some sense, directed at a selected set of discourse entities (a set of persons, objects, places, times, reasons, consequences, actions, events or some other set), and not diffusely at all discourse entities that are introduced or implied by U. This selected set of entities in focus of attention is what U is about and is called the topic of U. In the framework of this formal characterization the complementary notion of comment is characterized as that which is newly asserted of the topic of U.

The notions of topic and comment are thus related to sentences (utterances) and larger discourse units. In the analysis which we will present, this will result in an explicit formulation of both sentence topics and discourse topics. This will enable us to go beyond what is fairly common in topic-comment research, namely the analysis of sentence topics alone.

2.2 *Operational characterization*

The given formal characterization of topic and comment is insufficient insofar as the identification of topics is concerned. We need a selection criterion on the basis of which topic entities can be adequately distinguished from other discourse entities. To achieve this goal, we will present an operational characterization of topics.

In topic-comment research several operational characterizations have been proposed to identify sentence topics.[6] Besides context-independent characterizations in terms of merely a SPECIFIC SYNTACTIC CATEGORY (Chafe 1976)[7] or in terms of WORD ORDER, with or without the requirement of a specific category (for example, Chomsky 1965, Halliday 1967, Vallduví 1992),[8] context dependent characterizations have also been proposed, namely characterizations in terms of INFORMATIONAL STATUS (for example, Hornby 1970, Sgall et al. 1973, Bolinger 1977)[9] and characterizations in terms of

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[6] Topic-comment research also provides several identification tests for topic-hood which are not discussed here, for example, the FRONTING TEST (e.g. Lakoff 1971, Kuno 1972), the 'ABOUT'-CONTEXT TEST (Reinhart 1981), the QUESTION TEST (e.g. Sgall et al. 1973) and the 'ABOUT'-QUESTION TEST (Gundel 1977).

[7] As was said in section 2.1, Chafe (1976) identifies that which a sentence is about with the grammatical subject of the sentence.

[8] In Halliday (1967) the topic ('theme') of a sentence is identified with the element in sentence-initial position, without any restriction with respect to the syntactic category to which this element belongs or what is denoted by an element belonging to this category. Chomsky (1965) identifies a sentence topic with the leftmost NP immediately dominated by S in the surface structure. Vallduví (1990), on the other hand, characterizes a sentence topic ('link') as a sentence-initial element functioning as an address pointer.

[9] According to operational characterizations of topics in terms of informational status, the topic of a sentence is identified with the GIVEN/OLD or CONTEXTUALLY BOUND INFORMATION in the sentence. See for example, Prince (1981) and Yule (1980) for an overview of the different views on the given-new distinction.

QUESTIONS (for example, Vennemann 1975, Bartsch 1976, Klein & Von Stutterheim 1987).[10,11,12] The operational characterization we will propose can be placed in the latter category. This characterization assumes the existence of a direct relationship between the notions of topic and comment, on the one hand, and of both explicit and implicit questioning in discourse, on the other hand. The basic assumption is formulated in terms of the following hypothesis.

Basic assumption
Every contextually induced explicit or implicit (sub)question Q_p that is answered in discourse constitutes a (sub)topic T_p. T_p is that which is being questioned; a set of singular or plural (possibly non-existent)[13] discourse entities (or a set of ordered n-tuples of such entities in the case of a n-fold question) from which one is selected as an answer to Q_p. Comment C_p is provided by this answer and names or specifies the entity asked for.

The assumption provides a selection criterion for topic entities: of all the discourse entities that are introduced or implied by a discourse unit U only those subsets of discourse entities which are made the subject of explicit or implicit questioning have topic function. In section 6 we will show that questions and the topics constituted by them are not only serially ordered but are in most cases hierarchically organized.

Example (1) makes clear what is meant by the basic assumption.

(1) A: Late yesterday evening I got a lot of telephone calls.
Q_1 B: Who called you up?
A_1 A: John, Peter and Harry called me up.

In this dialogue, a topic is introduced as the result of the contextual induction of the explicit question Q_1. The topic constituted by that question is that

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[10] Operational characterizations in terms of questions identify the topic which is related to a question-answering sentence with a variety of things. In for example, Bartsch (1976) and Vennemann (1975) the topic is identified with (one of) the presupposition(s) defined by the question. Klein & Von Stutterheim (1987) on the other hand take as the topic what they call the 'alternative', that is 'the choice between two or more possibilities' as an answer to the question posed.

[11] In Van Kuppevelt (1991) it is shown that the operational characterizations belonging to the first three types are especially unsatisfactory, because of ambiguities, inconsistencies, counter-intuitive predictions and/or lack of evidence. The operational characterizations in terms of questions, on the other hand, were felt unsatisfactory mainly because they don't account for the dynamic process of topic constitution and topic termination which, as we will explain, necessarily involves the phenomenon of subquestioning. A short survey of the different types of operational characterizations, including some of their specific consequences, is presented in Van Kuppevelt (1993).

[12] The given set of operational characterizations of the notion of sentence topic is not an exhaustive one. Steedman (1991), for instance, provides a (provisional) characterization of a sentence topic ('theme') in terms of the speaker's assumptions about the subject of mutual interest.

[13] For instance, the non-existence of plural discourse entities functioning as a topic entity is expressed by answers such as *nobody* or *nothing*. They may be represented by an empty set.

which is questioned, namely who called up speaker A, or, more precisely, the set of persons that may have rung speaker A at the given time.[14] The comment to this topic is provided by answer A_1. It replaces the *wh-*constituent in the question and specifies the person asked for, thereby selecting a value from the questioned set of discourse entities.

If an answer is satisfactory to the listener (questioner), the requested discourse entity has been sufficiently specified for him. Consider example (2).

(2)　　　 A: This weekend Jim sold his old car.
　　 Q_1 B: To whom?
　　 A_1 A: He sold it to someone living in his own apartment building.
　　 Q_2 B: Who was it?
　　 A_2 A: The new tenant from Holland.

The answer to question Q_1 provides a specification of the person asked for in the question. This answer appears to be unsatisfactory for questioner B, given his next question Q_2. The unsatisfactoriness of the answer indicates that the person to whom Jim sold his old car is not yet sufficiently specified for questioner B, who seems to want a description which provides a unique identification of this person.

According to the basic assumption, the topic of a sentence is determined by the question it answers. This imposes a topic-comment modulation to every non-elliptical question-answering sentence which depends on the question it answers. The topic part (TP) relates to the question, whereas the comment part (CP) contains the proper answer. Consider (3).

(3) (a)　 (Who hit Bill?)

　　　　 $_{TP}$[The one who hit Bill] is $_{CP}$[Harry]　　　 (pseudo-cleft answer)

　　　　 It is $_{CP}$[Harry] $_{TP}$[who hit Bill].　　　 (cleft answer)

　　　　 $_{CP}$[Harry] $_{TP}$[hit Bill]　　　 (non-cleft full answer)

　　　　 $_{CP}$[Harry]　　　 (elliptical answer)

　　 (b)　 (Who did Harry hit?)

　　　　 $_{TP}$[The one who Harry hit] is $_{CP}$[Bill]　　　 (pseudo-cleft answer)

　　　　 It is $_{CP}$[Bill] $_{TP}$[who Harry hit].　　　 (cleft answer)

　　　　 $_{TP}$[Harry hit] $_{CP}$[Bill]　　　 (non-cleft full answer)

　　　　 $_{CP}$[Bill]　　　 (elliptical answer)

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[14] The topic set defined by a question can be taken as that which can be filled in in the 'open proposition' (Prince 1986) introduced by the question.

With exception of the elliptical answers all answers show a topic-comment modulation which corresponds to the question that is answered. As for the (pseudo-)cleft answers this modulation is both syntactically and intonationally marked (asterisks indicate sentence accents). The accented head of the clefted part is comment, whereas the complement of the clefted part refers to the question answered. The non-cleft full answers, on the other hand, only intonationally mark the topic-comment partition. In general, comment constituents are taken as the accentable input of accent rules.[15]

Our context-dependent and question-based topic notion is also a dynamic one.[16] According to the basic assumption, topic constitution is determined by the contextual induction of explicit or implicit questions. Therefore, every explicit or implicit question that is answered in discourse introduces a new topic. However, the basic assumption does not speak about the dynamics of TOPIC TERMINATION. Obviously, it is not always the case that a topic introduced at some time in the development of the discourse will survive till the end; nor does the introduction of a new topic automatically imply the disappearance of an old one. In order to account for these and other phenomena of topic termination, we will introduce a dynamic principle (section 6.5.2) which says that a (sub)topic is closed off when the (sub)question by which it was constituted has been answered satisfactorily. We will see that the notion of topic thus defined, i.e. as a context-dependent, question-based and also a dynamic notion, implies a UNIFORM CONCEPTION of sentence topics and topics of larger discourse units. Both types of topics are defined in terms of questions.[17]

The basic assumption includes one of the central ideas behind our topic notion, namely that the topic-constituting questions answered by a speaker are usually not explicitly formulated but remain implicit, particularly in monologues. Strong plausibility for this idea can be found in the fact that there is no difference in acceptability and coherence between texts with only

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[15] Elsewhere I present an account of the accent patterns of question-answer pairs (Van Kuppevelt 1991), taking Gussenhoven's accent rule SAAR (Gussenhoven 1984 and other publications) as a starting point.

[16] See Van Kuppevelt (1991) for a discourse representational account of this topic notion in terms of Seuren's theory of discourse semantics (Seuren 1985).

[17] In topic-comment research, differences exist with regard to both the EXPLICITNESS and CONCEPTUAL UNIFORMITY of the distinction between sentence topics and topics of larger discourse units. Some authors (for example, Scha and Polanyi 1988) assume only one topic notion which, without explicitly stating it, covers both the notion of sentence topics and discourse topics. Other authors explicitly assume two notions which are defined in such a way that they are conceptually unrelated. In Van Dijk (1977), for instance, a sentence topic is identified with an individual entity (or a set of entities or an ordered *n*-tuple of entities) about which new information is provided in the sentence. A discourse topic, on the other hand, is defined in terms of the entailments of the set of propositions expressed by the discourse.

implicit questions and those with only explicit questions, though the latter soon risk becoming tedious. Take for instance the monologue in (4a). In (4b) the implicit questions the speaker might have answered during the production of this monologue are made part of the actual text in the appropriate positions (angled brackets indicate the implicit character of a question).

(4) (a) Today the workers of the Philips computer division went on strike. They are very worried about the managers' new economy plans. According to these plans, the managers would consider moving the production section abroad. This would imply that 300 of all those employed in this division would be dismissed. The imminent dismissal would concern the lowest-paid.

(b) A: Today the workers of the Philips computer division went on strike.

$\langle Q_1 \rangle$ $\langle$Why?$\rangle$

A_1 They are very worried about the managers' new economy plans.

$\langle Q_2 \rangle$ $\langle$Why?$\rangle$

A_2 According to these plans, the managers would consider moving the production section abroad.

$\langle Q_3 \rangle$ $\langle$Why are the workers so worried about this?$\rangle$

A_3 This would imply that 300 of all those employed in this division would be dismissed.

$\langle Q_4 \rangle$ $\langle$Why are the workers so worried about this?$\rangle$

A_4 The imminent dismissal would concern the lowest-paid.

The set of implicit questions contributes to an interpretation of the text which does not differ in acceptability and coherence from an interpretation which would have been obtained if these questions had been explicitly uttered during the production of the text.

The topic notion presupposes a direct relationship between phenomena that occur with explicit question-answer pairs on the one hand and the same phenomena related to sentences which answer an implicit question on the other hand. This implies that certain formal characteristics, in particular accent distribution and syntactic form (mainly cleft and pseudo-cleft structures and context-dependent preferences in word order),[18] also hold for sentences that answer an implicit question. As such, these characteristics play an essential role in implicit question reconstruction. It can be demonstrated that a text, with its accent patterns and syntactic structures, remains equally

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[18] In the tradition of the Prague School word order is observed as an important (language-specific) means of expression of the topic-comment modulation of a sentence.

acceptable and coherent when the implicit questions reconstructed on the basis of these formal characteristics are made part of the actual text.[19]

As for addressee-oriented discourse an implicit question is defined in the following way. An implicit question is a question which the speaker anticipates will arise in the listener's mind on interpreting preceding utterances (or some non-linguistic events occurring in the discourse). The speaker assumes the listener needs an answer to this question for a fully integrated comprehension and interpretation of the ongoing discourse. The speaker makes his assumptions on the basis of what he knows or expects with respect to the listener's knowledge of background and situation and, of course, also with respect to the listener's likely patterns of reaction. According to this characterization implicit questioning necessarily implies a MODEL OF THE ADDRESSEE. In this paper, however, we will largely leave undiscussed the way in which these questions arise as the result of the interaction of given contextual information and a given model of the addressee.

3. RESEARCH-PROGRAMMATIC RESTRICTIONS

The research program related to our analysis of discourse structure is restricted to the following two main points: the account of the (hierarchical) structure of EXPOSITORY DISCOURSE CONSISTING OF BOTH MONOLOGUES AND DIALOGUES and the account of this structure as far as it is the result of WH-QUESTIONS AND QUESTIONS THAT ARE DERIVED FROM THEM.

For expository discourse we hypothesize that the production is essentially the result of the contextual induction of explicit or implicit topic-forming questions. Every question-answering sentence occurring in such a discourse is an assertion about a topic which, by definition, is operationally identified with that which is questioned. Though it is not a part of the research program, we assume that the hypothesis can be extended to other discourse types.

As for the interpretation of expository discourse, we assume that its achievement is essentially a process of topic-assignment. Topic-assignment implies that the hearer assigns topics to the sentences in discourse by taking them to be answers to explicit or implicit topic-forming questions the speaker

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[19] This implies that the assignment of another accent pattern to a sentence in a text may correspond to a change in its coherence in terms of question-answer structure. For instance, if in case of answer A_2 in (4b) a contrastive accent was assigned to *these*, making it an appropriate answer to another implicit question $\langle Q_2 \rangle$, e.g. $\langle$*What is the difference between these and the old plans?*$\rangle$, this would involve a structural change of the text. This change would consist in the fact that the implicit question $\langle Q_3 \rangle$ would no longer be subordinated to the implicit question $\langle Q_2 \rangle$. As will be discussed later, this would mean that answer A_3 would no longer contribute to a satisfactory answer to the implicit question $\langle Q_2 \rangle$.

has answered. In this respect, therefore, discourse interpretation is seen as the reconstruction of the discourse production process.

According to the second research-programmatic restriction a question can be derived from a *wh*-question defining its topic. This is the case when a *wh*-constituent in the topic-defining question is replaced by a value, either by a single definite value functioning as a comment or by indefinite values open to confirmation or choice. Consider first the two corresponding YES/NO QUESTIONS (5a) and (5b). The example is from Bäuerle (1979).

(5) (a) Are you Dr Livingstone?   (Who is Dr Livingstone?)

   (b) Are you Dr Livingstone?   (Who are you?)
                                              (Bäuerle 1979)

The assigned accent patterns mark that (5a) an (5b) are derived from different *wh*-questions behind them. The *wh*-question behind (5a) is *Who is Dr Livingstone?*; the *wh*-question behind (5b) is *Who are you?* The derivation of (5a) and (5b) requires that the *wh*-constituents in the questions behind them are replaced by a corresponding value which has to be confirmed or denied by the addressee. Just like comment constituents, a *wh*-replacing constituent is candidate for accent assignment.

The topics defined for the yes/no questions in (5) are identical to the topics of the *wh*-questions from which they are derived. Subject of questioning is who is Dr Livingstone and who is the addressee, respectively. The yes/no questions differ from the corresponding *wh*-questions in the fact that the questioner himself suggests a value to be comment.

In an analogous manner the ALTERNATIVE QUESTION (6) is derived from the topic-defining *wh*-question behind it. The alternative question is built up of two disjuncts which are derived from the *wh*-question *Who are you?*

(6) Are you John or (are you) Bill?   (Who are you?)

Among other things, these disjuncts are obtained by replacing the *wh*-constituents by an alternative value to be chosen among by the addressee.

Wh-questions which form a partial answer to a MULTIPLE WH-QUESTION are also analysed in this way.

(7) Who insulted Caspar?   (Who insulted whom?)

If in (7) the constituent *Caspar* is assigned a strong accent, the accent pattern of the question indicates that it is derived from the two-fold *wh*-question *Who insulted whom?* The derivation implies that one of the *wh*-constituents is replaced by a definite value which provides a partial answer or comment to

the two-fold question. As a consequence the two-fold question is reduced to a simple question. As in the preceding cases, the topic of this question is determined by the *wh*-question behind it.

4. The initiation of questioning in discourse—feeders

Explicit and implicit questions that constitute a topic do not arise without a cause. They are contextually induced by a linguistic or non-linguistic event, which we will call a FEEDER. If it is linguistic, a feeder F_n is a topicless unit of discourse, e.g. a single sentence, or one whose topic is no longer PROMINENT at the moment of questioning. In this latter case we speak of a linguistic feeder in a technical sense (see section 10 for a clarification of the technical notion). Examples of linguistic feeders are the opening sentences of examples (1), (2) and (4), and the opening sentence of the following example.

(8) F_1 A: Yesterday evening a bomb exploded near the Houses of Parliament.
     Q_1 B: Who claimed the attack?
     A_1 A: A well-known foreign pressure group which changed its tactics claimed the attack.

Assuming that this discourse starts with an 'empty' context, the opening sentence F_1 functions as a feeder. It gives rise to the contextual induction of the explicit question Q_1. Given this assumption, F_1 itself is topicless because it doesn't constitute an answer to a topic-forming question.

A non-linguistic feeder, on the other hand, is an event which occurs or is thought about in the speech situation and which is perceived by at least one of the discourse participants. For instance, an auditively perceived event occurring in the situational context in which the discourse is uttered. An example is (9).

(9) F_1 "Bang".
     Q_1 B: What's that?
     A_1 A: Bill is coming home.

In (9) question Q_1 is contextually induced as the result of a suddenly occurring noise perceived by both speakers A and B, namely the slam of the front door.

Actually the opening sentence of a discourse does not always function as a linguistic feeder. An opening sentence behaves either as a linguistic feeder (or an element of the set of sentences constituting a linguistic feeder), or as an answer to an implicit question induced as the result of the non-linguistic context. Only in the latter case is a topic defined for the opening sentence.[20]

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[20] In some cases it is intonationally marked whether a topic is defined for an opening sentence, namely when the assigned accent pattern expresses a topic-comment modulation.

In spite of the fact that non-linguistic feeders frequently occur in discourse, from now on we will only consider feeders of the linguistic type.

The introduction of a (linguistic) feeder has a specific function, namely to initiate or re-initiate the process of questioning in discourse. A feeder must be introduced when the context is empty or when no more questions are induced by the preceding context and the discourse participants wish to continue the conversation. Consider the discourse in (10).

(10) F_1 A: Mary is on holiday.
      Q_1 B: When did she leave?
      A_1 A: Yesterday.
      F_2 A: Tomorrow, after many years, George will again apply for a job.
      Q_2 B: Why?
      A_2 A: A competitor of the company he works for has invited him to apply for the position of assistant manager.

In this discourse the process of questioning is initiated by feeder F_1 and continued or initiated again by feeder F_2. In section 7 we will see that the introduction of a new feeder implies a discontinuous question-answer structure of discourse and, as a result of that, a discontinuous topic-comment structure.

A necessary condition for a sentence (or a larger discourse unit) to function as a feeder is that it provides a set of INDETERMINACIES or what may be called QUESTION LOCATIONS which have no unique extensional counterpart in the world talked about. Because of this they may give rise to specific questions the purpose of which is to reduce this undeterminedness. Stereotypical examples of textually provided question locations are indefinite pronominal terms such as *somebody*, *something* or *somewhere*. However, question locations often result from background knowledge associated with the discourse unit functioning as a feeder. For instance, in (10) the feeder F_1 provides a question location corresponding to the parameter of date of departure given by background knowledge.

However, what is the essential difference between feeders and other discourse units (for example, answers to questions) that may introduce an

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In this connection Schmerling's (1976) distinction between 'news sentences' and 'topic-comment sentences' is directly relevant. Both sentence types can function as an opening sentence, but only sentences of the latter type express a topic-comment modulation. For illustration Schmerling gives the following well-known, authentic examples: *Johnson died* and *Truman died*. The latter is a topic-comment sentence uttered in a speech situation where one expected Truman to die because he was very ill. However, in the former case such an expectation was absent. In the framework of our theory only the first sentence, if an opening sentence, is a feeder. The second sentence, on the other hand, is an answer to an implicit question induced by the speech situation in which it was uttered.

indeterminacy? The notion of feeder is essentially a functional one. In principle any unit of discourse can function as a feeder. It functions as such if the set of question locations it introduces is a new one, not restricted by the foregoing discourse. Consider the following example.

(11) (a) F_1 John is ill.
    (b)   + Q_1^a What does he suffer from?
          + Q_1^b For how long already?
          + Q_1^c What is the reason?
          + Q_1^d When do you expect him to recover?

If the sentence *John is ill* functions as a feeder it provides, together with associated background knowledge, a contextually unrestricted set of indeterminacies, for example, those corresponding to parameters of kind, duration, reason and expected recovery time from the illness. As indicated (by the + sign) in (11b), these indeterminacies may give rise to specific topic-forming questions.

But now consider the related example (11)'.

(11)' (a) F_1 John can't attend the meeting today.
        $\langle Q_1 \rangle$ $\langle$Why not?$\rangle$
        A_1 John/he is ill.
    (b)   + Q_1^a What is he suffering from?
          − Q_1^b For how long already?
          − Q_1^c What is the reason?
          − Q_1^d When do you expect him to recover?

The sentence *John is ill* functions as an answer, thereby contextually restricting the set of indeterminacies in such a way that the last three questions in (11b) will not be induced, unless the answer functions as a new feeder after having functioned as an answer to the main question Q_1.[21]

5. TOPIC-CONSTITUTING QUESTIONS

Explicit and implicit questions which are asked as the result of a feeder have a special, autonomous status in discourse. They introduce a questioning in discourse which, in hierarchical and functional terms, is independent of other questionings. They function as higher order questions which are neither subordinate nor subservient to preceding or future questions in discourse. By

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[21] The argument made here provides evidence for the view that no actual topic is defined for a sentence functioning as a feeder. If this would be the case, the sentence would form an answer to an implicit topic-forming question implying that the set of questions that can be asked as a result of this 'feeder' is contextually restricted by this higher-order topic-forming question. However, as illustrated by the examples (11) and (11)', a feeder provides a contextually unrestricted set of indetermanicies and does not impose any contextual restrictions on the set of topic-forming questions it may give rise to.

definition the topics they constitute are also hierarchically and functionally independent of other topics in discourse.

Explicit and implicit questions asked as the result of a feeder are called TOPIC-CONSTITUTING QUESTIONS. As the term indicates, such questions introduce a topic in discourse. Topic-constituting questions are formally defined in the following way.

Definition

An explicit or implicit question Q_p is a topic-constituting question if it is asked as the result of a set of preceding utterances which at the time of questioning functions as a feeder.

Examples of explicit topic-constituting questions are Q_1 up to and including Q_4 in example (12a).

(12) (a) F_1 A: Students are no longer allowed to take more than 6 years over their first degree.

Q_1 B: Whose decision has this been?

A_1 A: This has been the decision of the Minister of Education and Science.

Q_2 B: What is the reason for this decision?

A_2 A: It has been decided to cut the education budget drastically.

Q_3 B: When will the measure become operative?

A_3 A: The measure will become operative at the beginning of the new academic year.

Q_4 B: What is expected to be the effect of this measure?

A_4 A: One expects that in the years to come student numbers will go down substantially.

(b) Question-answer structure:

$$F_1 - Q_1 \quad Q_2 \quad Q_3 \quad Q_4$$
$$\quad\quad | \quad\quad | \quad\quad | \quad\quad |$$
$$\quad\quad A_1 \quad A_2 \quad A_3 \quad A_4$$
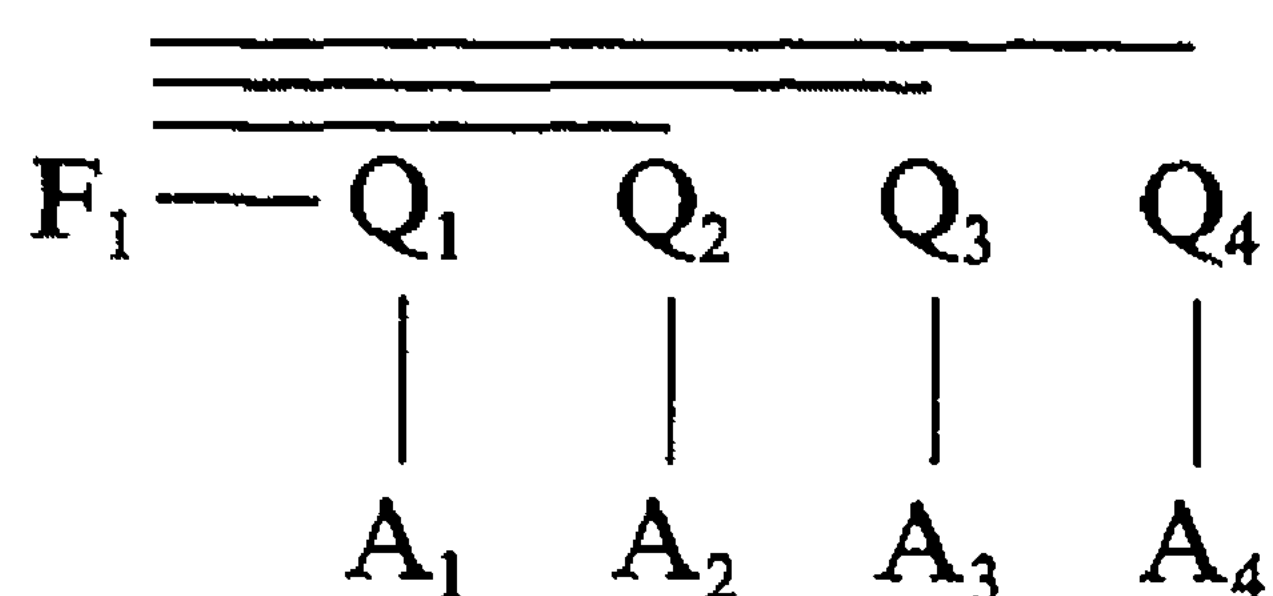
In (12a) all explicit questions are asked as the result of the opening sentence F_1 which functions as feeder. The discourse (12a) does not change in acceptability and coherence if these questions had been implicit, in which case they would have been anticipated by the speaker.

The structure in (12b) represents the question-answer structure of the discourse in (12a). This representation expresses the linear, non-hierarchical structure of the questions that were answered in that discourse. It shows that not one single question is embedded within another question.

Central in the procedure for generating a representation of a question-answer structure of a discourse is the CONTEXT ORIENTATION of a question. In the representations the context orientation of a question is indicated by a horizontal line. An answer, on the other hand, is directly attached under the question it answers. A subscript added to one of the connected elements in a representation – to a feeder, a question or an answer – refers to the sequential order of that element in the process of questioning.

Explicit and implicit topic-constituting questions play a leading role in the development of discourse. They impose a restriction upon the development of the discourse at hand. This restriction implies a PROGRAM that must be followed and implemented for the discourse to come to a satisfactory end. The program consists in the specific task, to be carried out by the speaker, of providing an answer to the question which is satisfactory to the listener.[22] Since the answering process often proceeds in stages, such a program may stretch over a considerable amount of discourse. In the next section we will see in which specific way such a program is carried out, making explicit the central function of subquestions in the discourse production process.

6. SUBTOPIC-CONSTITUTING SUBQUESTIONS

6.1 *Definition*

Not every question that is answered in discourse introduces a questioning which is independent of other questionings in discourse. Questions which have no autonomous status in discourse are subquestions. The questionings they introduce are hierarchically subordinate to questionings introduced by preceding questions because of their function: they are subservient to a program imposed on the development of the discourse by a preceding topic-constituting question. As said earlier, such a program consists of the specific task of providing a satisfactory answer to the topic-constituting question.

The contextual induction of a subquestion is essentially the result of an UNSATISFACTORY ANSWER to a preceding question. When a topic-constituting question has been answered unsatisfactorily, it will give rise to a subquestion which, if also answered unsatisfactorily, gives rise to a further subquestion, and so on recursively, until the original, topic-constituting question has been answered satisfactorily.[23]

An example which illustrates this notion of subquestion is presented in
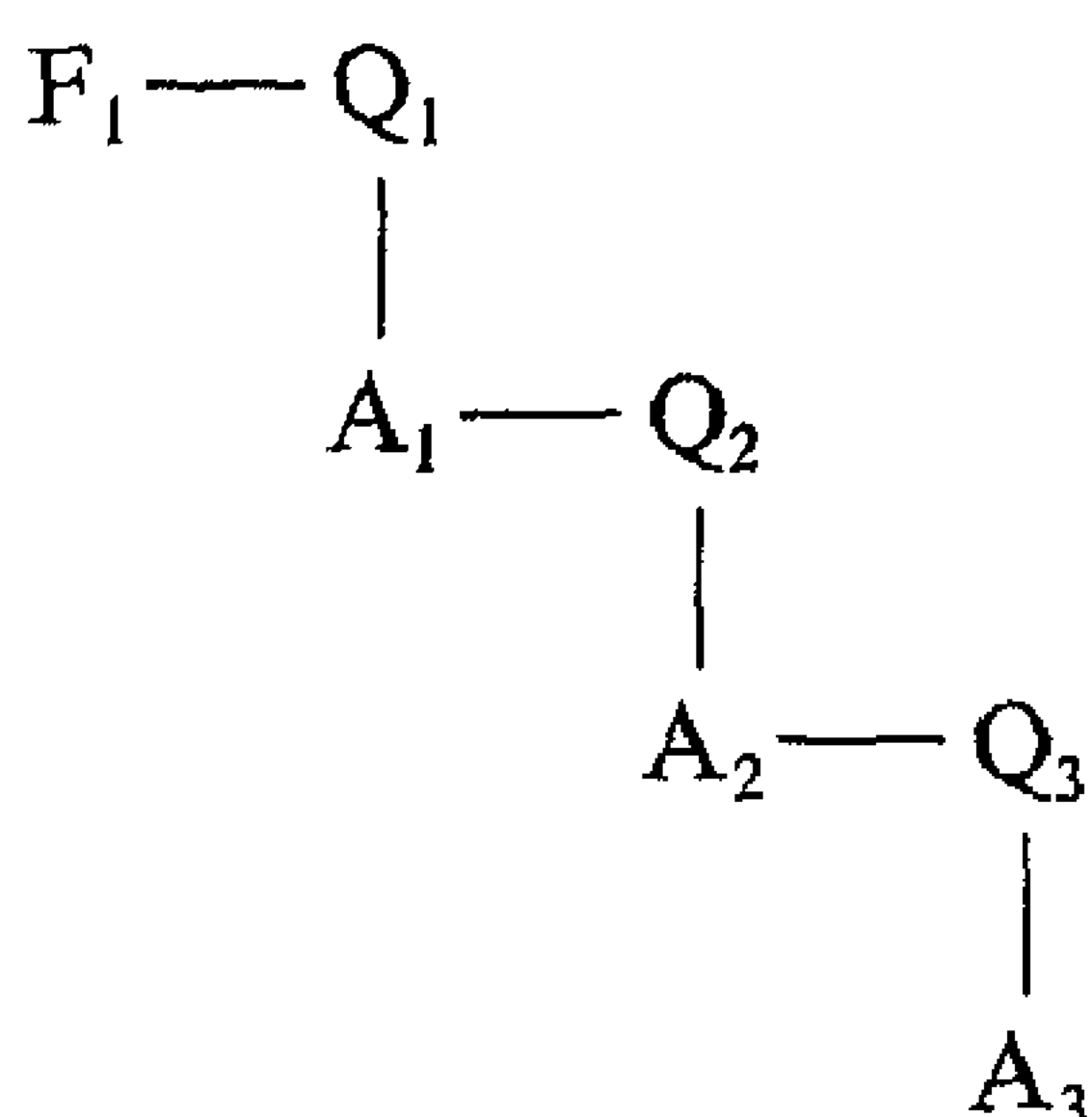
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[22] A satisfactory answer implies a unique determination of what is being asked for by the question. See section 6.4.2 on this point.

[23] Obviously, the process of subquestioning can be disturbed. In Zeevat (1991) several different factors of disturbance in question-answering processes are distinguished, for example, the speaker cannot give an answer, he does not know any appropriate answer to the current information state, he does not know a complete answer, nor does he know a rigid answer.

(13a). We assume that in this discourse the topic-constituting question Q_1 is eventually answered satisfactorily, because no more subquestions arise.

(13) (a) F_1 A: Mary is worried.

            Q_1 B: Why?

            A_1 A: John, her husband, wants to buy a DAT-recorder.

            Q_2 B: Why is she worried about that?

            A_2 A: She is worried about that because he doesn't have enough money, so he has to borrow it.

            Q_3 B: Why is that a problem?

            A_3 A: He already has a lot of debts.

(b)   Question-answer structure:

$$
\begin{array}{l}
F_1 - Q_1 \\
\qquad\ \ | \\
\quad A_1 - Q_2 \\
\qquad\qquad\ | \\
\qquad A_2 - Q_3 \\
\qquad\qquad\qquad | \\
\qquad\qquad A_3
\end{array}
$$

The satisfactory answer to the topic-constituting question Q_1 is realized in stages by means of subquestions Q_2 and Q_3. Subquestion Q_2 is contextually induced as the result of the unsatisfactory answer A_1 to the topic-constituting question. However, the answer given to subquestion Q_2 is also unsatisfactory, so that at that moment in the development of this discourse the topic-constituting question Q_1 is still answered unsatisfactorily. This then gives rise to subquestion Q_3. The example illustrates that the subquestions are subservient to the program associated with the topic-constituting question, namely the providing of a satisfactory answer to that question.

In (13a) subquestion Q_2 is a direct subquestion of the topic-constituting question Q_1. Subquestion Q_3, on the other hand, is a direct subquestion of subquestion Q_2, but an indirect subquestion of the topic-constituting question Q_1. It contributes to a satisfactory answer to subquestion Q_2 in a direct way, but only indirectly to a satisfactory answer to the main, topic-constituting question. The hierarchical relations between these questions can be read from the representation of the question-answer structure of this discourse, which is presented in (13b).

Explicit and implicit subquestions constitute a subtopic that is hierarchically ordered under the (sub)topics constituted by preceding questions. In view of what we said above subtopic-constituting subquestions are formally defined in the following way.

Definition

An explicit or implicit question Q_p is a subtopic-constituting subquestion if it is asked as the result of an unsatisfactory answer A_{p-n} to a preceding question Q_{p-n} with the purpose of completing A_{p-n} to a satisfactory answer to Q_{p-n}.[24]

Thus, an important difference between topic- and subtopic-constituting questions is that only the latter are contextually induced as the result of an unsatisfactory answer to a question. However, the notion of an unsatisfactory answer to a question is not an absolute one. Whether an answer to a preceding question is satisfactory depends upon (the speaker's assumptions about) the addressee's knowledge and interests. Thus, with regard to (13a), the explicit subquestions Q_2 and Q_3 (or the corresponding implicit subquestions in the case that speaker A would have been anticipated these questions with speaker B) would not have been raised if (speaker A would have assumed that) speaker B had known that John does not have enough money and that he had already contracted a lot of debts.

The nature of the unsatisfactoriness of an answer A_i can be different. A_i can be unsatisfactory in a QUALITATIVE and/or a QUANTITATIVE way. If quantitative, not all elements of the topic set defined by the question will have been specified by A_i. In this case the subquestion induced is asked with the purpose of realizing a quantitative completion to A_i. An example is answer A_1 in (14).

(14) F_1 A: Yesterday Harry, Paul and my aunt came to my birthday party.

      Q_1 B: What did you get from them?

      A_1 A: From Paul I got a book and from Harry flowers.

      Q_2 B: And from your aunt, what did you get from her?

      A_2 A: From my aunt I got nothing.

On the other hand, if the unsatisfactoriness is qualitative, one or more elements specified by A_i need elucidation. In this case the aim of subquestioning is not to provide a quantitative but a qualitative completion to A_i. Examples are A_1 in (13a), (15a) and (16a).

6.2 *Two types of subquestions*

An answer may be unsatisfactory for two reasons. A division is made here into two types of subquestions, corresponding to two different possible
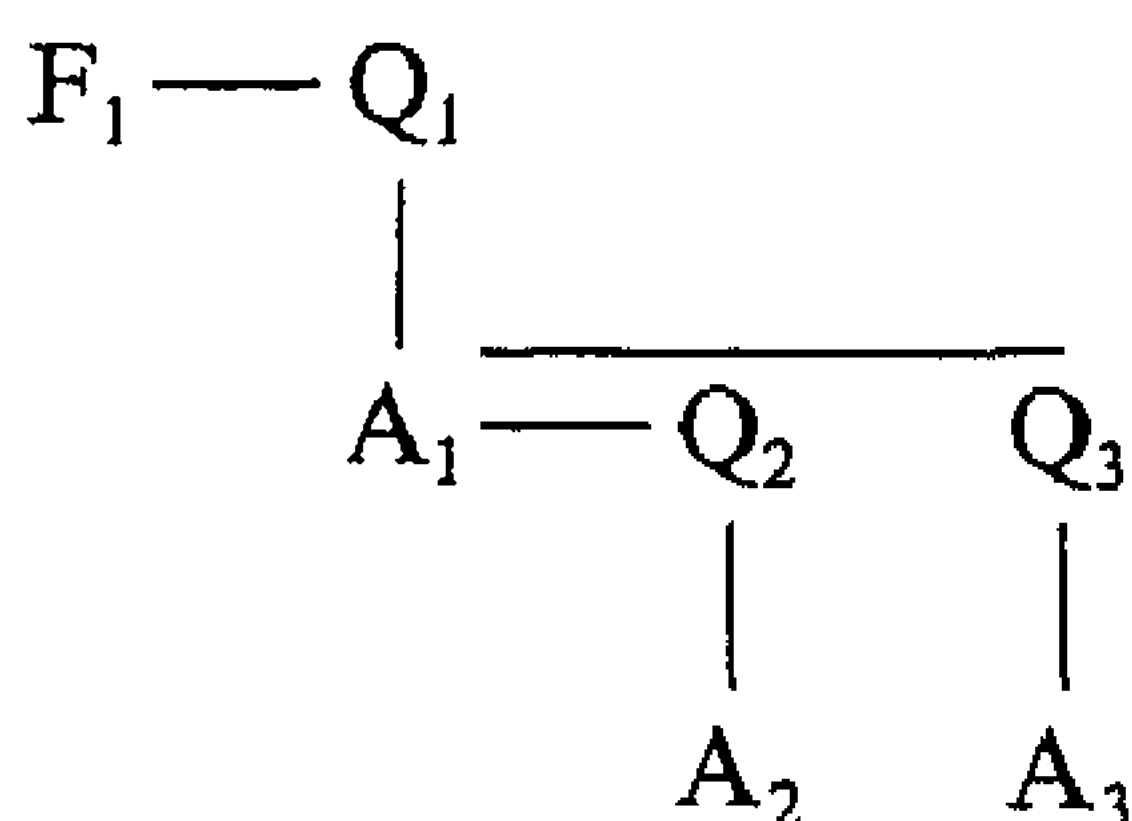
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[24] Subquestions have a specific property which is directly related to their completion task, namely that the conjunction of an unsatisfactory answer to a question Q_p and the answers to all questions that form – directly or indirectly – a subquestion of Q_p constitutes, in the order the answers appear in discourse, an appropriate answer to Q_p. This property is called the Conjunctive Property of Subquestions.

reasons for the unsatisfactoriness of an answer: ADEQUACY-ORIENTED SUBQUESTIONS and DISCREPANCY-SOLVING SUBQUESTIONS.

In the case of an adequacy-oriented subquestion the unsatisfactoriness of an answer arises from its (supposed) insufficiency. If insufficient in a qualitative way, more information is needed for a sufficient comprehension of the answer given. Adequacy-oriented subquestions are the explicit questions Q_2 and Q_3 in example (15a).

(15)　(a)　F_1　A:　Tomorrow is Harry's birthday.

　　　　　　Q_1　B:　What would be a suitable birthday present for him?

　　　　　　A_1　A:　A suitable birthday present for him would be a monkey-wrench.

　　　　　　Q_2　B:　What's that?

　　　　　　A_2　A:　That's some kind of tool with which one can loosen or tighten nuts and bolts of various sizes.

　　　　　　Q_3　B:　Why would that be a suitable birthday present for him?

　　　　　　A_3　A:　He recently came to borrow one from me.

　　　(b)　Question-answer structure:

$$
\begin{array}{l}
F_1 \text{---} Q_1 \\
\quad\quad\; | \\
\quad\quad\; |\rule{1.5cm}{0.4pt} \\
\; A_1 \text{---} Q_2 \quad\; Q_3 \\
\quad\quad\;\; | \quad\quad\; | \\
\quad\quad\; A_2 \quad\; A_3
\end{array}
$$

The subquestions are asked as the result of the unsatisfactory answer A_1. This answer is unsatisfactory because, given the subquestions Q_2 and Q_3, it is insufficient in the view of both the questioner's general and specific background knowledge. The questioner does not possess the general background knowledge of what a monkey-wrench is. After speaker A has given an answer to subquestion Q_2, the questioner knows what a monkey wrench is, but does not yet understand why a monkey-wrench would be a suitable birthday present for Harry. However, this specific background knowledge is needed for a sufficient answer to the topic-constituting question Q_1. After the answer to subquestion Q_3, the questioner seems to have a sufficient and satisfactory understanding of what would be a suitable birthday present for Harry. No more subquestions are contextually induced thereafter.[25]

---

[25] Evidence for the view that answer A_1 does not close off the topic defined by question Q_1 is the following. The answers A_2 and A_3 have a supportive function with respect to the comment value provided by A_1. However, if this support is negative, attention automatically shifts to alternatives differing from the monkey-wrench.

The representation of the question-answer structure in (15b) shows that, contrary to the subquestions in (13b), subquestions Q_2 and Q_3 are paratactically ordered under the topic-constituting question Q_1. According to the definition of subquestions, Q_3 is not a subquestion of Q_2 because it cannot be characterized as asked with the purpose of providing an informational completion to the answer given to subquestion Q_2.

A discrepancy-solving subquestion results from a (supposed) detection of a discrepancy of an answer with given contextual information and/or existing background knowledge. A discrepancy-solving subquestion is Q_2 in example (16).

(16) (a) F_1 A: Yesterday Peter bought something that you wouldn't have expected.

Q_1 B: What did he buy that I wouldn't have expected?

A_1 A: A new personal computer.

Q_2 B: Why didn't he buy my computer? (The fact is, he promised me that he would.)

A_2 A: He didn't buy your computer because he preferred a new one after all.

(b) Question-answer structure:

$$F_1 \text{---} Q_1$$
$$\big|$$
$$A_1 \text{---} Q_2$$
$$\big|$$
$$A_2$$
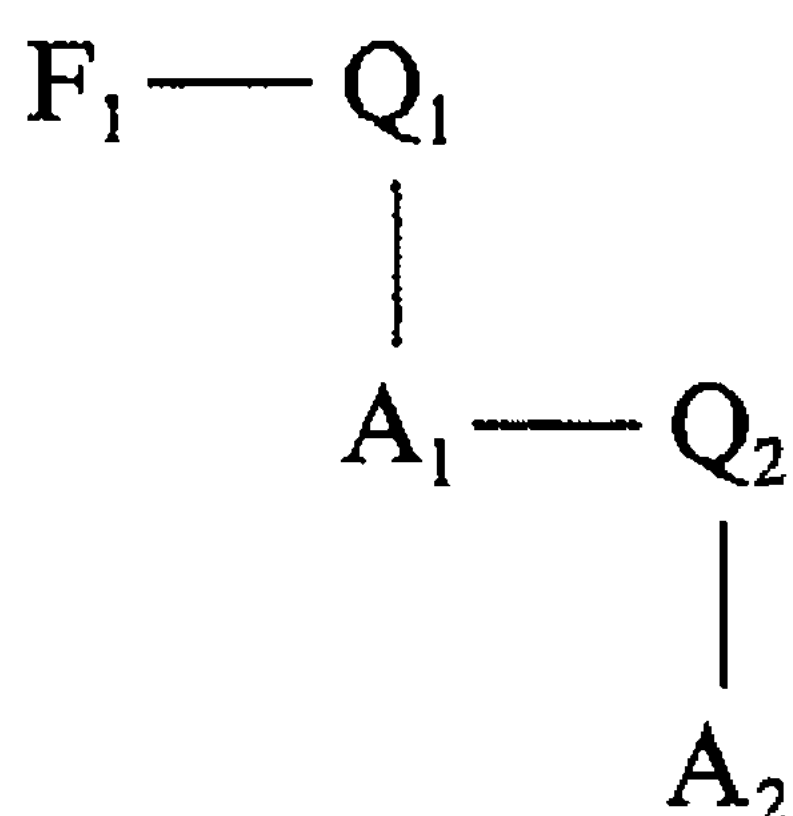
The subquestion is asked as the result of the sufficient but unsatisfactory answer to the topic-constituting question Q_1. The answer is unsatisfactory because, in view of the subquestion asked, it has given rise to a discrepancy with existing background knowledge, possibly verbally expressed by the questioner (see the linguistic material between brackets). The subquestion is asked to find a solution to the discrepancy. When the discrepancy is solved and no more subquestions arise, the answer to Q_1 seems to have become satisfactory, that is both a sufficient and discrepancy-free answer for the questioner.

6.3 Hierarchical control of subquestions and subtopics

We already said that subquestions have no autonomous status in discourse, but are subservient to a program imposed on the development of the discourse by a preceding topic-constituting question. The contextual induction of a subquestion is thus not free but CONTROLLED, in a technical sense, by preceding questions in the discourse. Question control implies that

the question induced is not an arbitrary one, but rather one which contributes to the completion of the program in course.

Question control is thus carried out by a preceding unsatisfactorily answered topic- or subtopic-constituting question. Because it is inherently connected with subquestions we will define this notion accordingly.

Question Control

An explicit or implicit question Q_p controls (the contextual induction of) an explicit or implicit question $Q_q (Q_p \xrightarrow{c} Q_q)$, iff Q_q is a subquestion of Q_p.
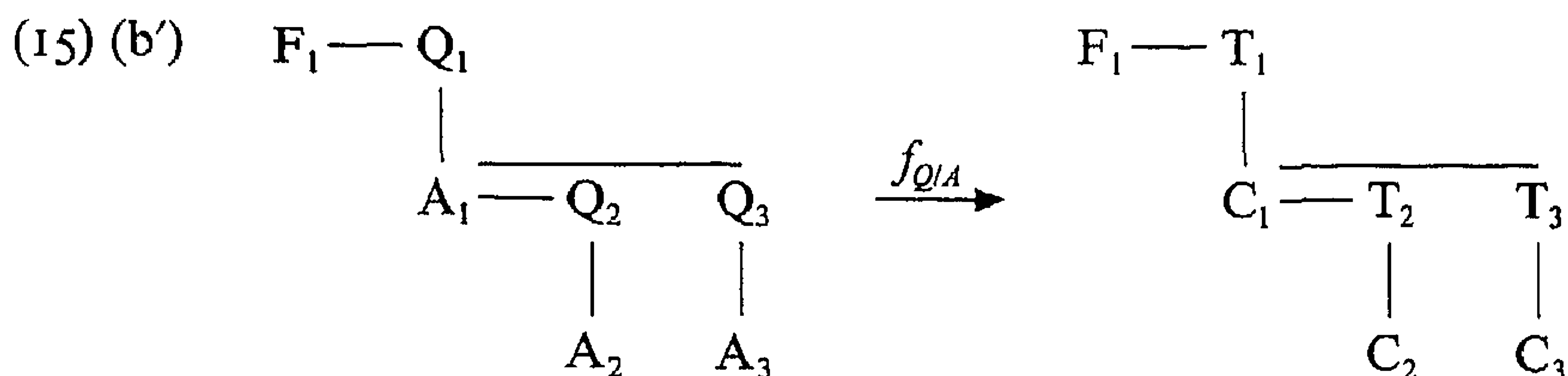
By definition this implies that if $Q_p \xrightarrow{c} Q_q$, Q_q can be characterized as a question which is asked with the purpose of completing the unsatisfactory answer to Q_p. Question control is either direct or indirect, depending on whether there are one or more intervening questions.

Because of the relationship between (sub)questions and (sub)topics the notion of topic control is defined correspondingly.

Topic Control

A topic T_p controls (the constitution of) a topic $T_q (T_p \xrightarrow{c} T_q)$, iff $Q_p \xrightarrow{c} Q_q$.

The control relations between questions and the control relations between topics can be read directly from the representations of the question-answering structure and of the topic-comment structure of discourse respectively. The representation of the topic-comment structure of discourse is obtained by mapping under the general topic-comment function $f_{Q/A}$ every explicit and implicit question Q_p that occurs in the representation of the question-answer structure to topic T_p which is defined by that question, and mapping under the same function every question-answering sentence A_p to the comment C_p which it provides. According to this mapping procedure the representation of the hierarchical question-answer structure in (15b) results in a representation of the topic-comment structure as is shown in (15b)'.

(15) (b')
$$F_1 \text{---} Q_1$$

$$A_1 \text{---} Q_2 \quad Q_3$$

$$A_2 \quad A_3$$

$\xrightarrow{f_{Q/A}}$

$$F_1 \text{---} T_1$$

$$C_1 \text{---} T_2 \quad T_3$$

$$C_2 \quad C_3$$

6.4 Two principles

6.4.1 Principle of Recency

We distinguish two principles which guide the process of explicit and implicit subquestioning: the PRINCIPLE OF RECENCY and the DYNAMIC PRINCIPLE OF TOPIC TERMINATION. This section will focus on the former principle. In the next section we will discuss the latter one.[26]

The Principle of Recency concerns the context orientation and related contextual induction of explicit and implicit subquestions. The principle indicates the order in which subquestions are contextually induced. It is defined in the following way.
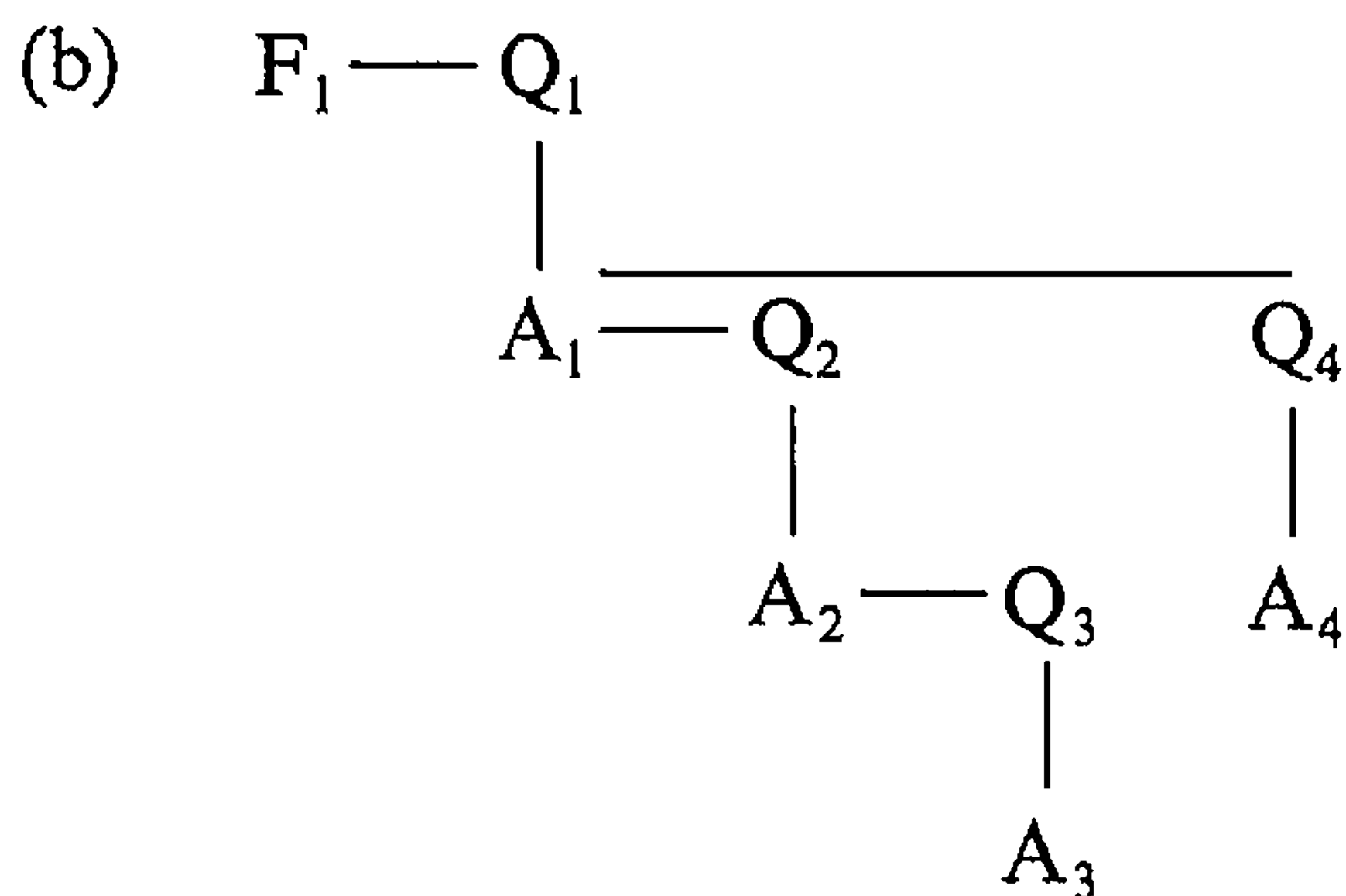
Principle of Recency (PR)
In a well-formed discourse every explicit or implicit subquestion Q_p is asked as the result of an answer A_{p-n}, which is the most recent unsatisfactory answer to a preceding question Q_{p-n}.

In cases in which the questionings in discourse remain implicit, a test for PR requires the explication of the assumed implicit questions.

PR is illustrated by the order of the explicit subquestions in example (17a).

(17) (a) F_1 A: It's sensible for Tom to buy a car now.
          Q_1 B: Why?
          A_1 A: Buying a car is probably favourable for him now and it won't be bad for his health.
          Q_2 B: Why is buying a car probably favourable for him now?
          A_2 A: Car expenses are expected to decrease.
          Q_3 B: For what reason?
          A_3 A: Gas will become substantially cheaper.
          Q_4 B: Why won't a car be bad for his health?
          A_4 A: He jogs every day.

(b) $F_1 \longrightarrow Q_1$
               |
        $A_1 \longrightarrow Q_2$ Q_4
            | |
          $A_2 \longrightarrow Q_3$ A_4
 |
            A_3

---

[26] The Principle of Recency and the Dynamic Principle of Topic Termination are both coherence principles in the sense that their application implies, in terms of Sperber & Wilson (1986), optimal coherence ('contextual effects') against minimal processing efforts.

The representation of the question-answer structure of this discourse is presented in (17b). It can be read from the representation that, at the moment question Q_2 is answered, the discourse contains two unsatisfactory answers to preceding questions, namely A_1 and A_2. These answers are unsatisfactory because each of them gives rise to a new subquestion. In agreement with PR, subquestion Q_3 is asked before subquestion Q_4 is asked, because at the moment of questioning answer A_2 is the most recent unsatisfactory answer to a preceding question.

Evidence for PR consists in the fact that it cannot be violated. Every attempt at violating it automatically results in either unwellformedness or in a reinterpretation of the discourse in such a way that the principle is again observed. Consider the following variant of (17) in which such an attempt is made. The questions Q_3 and Q_4 correspond to the questions Q_4 and Q_3 in (17), respectively. The questions (and also their context orientation) are the same, only the order in which they are asked is different.

(17)′ (a)

F_1	A:	It's sensible for Tom to buy a car now.
Q_1	B:	Why?
A_1	A:	Buying a car is probably favourable for him now and it won't be bad for his health.
Q_2	B:	Why is buying a car probably favourable for him now?
A_2/F_2	A:	Car expenses are expected to decrease.
Q_3	B:	Why won't a car be bad for his health?
A_3	A:	He jogs every day.
Q_4	B:	For what reason does one expect expenses for a car to decrease?
A_4	A:	Gas will become substantially cheaper.

(b)

$$F_1 — Q_1$$
$$| $$
$$A_1 — Q_2 \qquad Q_3$$
$$| \qquad\qquad |$$
$$A_2/F_2 — Q_4 \qquad A_3$$
$$|$$
$$A_4$$
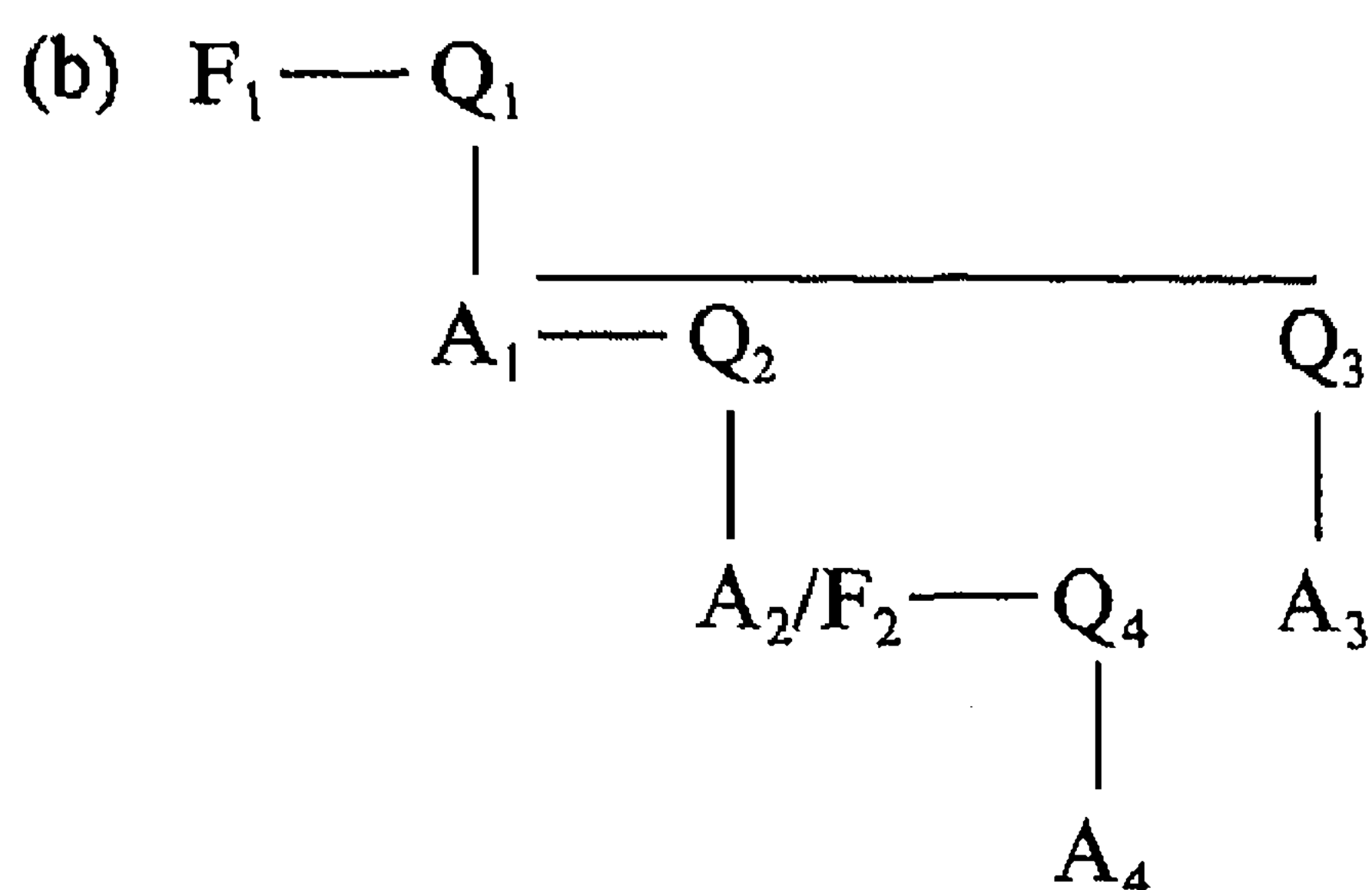
Though the changed order does not make this discourse unwellformed it has the result that question Q_4 (Q_3 in (17)) cannot be observed as a subquestion anymore. It has become a new topic-constituting question which realizes a topic shift. It is asked as the result of the answer to question Q_2 which, at the time of questioning, functions, in a technical sense, as feeder for the contextual induction of this question (the double function of a sentence is

expressed by the slash notation – see (17)′). This means that question Q_4 cannot be characterized as a question asked with the purpose of adding something (in an indirect way) to the reason why it is sensible for Tom to buy a car now. However, question Q_4 would be a subquestion if the topics defined by Q_1 and Q_2 would be reactualized, for example, by referring to the relevant part of the old context. In the last section, where a classification of topic shifts is presented, we will elaborate on the type of topic shift that is realized by question Q_4.

Strong support for the view that in (17)′ question Q_4 forms a new topic-constituting question is the fact that, in contrast to the same question Q_3 in (17), it may be preceded by the phrase *By the way* without becoming inappropriate. This topic shift marking phrase indicates that the question to which it is added is not a part of the program initiated by the preceding topic-constituting question Q_1 and thus that the question is asked as the result of a part of the preceding context (A_2) of which the topic has already been closed off. Because of the fact that in (17) the same question functions as a subquestion, the addition of the topic shift marking phrase has the result that it becomes inappropriate in the given context. In section 6.5 we will propose a general test to determine hierarchical relations in discourse.

6.4.2 *Dynamic Principle of Topic Termination*

According to the basic assumption (section 2.2), the dynamics of topic constitution are essentially determined by questioning: every contextually induced explicit and implicit (sub)question that is answered in discourse constitutes a (sub)topic. However, once a (sub)topic has been constituted, its actuality is not always preserved until the end of discourse. Like the process of topic constitution, the process of topic termination is dynamic.

But what determines topic termination? The introduction of a new (sub)topic certainly does not mean that in all cases the old topic or subtopic loses its actuality in discourse. What we need, therefore, is a principle that accounts for the process of topic termination. The principle we introduce, called the Dynamic Principle of Topic Termination, is directly formulated in terms of the notion of satisfactory answer to a question. It accounts for the standard cases in which topic termination does not result from a disturbance of the questioning process, due to epistemic limitations, disruptions, etc.

Dynamic Principle of Topic Termination (DPTT)
If an explicit or implicit (sub)question Q_p is answered satisfactorily, the questioning process associated with it comes to an end. As a consequence, topic $T_p (T_p = f_{Q/A}(Q_p))$ loses its actuality in discourse.
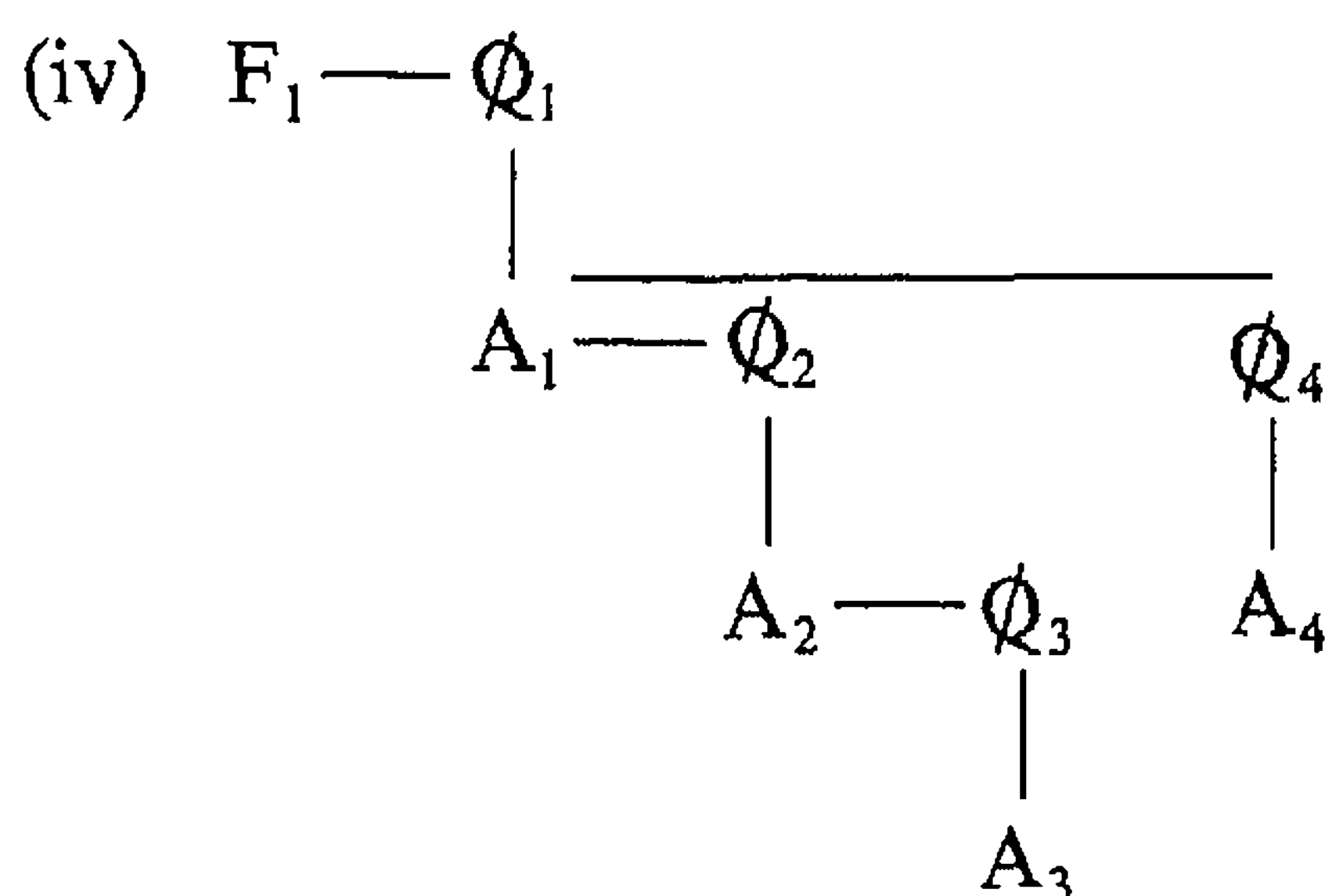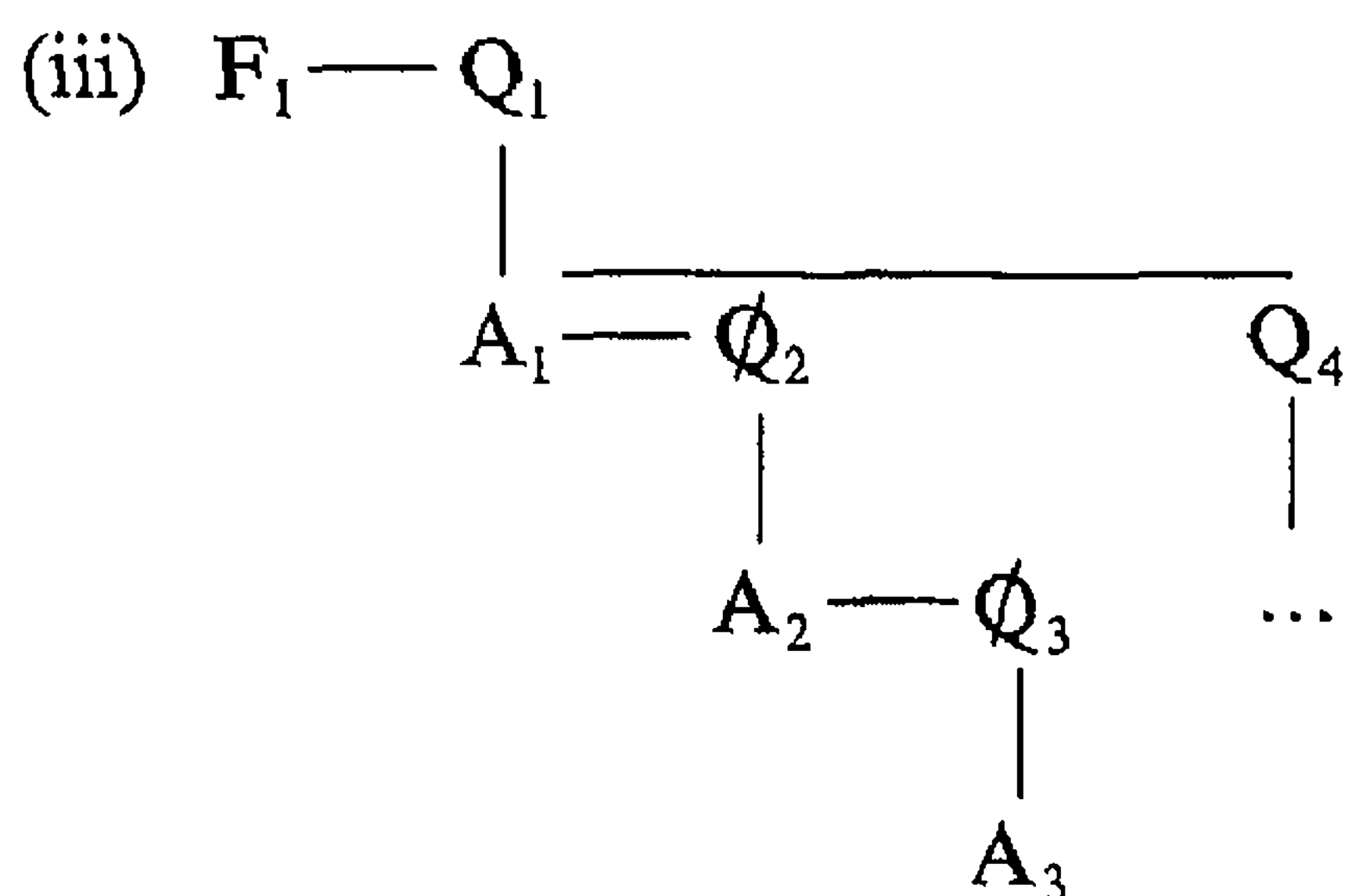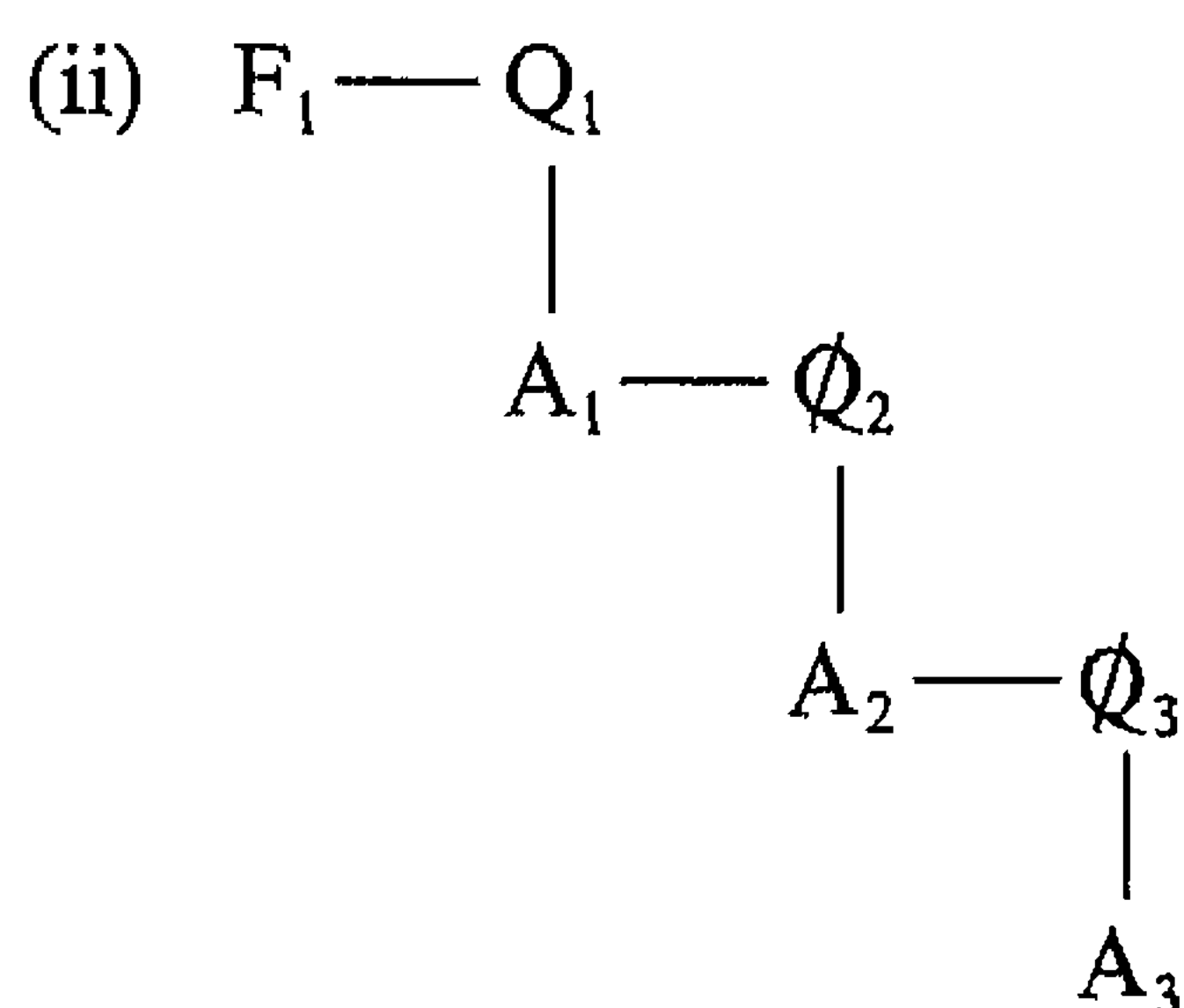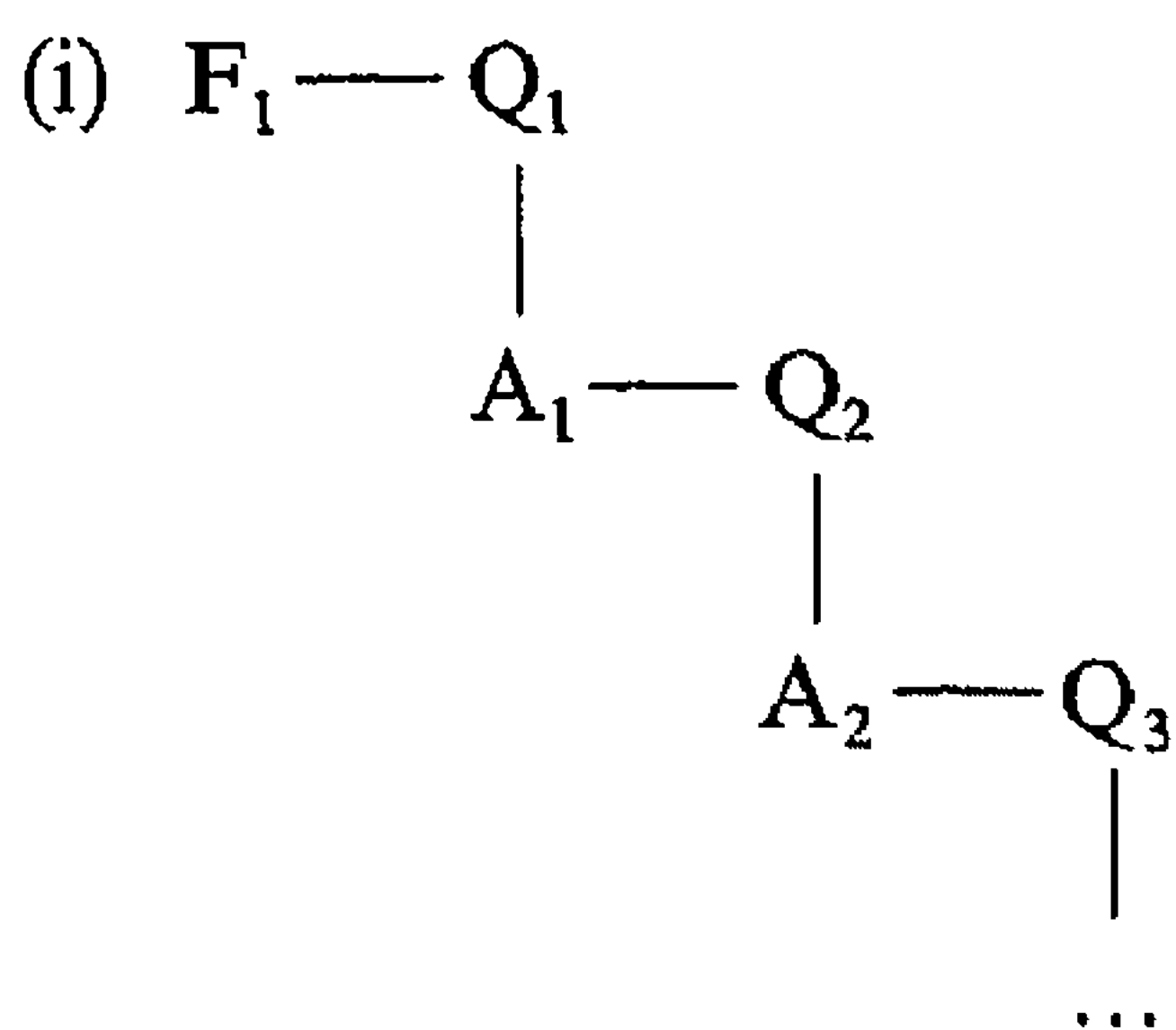
Satisfactory answers to the two types of subquestions mentioned earlier, namely adequacy-oriented subquestions and discrepancy-solving sub-

questions, will consist in more (for example, clarifying or supportive) information and a solution of the discrepancy, respectively. As is argued for in Van Kuppevelt (1994b) satisfactory answers imply unique determination of that which is asked for by the question, as a consequence of which the contextual induction of (further) subquestions is blocked.

The way in which DPTT rules the process of topic termination can be expressed most clearly by making explicit one of its main implications, namely TOPIC CONTINUITY IN CASE OF SUBQUESTIONING. DPTT implies that a (sub)topic constituted by a (sub)question is continued as long as subquestions of that question occur in discourse. The occurrence of subquestions indicates that a preceding question is not yet answered satisfactorily. According to DPTT the topic constituted by that question is then continued.
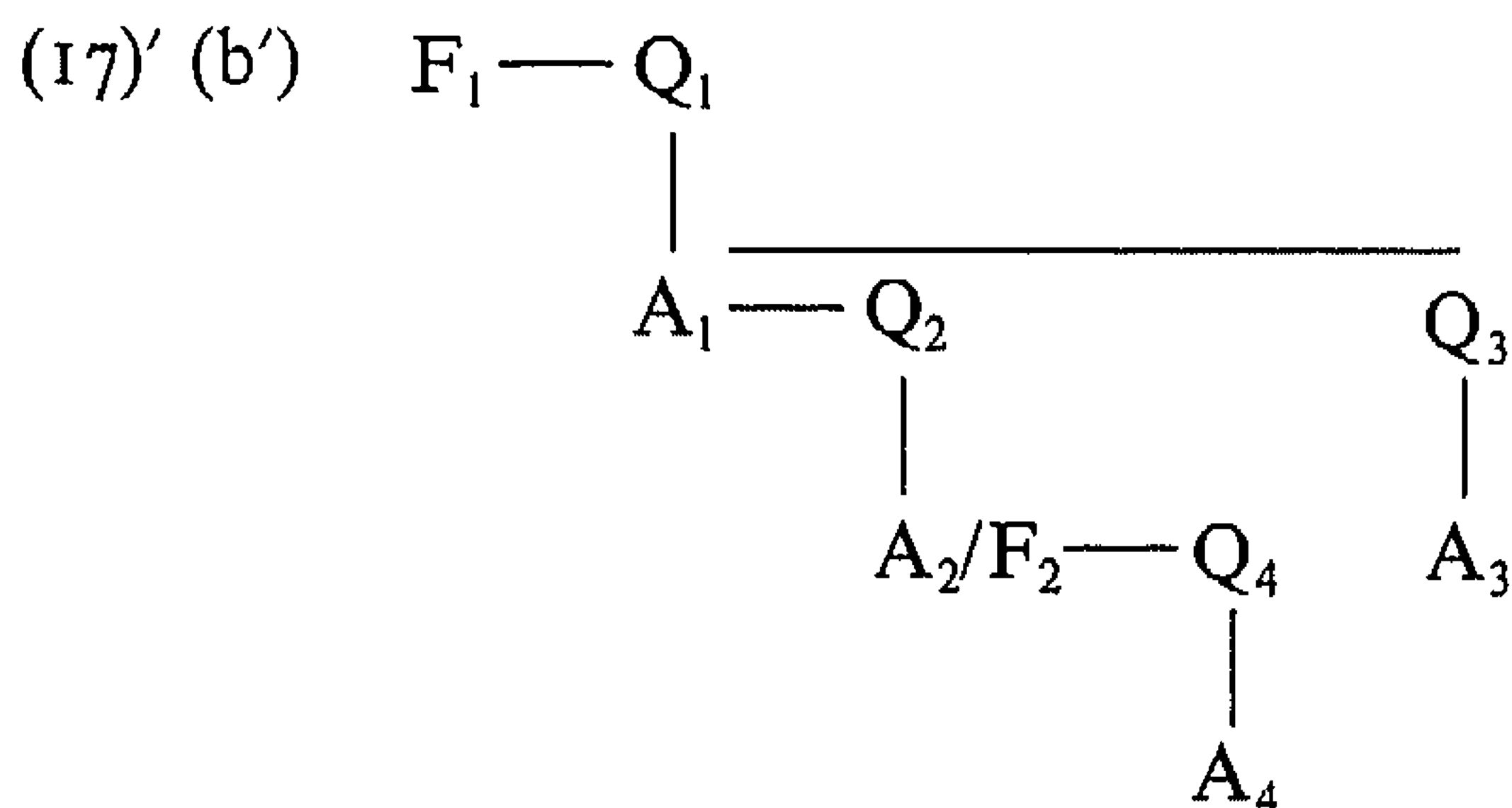
We will illustrate the phenomenon of topic continuity in a schematic way by showing, in terms of question-answer structure, the relevant steps in the development of a hierarchically structured discourse. Let us take the discourse presented in example (17a). The relevant production steps of this discourse are presented in (18b)'. Given our assumption, A_1 up to and including A_4 together form a satisfactory answer to the topic-constituting question Q_1. A slash through a question symbol marks that the corresponding question is answered satisfactorily and that as a consequence, according to DPTT, the topic constituted by it is closed off.

(18) (b')

(i) $F_1 - Q_1$

$A_1 - Q_2$

$A_2 - Q_3$

...

(ii) $F_1 - Q_1$

$A_1 - \cancel{Q}_2$

$A_2 - \cancel{Q}_3$

A_3

(iii) $F_1 - Q_1$

$A_1 - \cancel{Q}_2 \qquad Q_4$

$A_2 - \cancel{Q}_3 \qquad$ ...

A_3

(iv) $F_1 - \cancel{Q}_1$

$A_1 - \cancel{Q}_2 \qquad \cancel{Q}_4$

$A_2 - \cancel{Q}_3 \qquad A_4$

A_3

Production step (i) shows that at the time subquestion Q_3 is asked none of the preceding questions is answered satisfactorily. According to DPTT the topics defined by Q_1, Q_2 and Q_3 are still actual. The answer to question Q_3 – see production step (ii) – results in loss of actuality for the topics constituted by Q_2 and Q_3, in agreement with DPTT. At this stage in the development of the discourse, both subquestions have already been answered satisfactorily. Subquestion Q_2 has been answered satisfactorily because no more subquestions of it arise in the discourse. Subquestion Q_3, on the other hand, has been answered satisfactorily because its answer does not give rise to the contextual induction of a subquestion at all. In production step (iii) a new subtopic is constituted by subquestion Q_4. When this question is answered satisfactorily – see production step (iv) – the topic-constituting question Q_1 is also answered satisfactorily, so that in agreement with DPTT all topics have lost their actuality in the discourse.

Beside the fact that DPTT accounts for the process of topic termination, it is also relevant with respect to the recency principle PR, for which it provides an explanation. In example (17)' we saw that our attempt to violate PR was not successful. It led to a reinterpretation of the discourse such that this principle was again observed. The question asked as the result of the answer to subquestion Q_2 was reinterpreted as a new topic-constituting question. Let us repeat here the question-answer structure we have discussed.

(17)′ (b′) F_1 —— Q_1
                        |
            A_1 —— Q_2 Q_3
                        | |
            A_2/F_2 —— Q_4 A_3
                        |
                     A_4

Subquestion Q_3 is asked as the result of the answer A_1 to the topic-constituting question Q_1. According to PR, A_1 must be the most recent unsatisfactory answer to a preceding question. This implies that at the time subquestion Q_3 is asked, subquestion Q_2 is already answered satisfactorily. According to DPTT the subtopic defined by Q_2 must have lost its actuality in the discourse then. For this reason question Q_4 is not a subquestion but a new topic-constituting question asked as the result of answer A_2. Because this answer has turned into a topicless sentence, it functions as a feeder in a technical sense.

A last relevant point is that DPTT allows one to compute whether, and to what extent, the resolution domain of a given sentence-external anaphor is

restricted on TOPICAL GROUNDS. The issue of topical restrictions on sentence-external anaphors is (indirectly) prominent in, for example, Grosz (1978 and other publications) and Reichman (1978). It is argued and illustrated by these authors that a discourse reveals a hierarchical structure of discourse segments, for each of which a topic could be presupposed. The restrictions are directly characterized in terms of discourse structure which, according to the present study, reflects the topic-comment structure. However, the notion of topic-comment structure is not formally and operationally defined by the authors. In our framework the explication of this notion is central. It is argued that the topic-comment structure of discourse is the result of the process of explicit and/or implicit questioning.

Without going into detail, the point made here with respect to topical restrictions on sentence-external anaphora resolution is schematically as follows.[27] Let us assume we have three succeeding discourse units U^{T_1}, U^{T_2}, and U^{T_3}, where the superscripts indicate the topic defined by the question which the corresponding discourse unit answers. In U^{T_3} a pronoun P occurs. PC_1 in U^{T_1} and PC_2 in U^{T_2} are potential candidates for anaphoric resolution of P.

(19)

U^{T_1}	PC_1
U^{T_2}	PC_2
U^{T_3}	P

The resolution domain of P is restricted to PC_1 only if, at the moment that P is introduced, in agreement with DPTT, topic T_2 of the intervening discourse segment U^{T_2} has lost its actuality in the discourse. In that case, the attention of the discourse participants is not directed to what is said or implied by U^{T_2} because the question answered by this discourse unit is closed off. This can only be the case when the topics of U^{T_2} and U^{T_3} are PARATACTICALLY ordered as direct subtopics of the topic defined for U^{T_1}.

6.5 Testability of subordination relations

In this section we present a test the main function of which is to distinguish operationally subquestions from higher order questions. This test enables us to determine the existing subordination relations between explicit(ated) non-

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[27] See, for example, Grosz (1978) and Reichman (1981) for examples of so-called long distance anaphora which imply a restricted resolution domain, excluding potential candidates in the immediate context.

ambiguously formulated questions in discourse. In an indirect way it also functions as a test for the identification of feeders. A question has functioned as a topic-constituting question if after the application of the test it has turned out that this question is not a subordinate one. By definition, the linguistic or non-linguistic event to which this question is directed has functioned as a feeder.

The test we propose is called the Subordination Test.

Subordination Test (ST)

An (unambiguously formulated)[28] explicit or explicitated implicit question Q_q is a subquestion of a preceding question Q_p iff, according to the addition of a test sentence S indicating the closure of the preceding topic T_p ($T_p = f_{Q/A}(Q_p)$), Q_q becomes inappropriate.

S is added just after the (relevant part of the complex) answer to question Q_p and has, for instance, the following form: *I now understand (without discrepancy)* $\ll Q_p \gg$, where $\ll Q_p \gg$ is a linguistic representation of Q_p.

ST is functional when the discourse in question lacks overt markings of topic termination. When these markings are absent the application of ST, especially the addition of a test sentence S, forces the closure of a preceding topic. This makes a following question inappropriate if it elaborates on this topic. Obviously, every other test sentence (or test phrase) which fulfils the same function, namely the closure of the preceding topic, is in principle adequate. A reason to use an alternative is that its use may be less artificial in the particular context to which it is added.

Applications of ST are presented in (20). Here the test is applied to the preceding example (15) with the purpose of yielding all the existing subordination relations between the explicit questions occurring in that discourse. The inappropriateness of the questions Q_2 and Q_3 in (20a) and (20b) respectively implies that these questions must be subquestions of question Q_1. As a consequence, Q_1 is a topic-constituting question asked as the result of feeder F_1. Subquestion Q_3 in (20c), on the other hand, is appropriate in the given context. ST predicts then that it is not subordinated to subquestion Q_2.

(20) (a) F_1 A: Tomorrow is Harry's birthday.

Q_1 B: What would be a suitable birthday present for him?

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[28] A question is ambiguously formulated if it remains appropriate both when it is forced to be subordinated to a preceding question and when it is forced to be independent of such a question. The addition of a test sentence like the one described in ST forces an ambiguously formulated question to function as a higher order question, while, for example, *then*-insertion in the ambiguously formulated question, with *then* having an explanatory meaning, is a good means of forcing it to be subordinated to the preceding question.

A_1 A: A monkey-wrench.

S B: I now understand what would be a suitable birthday present or Harry.

* Q_2 What's a monkey-wrench?

A_2 A: That's some kind of tool with which one can loosen or tighten nuts and bolts of various sizes.

Q_3 B: Why would that be a suitable birthday present for him?

A_3 A: He recently came to borrow one from me.

(b) F_1 A: Tomorrow is Harry's birthday.

Q_1 B: What would be a suitable birthday present for him?

A_1 A: A monkey-wrench.

Q_2 B: What's that?

A_2 A: That's some kind of tool with which one can loosen or tighten nuts and bolts of various sizes.

S B: I now understand what would be a suitable birthday present for him.

* Q_3 Why would a monkey-wrench be a suitable birthday present for him?

A_3 A: He recently came to borrow one from me.

(c) F_1 A: Tomorrow is Harry's birthday.

Q_1 B: What would be a suitable birthday present for him?

A_1 A: A monkey-wrench.

Q_2 B: What's that?

A_2 A: That's some kind of tool with which one can loosen or tighten nuts and bolts of various sizes.

S B: I now understand what a monkey-wrench is.

$\sqrt{Q_3}$ Why would that be a suitable birthday present for him?

A_3 A: He recently came to borrow one from me.

ST is also an adequate means of identifying topic shifts. In case of a topic shift, the topic-constituting question defining the new topic is not subordinated to the one associated with the old topic. Let us take the following extended variant of (20) to illustrate this point.

(20)′ F_1 A: Tomorrow is Harry's birthday.

Q_1 B: What would be a suitable birthday present for him?

A_1 A: A monkey-wrench.

Q_2 B: What's that?

* A_2 A: That's some kind of tool with which one can loosen or tighten nuts and bolts of various sizes.

Q_3 B: Why would that be a suitable birthday present for him?

A_3 A: He recently came to borrow one from me.

S   B: I now understand what would be a suitable birthday present for him.

$\sqrt{Q_4}$ Where can I buy a monkey-wrench around here?

A_4 A: At the plumber's shop.

Q_5 B: Where is it?

A_5 A: In the shopping centre just around the corner.

According to ST, question Q_4 is not a subquestion of the preceding topic-constituting question Q_1. Further applications of ST will also show that Q_4 is neither a subquestion of Q_2 nor of Q_3. It can be concluded, therefore, that Q_4 is a new topic-constituting question which accomplishes a topic shift. It is induced by the preceding discourse which, as a whole, functions as a new feeder.

7. DISCOURSE TOPICS

Until now we have made a distinction between topics and subtopics. In addition to these types of topic of a higher order must be also distinguished. This type of topic is called a DISCOURSE TOPIC. It is defined in terms of topics constituted by topic-constituting questions.

Definition
A discourse topic $\mathbf{DT}_i$ is defined by the set of all topics T_p that are constituted as the result of one and the same feeder F_i ($DT_i = \{T_p \mid T_p$ constituted a.r.o. $F_i\}$). As such $\mathbf{DT}_i$ is a set of main, higher order topics usually hierarchically comprising lower topics.

By definition, topic and discourse topic coincide if, as the result of a given feeder, only one topic is constituted ($\{T_p\} := T_p$). The discourse topics of, for instance, examples (13), (15) and (16) are configurated in this way.[29]
The discourse topic of example (21), on the other hand, is determined by two topics, namely those which are constituted by the topic-constituting questions Q_1 and Q_3:

(21)   (a) F_1 A: Yesterday a jury of investigation came to the conclusion that the 31 casualties of the fire in the King's Cross London underground station died as the result of an accident and not as the result of negligence.

         Q_1 B: How did people react to the outcome of the investigation?

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[29] Contrary to Keenan & Schieffelin (1976) the notion of discourse topic is not identified with (the proposition expressed by) the feeder itself, due to awareness of the fact that a feeder may give rise to different discourse topics.
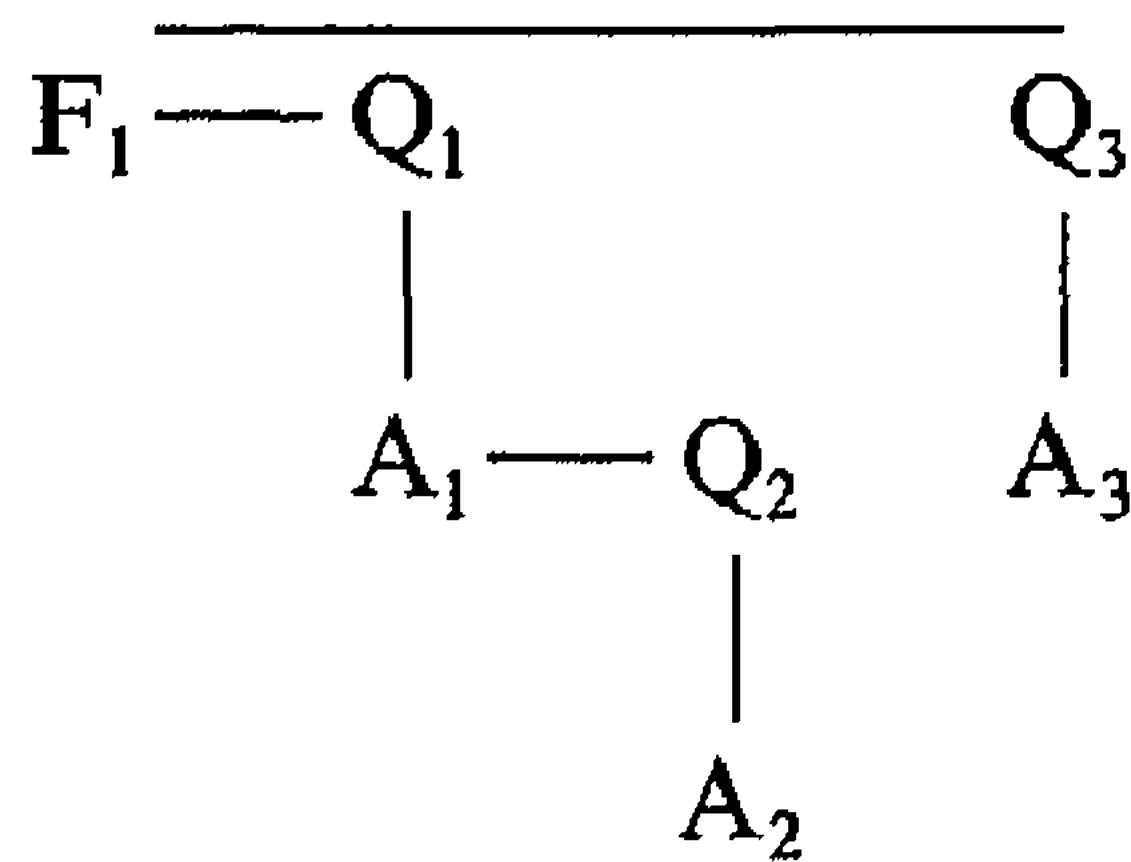
A_1 A: Relatives of the victims rejected it.

Q_2 B: Why?

A_2 A: They are of the opinion that the jury did not do their job well.

Q_3 B: What is the consequence of this outcome?

A_3 A: The consequence is that further prosecution of the officials of London Regional Transport is ruled out.

(b) Question-answer structure:

$$
\begin{array}{ccc}
F_1 \text{---} Q_1 & & Q_3 \\
\quad\mid & & \mid \\
A_1 \text{---} Q_2 & & A_3 \\
\quad\mid & & \\
A_2 & &
\end{array}
$$

$$DT_1 = \{T_p \,|\, T_p \text{ constituted a.r.o. } F_1\} =$$
$$= \{T_1, T_3\}$$
$$(T_1 = f_{Q/A}(Q_1) \text{ and } T_3 = f_{Q/A}(Q_3))$$

The discourse topic is the set of topics defined by these questions, namely people's reaction to the outcome of the investigation and the consequence of this outcome.

In cases where a discourse contains more than one discourse topic, we say that the internal topic-comment structure (and related question-answer structure) of that discourses is DISCONTINUOUS. In that case the discourse can be divided into two or more segments which are mutually incoherent in structural terms. Our definition of the notion of discourse topic implies that a discontinuous topic-comment structure always contains more than one feeder. A discontinuous topic-comment structure is defined for the discourse in example (10).[30]

8. BOUND VERSUS FREE (UNBOUND, SPONTANEOUS) DISCOURSE

Whereas topics and subtopics are always constituted in one production step involving the contextual induction of a (sub)question, the constitution of a discourse topic can take several production steps. This leads to a formal

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[30] Apart from these so-called unembedded structural discontinuities we distinguish embedded discontinuities. As shown in Van Kuppevelt (1994a) the latter constitute intervening side structures which result from a temporary topic digression, causing deviations from the main structure of the discourse.

distinction between BOUND DISCOURSE on the one hand and FREE, UNBOUND OR SPONTANEOUS discourse on the other hand. The definitions are as follows.

Bound discourse

The main structure of a bound discourse is determined by one leading discourse topic DT_1 constituted in one production step at the beginning of the discourse. The development of such a discourse is, with regard to its main structure, from the beginning bound programmatically by the set of topic-constituting questions defining DT_1.

Free (unbound, spontaneous) discourse

The structure of a free discourse, on the other hand, is determined by a set of discourse topics $\{DT_1, \ldots, DT_n\}$ containing one or more discourse topics ($n \geq 1$), of which the constitution takes several production steps. The development of a free discourse is thus not bound programmatically by a single discourse topic-defining set of topic-constituting questions which have arisen in one step at the beginning of the discourse.

For a bound discourse it holds that, if topic and discourse topic coincide, the discourse forms an answer to one topic-constituting question. If, on the other hand, topic and discourse topic are different, the discourse answers a question consisting of a conjunction of topic-constituting questions. The topics defined by this question are constituted in one production step.

The discourses in examples (10) and (21) belong to the category of free discourse. For (10), two discourse topics are defined. Both coincide with a topic-constituting question. For (21), on the other hand, only one discourse topic is defined. However, the constitution of this discourse topic takes two production steps, in each of which a topic-constituting question is asked.

Typical examples of bound discourse are NARRATIVES. In Klein & Von Stutterheim (1987) it is argued that in discourses of this type the main structure is determined by a single (usually implicit) question, called the 'quaestio' of the narrative.[31] This is a specific question which accounts for the sequential order of the events communicated in the main structure of the narrative. It is demonstrated, without assuming this main structure to be hierarchical, that the utterances which belong to it together form an answer to the main question. In terms of our framework this question is a topic-constituting question defining the discourse topic of the leading part of the discourse. All other questions belonging to this part are directly or indirectly controlled by that question, because, through being answered, they are

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[31] See for the distinction between MAIN STRUCTURE ('actual story line', 'narrative skeleton', 'foreground') and SIDE STRUCTURES ('supported material', 'flesh', 'background'), for example, Hopper (1979), Klein and Von Stutterheim (1987), Labov (1972), Reinhart (1984).

subservient to the program that is associated with this question. Intervening utterances which do not belong to this main part of the narrative, but which are nevertheless related to it (comments, evaluations, etc.), are in our framework analyzed as realizing a temporary topic digression which may also be hierarchically structured.

Another discourse type which pre-eminently belongs to the category of bound discourse are TASK-ORIENTED DIALOGUES. As with narratives, the sentences belonging to the main structure form together an answer to, usually, a single explicit or implicit topic-constituting question (e.g. *How can I replace the flat tyre on my car?*). This is a specific question expressing the main task communicated in the discourse. Subquestions, on the other hand, express subtasks (for example, the related subquestion *How must I loosen the nuts?*). They are subservient to the program associated with the topic-constituting question.[32]

9. HIERARCHY OF STRUCTURAL UNITS IN DISCOURSE

The model of discourse structure presented here implies that a discourse is segmented according to a hierarchy of structural units which corresponds to the following topic hierarchy in discourse.
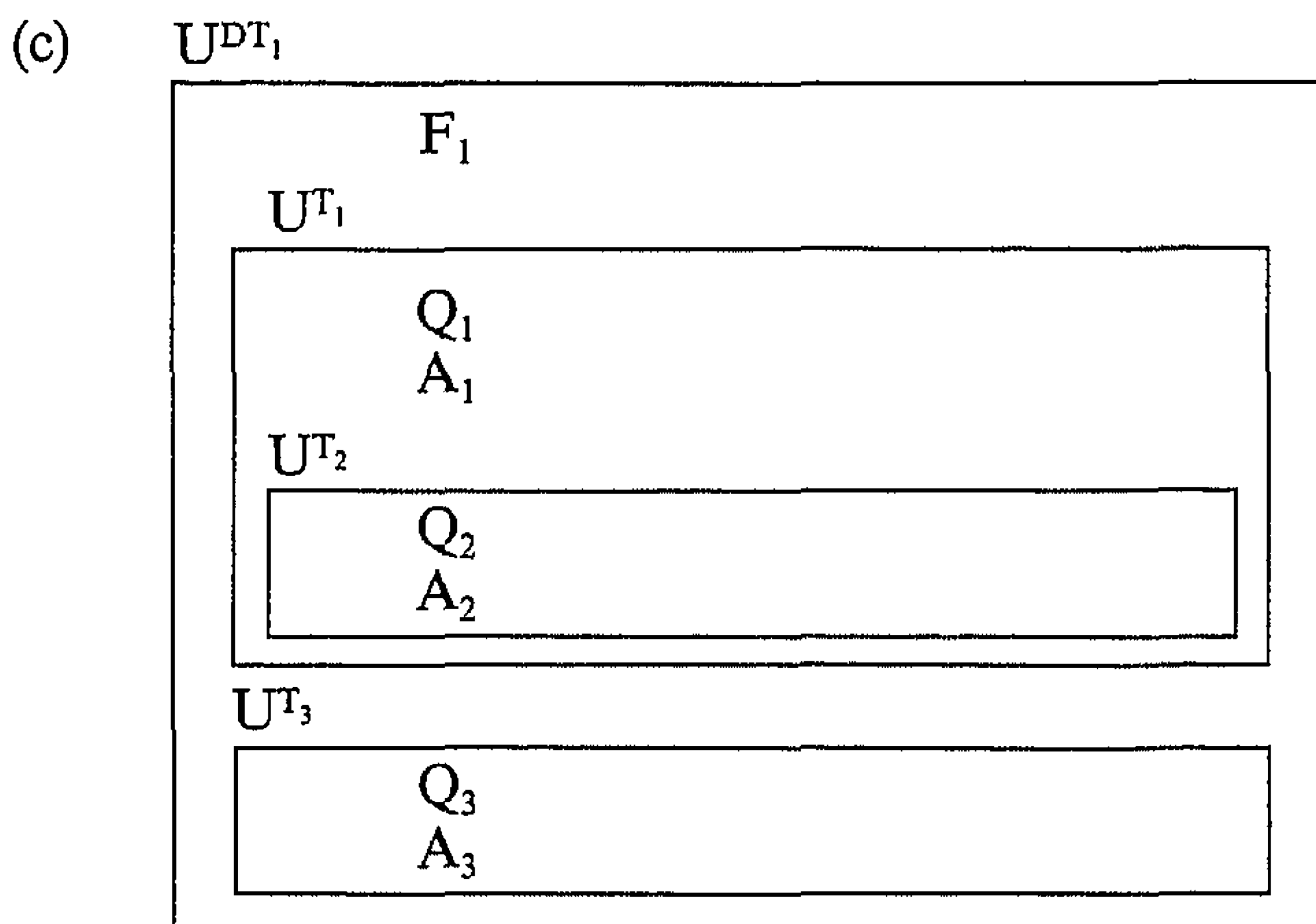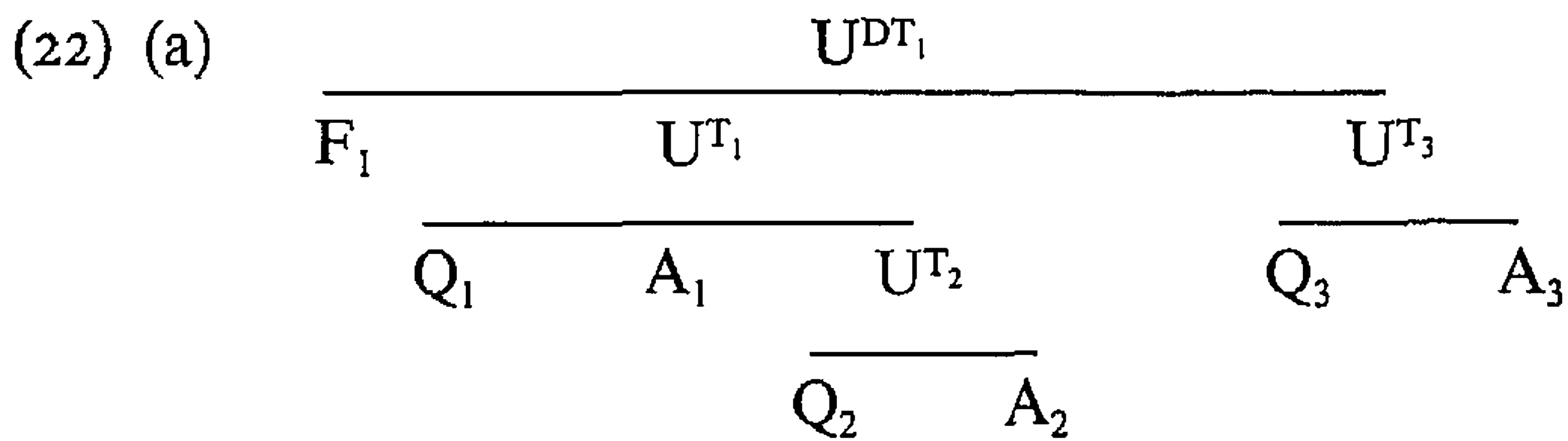
Topic hierarchy in discourse
Discourse topics > Topics > Subtopics

At the highest level a discourse is segmented in structural units for each of which a discourse topic is defined. As has been said earlier, these structural units are mutually unrelated insofar as discourse structure is concerned. Each of these structural units is itself segmented into one or more smaller, but structurally related, discourse units for which a topic or subtopic is defined. The relations between these subsegments are inclusion relations which correspond to the existing hierarchical relations between the (sub)topics defined for the subsegments.

The internal segmentation structure of discourse topic units can be demonstrated by representing the question-answer structure of discourse not, as above, in terms of the context orientation of the (sub)questions, but in terms of its segmentation according to the topic hierarchy. This results in the representation (22a) for a discourse like (21), or its flat structure variant

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[32] It is argued in Grosz (1978 and other publications) that the structure of a task-oriented dialogue reflects the structure of the task communicated in it. Our theory is not in disagreement with this view, but takes the structure of such a dialogue to be basically a question-answer structure reflecting the task structure in the main part of the dialogue.

in (22b). A visualization of the segmentation structure is presented in (22c).

(22) (a)

$$U^{DT_1}$$

$$F_1 \qquad U^{T_1} \qquad U^{T_3}$$

$$Q_1 \qquad A_1 \qquad U^{T_2} \qquad Q_3 \qquad A_3$$

$$Q_2 \qquad A_2$$

(b) $\quad _{U^{DT_1}}[F_1 \quad _{U^{T_1}}[Q_1 \quad A_1 \quad _{U^{T_2}}[Q_2 \quad A_2]] \quad _{U^{T_3}}[Q_3 \quad A_3]]$

(c) $\quad U^{DT_1}$

F_1
U^{T_1}

Q_1
A_1
U^{T_2}

Q_2
A_2

U^{T_3}

Q_3
A_3

U^{DT_1} represents the discourse unit for which discourse topic DT_1 is defined. This discourse unit coincides with the discourse as a whole. U^{T_1}, U^{T_2} and U^{T_3} represent the discourse units for which the defined topics are T_1, T_2 and T_3 respectively.
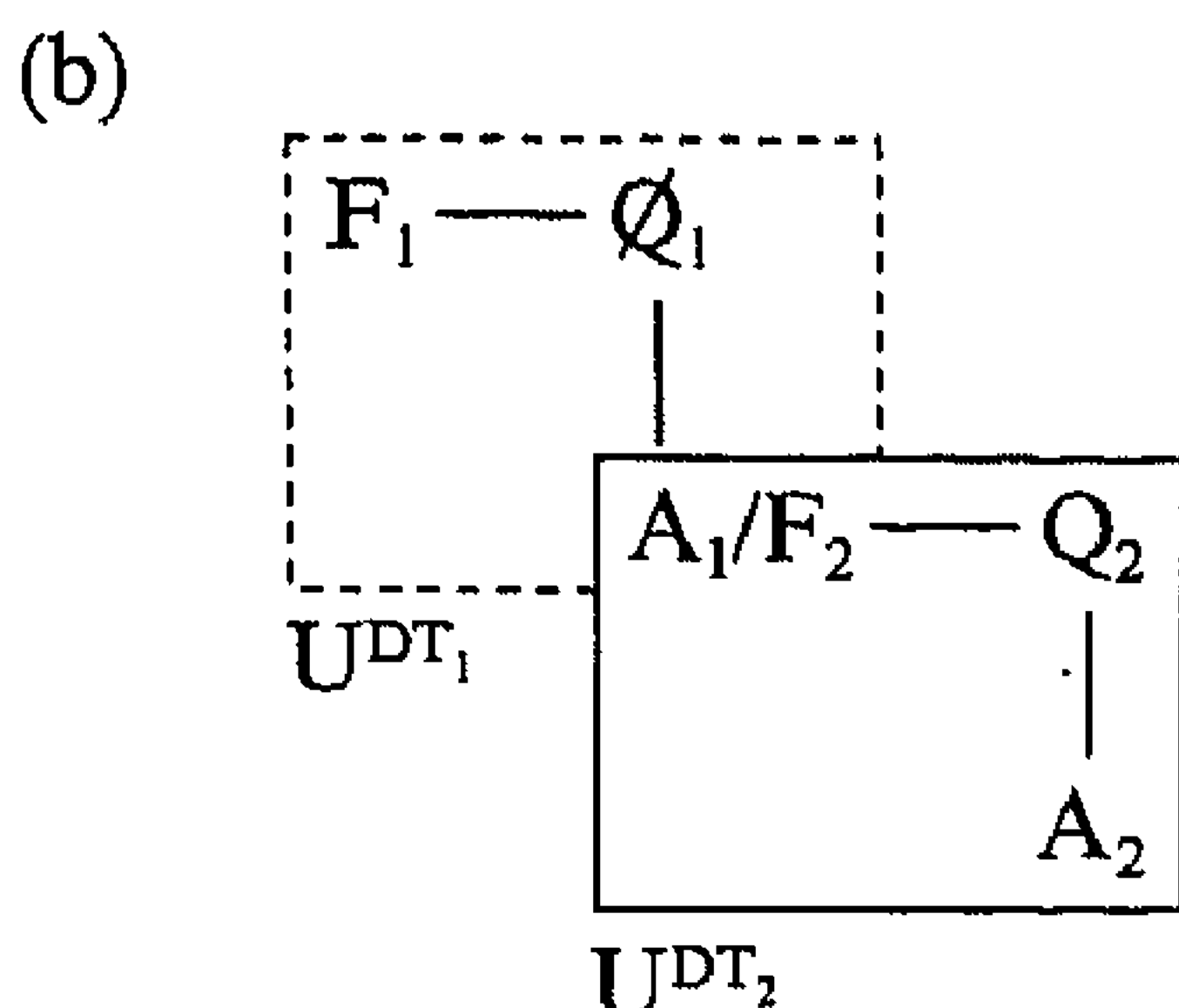
10. TOPIC SHIFTS

A final point we will consider are topic shifts. As the central hypothesis of the present framework suggests, a topic shift implies a transition from one discourse unit to another. However, the discourse units involved can be of structurally different types, depending on whether or not the new discourse unit has a new discourse topic defined for it. For that reason, at the highest level a subdivision is made between topic shifts realized under the same feeder and those realized under successive feeders. By definition, only the latter bring about a change of discourse topic.

Topic shifts under the same feeder and those realized under successive feeders are generally represented by $T_n^{F_i} \xrightarrow{S} T_{n+1}^{F_i}$ and $T_n^{F_i} \xrightarrow{S} T_{n+1}^{F_{i+1}}$ respectively. DPTT holds for both categories of topic shifts: when the question defining a topic has been answered satisfactorily, the topic stops functioning as such and loses its actuality.

A topic shift belonging to the first category is quite straightforward. It is realized when, as the result of the same feeder, a new topic-constituting question arises. Many of these topic shifts were presented in the preceding examples.

The second category of topic shifts, those realized under successive feeders, consists of three types: ASSOCIATED TOPIC SHIFTS, NON-ASSOCIATED TOPIC SHIFTS and TOPIC DESCENDING SHIFTS. In the case of an associated topic shift the new feeder is, or is directly provided by, a part of the preceding discourse, for instance a sentence which answers a question. An example is the answer given to question Q_1 in (23).

(23) (a) F_1 A: We won't see Jones in the pub this afternoon.
            Q_1 B: Why not?
           A_1/F_2 A: He has to meet his daughter at the airport again.
            Q_2 B: Where has she been this time?
            A_2 A: This time she has been to Africa to work for VSO.

(b)

Topic shift: $T_1^{F_1} \xrightarrow{S} T_2^{F_2}$

$$(T_1^{F_1} = f_{Q/A}(Q_1^{F_1}) \text{ and } T_2^{F_2} = f_{Q/A}(Q_2^{F_2}))$$

(c) $U^{DT_1}[F_1 \, {}_{U^{T_1}}[Q_1 \, A_1]] \, {}_{U^{DT_2}}[F_2 \, {}_{U^{T_2}}[Q_2 \, A_2]]$
              $\rule{2em}{0.4pt}/\rule{2em}{0.4pt}$

The answer gives rise to a new topic-constituting question Q_2 which introduces a new topic, the test being provided by ST. This topic shift is

called ASSOCIATED, because the question defining the new topic is associated with a part of the preceding discourse which, depending on the function it fulfils, has an actual topic defined for it.

The sentence which answers the topic-constituting question Q_1 takes not one, but two functions in the development of the discourse. Firstly, it functions as an answer to Q_1, in which case a topic is defined for this sentence. Thereafter, from the moment the new topic-constituting question Q_2 is asked, it functions as a feeder in a technical sense. Assuming that at that point the sentence forms a satisfactory answer to Q_1, in accordance with DPTT, the topic that is defined for it is closed off. It has thereby changed into a topicless sentence. By definition, a sentence (utterance or set of utterances) functions as a feeder in a technical sense if the topic that is defined for it is no longer prominent at the moment of questioning. This is the case if either, in accordance with DPTT, this topic lost it actuality in the discourse or, as is explicated in Van Kuppevelt (1991), it is pushed aside by a topic digression.
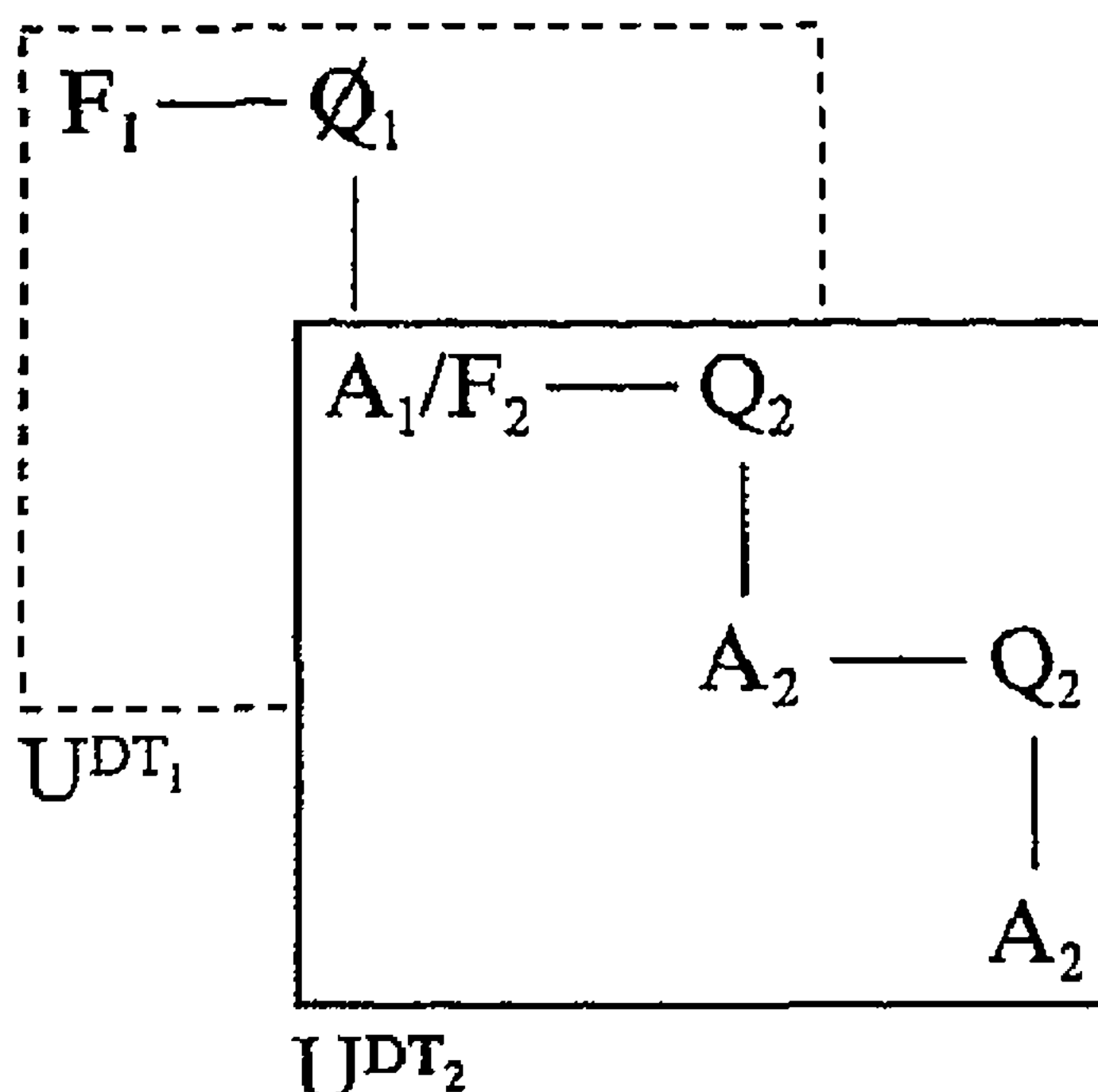
An associated topic shift has the result that the question-answer (or corresponding topic-comment) structure of the discourse is divided into two overlapping structural units that are structurally unrelated. In (23b) these structural units are indicated by the boxes (a situation is presented in which question Q_1 has been answered satisfactorily). The overlap is the result of sentence A_1/F_2 which, as we have seen, has a double function in the development of the discourse. A corresponding flat structure representation of the segmentation structure of this discourse is presented in (23c).

In contrast to an associated topic shift, a non-associated topic shift results from the introduction of a new feeder 'from outside' so to speak, as when a newsreader on radio or TV starts a new topic, switching from one crisis to another. A topic shift of this type occurred in example (10).

A topic descending shift is a special case of an associated topic shift which involves a change of status: a subtopic under an old topic becomes the new topic. This typically occurs in cases of failed transitivity in the control relation between questions, that is, when, given three successive questions Q_m, Q_n and Q_o, Q_n is a subquestion of Q_m, Q_o is a subquestion of Q_n, but Q_o is not a subquestion of Q_m. The situation is exemplified in (24).

(24) (a) F_1 A: Nigel has kicked his dog again.
         Q_1 B: Why?
         A_1/F_2 A: His wife has a terrible headache.
         Q_2 B: How come she has a headache?
         A_2 A: She has been drinking again.
         Q_3 B: Why does she get a headache when she drinks?
         A_3 A: She always drinks heavy cocktails.

(b) $Q_1 \xrightarrow{c} Q_2$ and $Q_2 \xrightarrow{c} Q_3$, but $Q_1 \xrightarrow{c}\!\!\!\!\!/\, Q_3$.

$$F_1 \text{---} \emptyset_1$$
$$|$$
$$A_1/F_2 \text{---} Q_2$$
$$|$$
$$A_2 \text{---} Q_2$$
$$|$$
$$A_2$$

U^{DT_1}

U^{DT_2}

Topic shift: $T_1^{F_1} \xrightarrow{s} T_2^{F_2}$ but not until question Q_3 has been asked.

$$(T_1^{F_1} = f_{Q/A}(Q_1^{F_1}) \text{ and } T_2^{F_2} = f_{Q/A}(Q_2^{F_2}))$$

(c) $\quad _{U^{DT_1}}[F_1 \,_{U^{T_1}}[Q_1 A_1 \,_{U^{T_2}}[Q_2 A_2]]] \,_{U^{DT_2}}[F_2 \,_{U^{T_2}}[Q_2 A_2 \,_{U^{T_2}}[Q_3 A_3]]]$

The application of ST to this dialogue implies that Q_3 is a subquestion of Q_2 but not an (indirect) subquestion of Q_1. When question Q_3 is asked, a topic shift is realized from topic T_1 which is defined by question Q_1 to topic T_2 which is associated with question Q_2. Topic T_2 formed a subtopic of topic T_1. When question Q_3 is asked, the status of this subtopic has changed in the new topic.

Like an associated topic shift, a topic descending shift results in the division of the question-answer structure of discourse into two overlapping structurally unrelated units. However, in this case the overlap is larger because both the sentence A_1/F_2 and the question-answer pair Q_2-A_2 have a double function in the development of the discourse. In (24b) the units are again indicated by boxes (as in (23b) a situation is presented in which question Q_1 has been answered satisfactorily). In (24c) the representation of the corresponding segmentation structure of this discourse is presented.

11. CONCLUSION

In this paper we have presented an alternative approach to discourse structure, one which assumes that topicality is the general organizing principle in discourse. According to this approach, the segmentation

structure of discourse corresponds with the hierarchy of topics defined for the discourse units. Fundamental to the given analysis was the relation between the notion of topic and that of explicit and implicit questioning in discourse. It has been shown that this relation implies the following: firstly, that the topic associated with a discourse unit is provided by the explicit or implicit question it answers, and secondly, that the relation between discourse units is determined by the relation between these topic-providing questions.

A procedural account has been given implying that the topic-comment structure underlying the hierarchy of structural units in discourse results from the process of the contextual induction of explicit and implicit topic-forming questions. We distinguished three basic functional parameters in this process, namely: feeders, topic-constituting questions, and subtopic-constituting subquestions. Together, they give rise to discourse units of the highest structural level for which a discourse topic is defined. However, we have demonstrated that the three different types of topics defined for the structural levels we distinguished underly a uniform topic notion comprising both that of sentence topic and discourse topic. A discourse topic has been analyzed as a (set of) higher-order sentence topic(s) the actuality of which is continued in discourse as long as subordinated topics arise as the result of subquestioning.

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