Annotation Guidelines for Questions under Discussion and Information Structure

Arndt Riester (Universität Stuttgart), Lisa Brunetti (Université Paris Diderot/CNRS), Kordula De Kuthy (Universität Tübingen)

[final revised manuscript – December 11th, 2017]

Abstract

We present a detailed manual for a pragmatic, i.e. meaning-based, method for the information-structural analysis of naturally attested data, which is built on the idea that for any assertion contained in a text (or transcript of spoken discourse) there is an implicit Question under Discussion (QUD) that determines which parts of the assertion are focused or backgrounded (and which ones are non-at-issue, i.e. not part of the assertion at all). We formulate a number of constraints, which allow the analyst/annotator to derive QUDs from the previous or upcoming discourse context, and demonstrate the method using corpus examples (of French, German, and English). Since we avoid making reference to language-specific morphosyntactic or prosodic properties, we claim that our method is also cross-linguistically applicable beyond our example languages.

Keywords: information structure, annotation, naturalistic data, discourse structure, non-at-issue

1 Introduction

1.1 Information structure

It is well known that the information conveyed by an utterance can be divided into *background* information, which is usually *given* in the context, and *focus* information, which can be interpreted as the answer to some currently relevant

question. The study of this so-called *information structure* of sentences (Halliday 1967, Rooth 1985, 1992, Vallduví 1992, Lambrecht 1994, Hajičová et al. 1998, Schwarzschild 1999, Büring 2003, 2016, Krifka 2007, Beaver and Clark 2008, Roberts 2012) in actual written and spoken corpora is receiving increased interest in linguistics, as the attention has shifted from the analysis of constructed sentences to the question of how information is packaged in sentences that occur in real contexts. Depending on the language, information structure may be expressed via morphologic, syntactic and/or prosodic means. Such linguistic means, however, are typically underspecified and often leave room for ambiguity. A well-known example is *focus projection* in English (Selkirk 1995, Gussenhoven 1999), but also syntactic means, such as fronting and clefting, or morphological means, like specific morphemes (e.g. the long standing debate, started with Kuno 1973, on Japanese *wa*), normally do not uniquely identify a single information-structural configuration within or across languages. In other words, the way information is conveyed by an utterance in isolation may often remain linguistically opaque. Yet, the information structure can be largely recovered by the listener/reader when the whole discourse in which the utterance is inserted is taken into account, namely when the utterances that precede and (to a minor extent) follow the target utterance are considered.

1.2 Discourse structure and Questions under Discussion (QUDs)

In the present paper, we want to make explicit the way the listener/reader recovers the information structure of the utterances in a text.[1] For that, we need to formulate assumptions concerning the way discourse is organized. Our main assumption is that discourse is not linear but hierarchically organized in the form of a discourse tree. This assumption goes back to theories of discourse structure (Hobbs 1985, Grosz and Sidner 1986, Polanyi 1988, Mann and Thompson 1988, Van Kuppevelt 1995, Asher and Lascarides 2003, Taboada and Mann 2006) and

---

[1] Throughout this document, when we speak of *text* we do not only refer to written text, such as narratives, newspaper articles etc., but we also include transcripts of spoken discourse or dialogue.

information structure (Roberts 2012, Büring 2003, Beaver and Clark 2008) but the implementations of the actual trees (and sometimes graphs) differ. On the one hand, theories of discourse structure usually assume that a text is built from so-called *elementary discourse units* (roughly: clauses), which themselves represent the nodes of discourse trees and which are connected via discourse (or rhetorical) relations (ELABORATION, NARRATION, EXPLANATION, et cetera). On the other hand, theories of information structure based on Questions under Discussion (QUDs), following Roberts (2012), typically postulate the existence of *QUD stacks,* which are abstract objects that contain increasingly specific questions, ordered by an entailment relation.[2] The connection between discourse structure and QUDs has also recently received attention in work by Onea (2016), Velleman and Beaver (2016), Hunter and Abrusán (2017) and Riester (to appear). These authors investigate whether QUDs can be integrated into existing discourse trees, e.g. of SDRT, (probably yes); what kind of changes have to apply to the representation formats; whether the original QUD framework of Roberts (2012) is too restrictive to handle truly naturalistic text (again, probably yes); and whether QUDs and rhetorical relations are interchangeable (probably not without information loss, in either direction).

The discourse trees we have in mind combine elements from both discourse structure theories and theories of Questions under Discussion. Our goal is to transform natural discourse into a compact tree representation, *QUD trees,* whose non-terminal elements are *questions* and whose terminal elements are the *assertions* contained in the text, in their linear order, as shown in Figure 1. This representation format is compatible with earlier approaches to discourse structure, especially SDRT (cf. Riester, to appear). It is meant to help visualize the discourse structure, but at the same time to allow the analyst to read off the text in its linear order. QUD trees also have a theoretical motivation in that they represent the topical structure of any piece of discourse, much like sections and subsections of

---

[2] Note that perhaps the earliest relevant work on the discourse-structuring properties of implicit questions is Klein and von Stutterheim (1987). In this work, what later became known as QUDs are called *Quaestiones*.
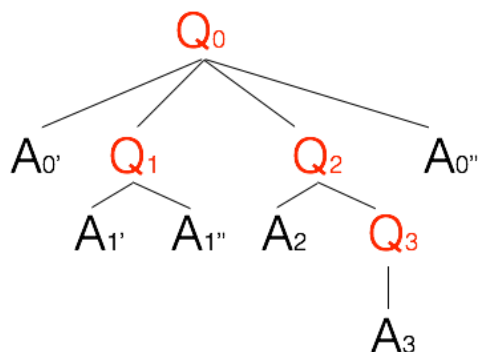
an article, but in much more detail.

Figure 1 *Discourse tree with Questions under Discussion (QUD tree).*

When faced with the task of reconstructing the information structure of the sentences of a text, the analyst must first reconstruct its QUDs, and, in the course of this, the geometry of the discourse tree. Then, by making explicit the link between discourse structure and informational categories, the information structure of each utterance will be derived. From Section 2 on, we are going to explicitly spell out the necessary steps of such an analysis.

1.3 Universality of information-structural notions

We are aware that some scholars seem to reject the existence of universal information-structural categories (see for instance Matić and Wedgwood 2013, and a few critical remarks on it in Riester 2015). The justified core of the criticism is based on the fact that often, in the literature, languages have been claimed to possess a syntactic position for focus or topic, a "focus accent" or "focus particle" while, in reality, the morphosyntactic and prosodic realization of any sentence depends on a bundle of factors, and expressive means like the ones mentioned may fulfill several functions simultaneously or occur only under favorable conditions. It is, therefore, mostly misleading to call them "focus markers". Few people, however, would deny that information structure does have a strong influence on sentence realization and that this deserves to be studied by linguists. The problem with Matić and Wedgwood (2013), in our opinion, is that, beyond their valuable criticism of bad linguistic practice, they make it sound as if there cannot even exist semantically-pragmatically defined (and therefore universal)

4

information-structural categories, i.e. that the meaning of central concepts like *focus* or *topic* differs from language to language. Such a position ultimately undermines the very study of information structure from a comparative point of view. We believe, however, that such a comparative study is possible and we also believe in the benefit of universal information-structural concepts in general. We are therefore going to provide a method to recover the information structure of a sentence, for the most part *independently from its form*, i.e., only by looking at its place, informational content and function within the discourse. If we prove this to be possible, our procedure will be a valuable instrument for scholars who study the interface between information structure and its linguistic realization by morphological, syntactic and/or prosodic means, since we avoid the often-bemoaned circularity sometimes found in information-structure research, when formal criteria like constituent order or prosody lead to pragmatic annotations which, in turn, are used for the study of syntactic or prosodic properties. Furthermore, our procedure is intended be applicable to any language.

1.4 Corpus resources and a prospect for the study of lesser-described languages

In order to make the approach clear, we will provide examples taken from different texts and in three different languages: French, German, and English. What these examples have in common is that they are extracted from corpora of naturally attested data but they belong to different text genres – semi-spontaneous speech such as interviews and radio debates as well as written texts such as newspaper articles or drafts of radio news etc. – and can be either dialogues or monologues. The choice of data has no consequences on the formulation of the guidelines, which unanimously apply to all of them. The main difference between the sources is that some discourse genres contain a number of explicit questions (on which, see discussion in Section 5.2) while others don't. The corpus resources are listed in Appendix 1. Reference to corpora will be indicated above each of the examples. We are aware of the fact that the choice to illustrate our method with examples from three well-known European languages does not do justice to proving our conviction of its universal applicability and, particularly, of its applicability to lesser-studied

languages whose information structure marking is still poorly understood. First promising annotation attempts, in collaboration with typologists studying the Austronesian languages Sumbawa (Riester and Shiohara to appear) and Tagalog (Latrouite and Riester to appear) as well as the North Cushitic language Beja have been made, but the data analyses were made after the formulation of the current guidelines and are, therefore, not included in this article. Since it is precisely our hope that the framework presented in this article will inspire researchers working on, and sometimes struggling with, information-structural analyses in fieldwork data of lesser-studied languages, we nevertheless firmly believe that the article is published in the right volume at the right time. In the proposal for the current book, the editors mention, among other issues, two obstacles to the study of information structure in lesser-described or endangered languages. One of them is the lack of explicit question-answer pairs in the limited textual resources available for some languages (cf. Schultze-Berndt and Simard 2012). With our method, we expect to overcome this problem since it is precisely our goal to enhance textual resources with (implicit) questions. The other obstacle is that the study of information structure is still considered a "luxury problem" which presupposes excellent knowledge of both the syntactic and prosodic structure of the language. While our approach certainly builds on linguistic data that must be well understood, to the extent that good glosses and translations are available, it does not require any higher-level syntactic or prosodic analysis.

2 Preliminaries for the reconstruction of QUDs (and the creation of discourse trees)

In this section and the following one, we will describe the necessary steps of the proposed procedure in terms of QUD reconstruction. We will start with the preparation of the text, i.e. the segmentation into separate assertions. Then (Section 3) we will present the principles constraining the adequate formulation of QUDs. In Section 4 we will specify how the information structure of each utterance is derived from its QUD. Section 5 is dedicated to a discussion of parallel structures

and their special properties with respect to the formulation of QUDs. Section 6 discusses the necessary criteria for the identification of non-at-issue material, and Section 7, building on insights from Sections 5 and 6, proposes an analysis for conditionals. Finally, three appendices list the corpus resources employed, provide a short summary of the analysis procedure, and present a short annotated text from an English interview. Note that some parts of the procedure presented in Sections 3-5 have already been sketched in Riester (2015), a semantic interpretation can be found in Reyle and Riester (2016), and more information about the particular format of *QUD trees* and their relation to discourse-structure theory is found in Riester (to appear).

2.1 *Understanding the text*

It is very important that the text that will be analyzed in terms of information structure is well understood by the annotator. As should be general practice in the study of language, the annotator should be familiar with the language to a substantial degree, or at least have verified the glosses and translation carefully with a native speaker or expert in the language. Another potential source of misunderstanding is the content of the text itself. Incoherence, artistic license found in literary texts, or other stylistic factors may blur the speaker/writer's goals or pattern of argumentation. To analyze the information structure of the utterances of such discourse may occasionally turn out to be difficult.

2.2 *Preparing the text*

The annotator will split the text into separate assertions. Complex sentences will be split into clauses at sentence-level conjunctions or disjunctions (marked e.g. by *and, or, but,* but also those without explicit marking), in order to isolate single assertions, as in Examples (1) and (2). Each separate assertion is marked by an *A*. This can be understood as the beginning of the actual annotation procedure, which can be carried out in a simple text editor.[3]

---

[3] We do not exclude, however, the possibility that the annotation be done using some more

(1) [German, SWR]

A: Wir haben ja   nun alle von Konflikten gehört,
   We   have   as.you.know now all   of   conflicts   heard
   'Now, we have all heard of conflicts'

A: aber es   gibt immer Konflikte
   but   there gives always conflicts
   'but there are always conflicts'

A: und das   bedeutet nicht automatisch, dass dann Tausende von
   and that means   not   automatically that then thousands of
   Flüchtlingen bis   nach Deutschland kommen.
   refugees   until to   Germany   come
   'and that doesn't mean per se that thousands of refugees will be coming to Germany.'

(2) [German, SWR]

A: Viele Menschen sehen zu   wenig Demokratie,
   many people   see   too   little democracy
   'Many people are experiencing too little democracy'

A: und deshalb   laufen sie   zum Teil falschen Propheten hinterher.
   and therefore run   they for.a part false   prophets   after
   'and, therefore, some of them are following false prophets.'

Segmentation is also applied to other types of coordination, e.g. NP- or VP-coordinations.[4] For such coordinations in particular, it may be helpful for the annotator to reconstruct the elided semantic material, as we do in Examples (3) to (5) (and subsequent examples in the text) by marking it as crossed out and gray.

---

sophisticated annotation tool.

[4] In all cases, we assume that each conjunct has an illocutionary force on its own, even if it is not syntactically independent.

This material, however, is not meant to be included in the final annotation.[5]

(3) [German, SWR]

A: Da   sollen Fenster in   Teeküchen   vorgeschrieben   werden
   there   shall windows in   staff.kitchens prescribed   be
   'They are going to prescribe having windows in staff kitchens'

A: oder auch die Helligkeit am   Heimarbeitsplatz ~~soll~~ ~~vorgeschrieben~~
   or   also the brightness at.the   home.workplace   shall   prescribed
   ~~werden~~.
   be
   'as well as the brightness of the home workplace.'

(4) [French, CFPP2000]

A: y'a   absolument rien   pour euh s'amuser
   there.is   absolutely   nothing   for   ehm have.fun
   'there is absolutely nothing to have fun with'

A: ou   euh ~~y'a~~   ~~absolument~~ ~~rien~~   pour sortir   le   soir
   or   ehm there.is   absolutely   nothing   for   go.out   the evening
   'or to go out in the evening'

A: ou   ~~y'a~~   ~~absolument~~ ~~rien~~   ~~pour~~ aller faire
   or   there.is   absolutely   nothing   for   go   make
   ses   courses   de dernière minute
   one's purchases of last   minute
   'or to go for last-minute shopping'

(5) [French, EUR]

---

[5] Given the purposes and interests of the present paper, we do not make any claim concerning the nature of such elided material, and we do not take part in the long-standing debate between structural approaches to ellipsis, which argue for a syntactic hidden representation of the elided material (cf. Fiengo and May 1994, Merchant 2001, etc.) and non-structural ones (cf. Hardt 1999, Dalrymple 2005, etc.).

A: La construction européenne c'était un moyen d'assurer la paix
the construction European it.was a means to.ensure the peace
entre les pays d'Europe de l'Ouest
between the countries of.Europe of the.West
'The construction of Europe was a means to ensure peace among the Western European countries'

A: et ~~c'était~~ en même temps ~~un~~ ~~moyen~~ d'assurer une prospérité
and ~~it.was~~ at same time ~~a~~ ~~means~~ to.ensure a prosperity
commune
common
'and at the same time a means to ensure a common prosperity'

A: et ~~c'était~~ ~~un moyen d'assurer~~ une défense vis-à-vis la menace
and ~~it.was~~ ~~a means to.ensure~~ a defense towards the threat
soviétique.
Sovietic
'and a defense against the Sovietic threat.'

In principle, all coordinations should be dealt with according to this procedure of separation and elliptic reconstruction.[6] In doing so, we account for the assumption that coordination is a means to efficiently communicate a series of parallel statements in one go (more on parallelism in Section 5), and the idea that coordinated phrases are often in contrast with each other and that, therefore, each of them contains an instantiation of the same focus variable, cf. Lang and Umbach (2002), Jasinskaja and Zeevat (2009), and others.

At this stage of the annotation, subordinate clauses (complement or adjunct clauses) will not be separated from their verbal heads, as shown in (6) (complement

---

[6] There are two relatively rare exceptions, which should not lead to the splitting of a coordination. The first one is represented by idiomatic expressions (e.g. *nuts and bolts*). The second one is more involved: a coordination that is not focal but part of the information-structural background, e.g. when an expression like *the couple* is later on referred to as *the woman and the man*. Since this case anticipates a lot of what we first need to discuss in detail, it will be ignored here.

clause and relative clause), (7) (concessive clause), and the third assertion of (1) (complement clause).

(6) [German, SWR]
A: Ich glaube, viele Menschen sind mit vielem, was in Europa
   I   believe   many   people   are   with   a.lot   that   in   Europe
   läuft, unzufrieden.
   goes.on   unhappy
   'I believe that many people are unhappy with a lot of things that are happening in Europe.'

(7) [French, *www.monde-diplomatique.fr*]
A: Bien que les règles statutaires définissent des langues
   even   though   the   rules   statutory   define   INDEF   languages
   officielles, (...) un monolinguisme de fait s'impose peu à peu.
   official   a   monolingualism   of   fact   itself.establish   little   to   little
   'Although statutory rules set out the official languages, monolingualism is in fact establishing itself little by little.'

This last point will be revised at a later stage of the annotation procedure, namely in Section 6, where we will discuss the notion of *non-at-issue material*. As a matter of fact, whether a subordinate clause is separated from the root clause or not depends on whether its content is *at issue* or not, and as we will see, many instances of non-at-issue content are expressed by subordinate clauses (and adjunct ones in particular, such as temporal, conditional, concessive, causal or non-restrictive relative clauses).

3 Formulating Questions under Discussion

The annotator is now ready to formulate a QUD for each utterance of the text. In the following, we will provide a number of explicit principles that are meant to

constrain the formulation of QUDs and to make the analysis transparent and reproducible by other analysts.

Primarily and most importantly, the QUD must be such that an assertion below the question is *congruent* with it (i.e. the assertion must indeed answer the question).

Q-A-Congruence:
QUDs must be answerable by the assertion(s) that they immediately dominate.

The principle of Q-A-CONGRUENCE allows that the QUD can, at the outset, target any constituent of the assertion. For instance, a sentence like assertion *A* in (8), when uttered in isolation, could be the answer to any of the questions *Q* shown in (8), and perhaps to others.

(8) [English, SNO]
 Q: *What happened?*
 Q: *What about you?*
 Q: *Who were you working for until last summer?*
 A: You were working until last summer for the NSA.

The typical situation we are faced with, however, is that assertions are not made in isolation but occur against a context. In this situation, the formulation of QUDs is subject to further constraints. The most important of these constraints is that QUDs should make reference to the immediately preceding discourse, i.e. a QUD should contain as much given material as possible (in particular, the given material that occurs in A). This principle, which we call MAXIMIZE-Q-ANAPHORICITY, is a variant of earlier linguistic principles discussed by, among others, Heim (1991), Williams (1997), Schwarzschild (1999), and Büring (2008), which require that discourse should be made maximally coherent by the use of presuppositions and the establishment of anaphoric connections.

> **Maximize-Q-Anaphoricity:**
> Implicit QUDs should contain as much given material as possible.

Consider the utterance in (8) within its context, as shown in (9). *Snowden* is already mentioned in the preceding utterance, therefore a question like *What happened?*, which does not include any given material, will be ruled out by MAXIMIZE-Q-ANAPHORICITY.

(9) [English, SNO]

A: Edward Snowden is, in the meantime, a household name for the whistleblower in the age of the internet.

Q: ~~*What happened?*~~

Q: *What about you?*

Q: *Who were you working for until last summer?*

A: You *[=Snowden]* were working until last summer for the NSA.

Another example that illustrates the choice of QUD according to the principles defined above is (1), repeated below (without glosses) as (10). After utterance A_3, several questions might be formulated, for instance, a very general question like *What is the way things are?* (Roberts 2012: 5)*,* to which A_4 would be an answer. However, MAXIMIZE-Q-ANAPHORICITY instructs us to integrate the available given material of A_4 (*conflicts*), and Q_4 will be *What about conflicts?*, as shown below.

In this article we will adopt the convention to indicate implicit QUDs in curly brackets. Furthermore, each assertion is assigned an index that matches the index of its respective question. By means of indentations (> symbols) we symbolize the tree structure. Generally, in order to keep trees compact, a question that makes use of material given in the immediately preceding assertion A will attach as a sister node of (i.e. at the same level as) A, cf. Riester (to appear). The abstract representation of the tree of (10) is provided in Figure 2.

(10) [German, SWR]

A₃: Wir haben ja nun alle von Konflikten gehört,

'Now, we have all heard of conflicts'

Q₄: {What about conflicts?}

> A₄: aber es gibt immer Konflikte

'but there are always conflicts'

> Q₅: {What follows from the fact that there are always conflicts?}

> > A₅: und das bedeutet nicht automatisch, dass dann Tausende von Flüchtlingen bis nach Deutschland kommen.

'and that doesn't mean per se, that thousands of refugees will be coming to Germany.'
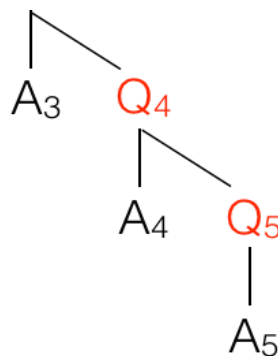

Figure 2. QUD tree for the discourse in (10)

If there is no given content to formulate a QUD, this means that the respective section of text is not very coherent, i.e. that the writer or speaker is randomly switching to a completely different topic. If it happens that no connection to the previous discourse can be established, then the only possible question is a very general one; one that only contains completely general concepts, like *to happen* (i.e. a question like *What happened?*, *What is going on?,* or *What is the way things are?*). This also essentially means the return to the root node of the tree.

While the MAXIMIZE-Q-ANAPHORICITY principle instructs us to integrate in the current QUD all material from the previous discourse which also appears in the answer, we still need a principle that regulates what *cannot* be included in the question: viz. completely new material.

> **Q-Givenness:**
>
> Implicit QUDs can only consist of given (or, at least, highly salient) material.

The principle of Q-GIVENNESS is derived from the GIVENNESS principle by Schwarzschild (1999).[7] The constraint also indicates that implicit QUDs differ from explicit ones. Only explicit QUDs can, under certain conditions, introduce new material into the discourse,[8] while implicit QUDs cannot.

Consider again example (9). The questions *What about you?* and *Who were you working for until last summer?* both satisfy MAXIMIZE-Q-ANAPHORICITY, but only *What about you?* does not introduce new material in the context of the previous discourse.

Again on this point, consider example (11). In principle (and partly using heavy intonation), we could imagine questions targeting any constituent of utterance A_8. Possible questions are: *What about this alliance of intelligence operations?*, *Who is known as the Five Eyes?*, *What about the Five Eyes?*, etc. However, only *What about this alliance of intelligence operations?*[9] contains only given material, and, therefore, satisfies all constraints defined above.

---

[7] Consider example (i). Schwarzschild (1999:155) requires non-given information (in A_1, the phrase *was littered with plastic bags)* to be focused (F-marked).

    i. A_0: Paul went to the beach.

            Q_1: {What about the beach?}

        > A_1: The beach [was littered with plastic bags]$_F$.

Since the focused material in an assertion is replaced by a wh-phrase (in Q_1: *what about*) in its corresponding QUD, we conclude that the implicit question cannot contain discourse-new (non-salient) information.

[8] See Ginzburg (2012) for in-depth analysis of explicit questions in spoken conversation.

[9] Since *this alliance of intelligence operations* and *a multilateral agreement for co-operation among the services* refer to the same entity, this question is interchangeable with *What about this multilateral agreement for co-operation among the services?*

(11) [English, SNO]

A$_7$: There is a multilateral agreement for co-operation among the services

Q$_8$: {What about this multilateral agreement for co-operation among the services?}

> A$_8$: and this alliance of intelligence operations is known as the Five Eyes.

According to the principle of Q-GIVENNESS, a QUD can also consist of "highly salient" material. The *salience* of a word simply means its active presence in the addressee's mind right before its actual occurrence in the text. Note that it is difficult to provide a general account of what may count as salient. Certainly, all function words and very general concepts like*, status, name, event,* or *property*, may always be used in the formulation of a QUD, but it is not excluded that certain specific information may become active in a situation without having been explicitly mentioned. As an illustration, consider utterance *A$_7$* in example (12).

(12)   [German, SWR]

A$_6$: Mein Opa   hat eine Staublunge gehabt.
  my   grandpa has a   black.lung   had
  'My grandpa suffered from silicosis.'

Q$_7$:   {What did grandpa do (after the war)?}

> A$_7$: Der   war im   Schieferbergwerk nach dem Krieg.
  that.one was in.the slate.mine   after the   war
  'He was working in a slate mine after the war.'

Assertion *A$_7$* in (12) contains the phrase *after the war,* which might arguably be classified as salient (rather than truly new) information after the mention of the speaker's grandfather (and presuming the addressee's awareness of the impact and omnipresence of World War II – "the war" – in German history of the 20th century), although the phrase itself was not mentioned before. To get a sense of the difference between potentially salient and clearly non-salient information, it suffices to replace the expression *after the war* by a more informative phrase, like *from 1949 to 1963.* However, as we said, it is difficult to establish a general rule for

this, which is why analyses can occasionally become ambiguous when matters of salience are involved. In this connection, the problem is not so much to *detect* salient information but, rather, not to assign the label too generously. Annotators should always ask themselves whether it is acceptable to include the allegedly salient (but strictly-speaking, discourse-new) information into the QUD without thereby distorting the discourse.

Two true exceptions to Q-GIVENNESS exist in the form of parallelisms and the beginnings of discourses. The former will be discussed in detail in Section 5 below. As for the latter, according to the theory formulated in Roberts (2012), the initial question of a text should always be the so-called "Big Question" *What is the way things are?* (alternatively: *What is going on?* or *What happened?*). However, language-specific syntactic or prosodic information may force a discourse-initial sentence to be analyzed with a narrow, rather than wide, question. For instance, example (13) is the beginning of a radio news bulletin, which picks up on a debate about wage dumping – a hot topic at the time of the broadcast. In German, the adjunct phrase *notfalls per Gesetz* 'if necessary by law' would occur, by default, before the argument phrase *gegen sittenwidrige Minilöhne* 'against unethical dumping wages'. The fact that, in (13), the order is reversed is an indicator that everything besides the adjunct is backgrounded. Hence, besides the Big Question Q_0, the analysis contains the narrow question $Q_{0.1}$ asking for the information provided by the adjunct. (As will be explained in Section 5.2, a numbering of this kind indicates *entailment* between a super- and a sub-question.)

(13) [German, DIRNDL]
Q_0: {What is going on?}
> $Q_{0.1}$: {How is the CDU planning to crack down on unethical dumping
        wages?}
> > $A_{0.1}$: In der CDU wächst die Bereitschaft, gegen   sittenwidrige
        in the CDU grows   the willingness against unethical
        Minilöhne   **notfalls   per Gesetz** vorzugehen.
        dumping.wages if.necessary   by   law   to.crack.down

'In the Christian Democratic Party, there is a growing willingness to crack down on unethical dumping wages, **if necessary by law**.'

Since such an explanation is language-specific and based on syntactic information, it is not considered to be part of our QUD framework, which would simply predict the wide question Q_0 in this case. Note that our approach is conservative and will in some cases assume a question that is too wide; never one that is too narrow. However, the annotator is encouraged to narrow down the question as soon as language-specific rules have been established with a reasonable degree of certainty. Relatedly, a discourse-initial assertion may contain a so-called *presupposition trigger* (cf. van der Sandt 1992, Geurts and Beaver 2011), e.g. a cleft, which lets the hearer accommodate a more specific question. We may for instance find a case like this at the beginning of a novel, where the presupposition usually gives rise to a stylistic effect, as in (14), first sentence of the novel *Vivement dimanche!* (French translation of Charles Williams' novel *The long Saturday night*).[10]

(14) [French, *Vivement dimanche!*][11]

Q_0: {What happened?}

$> Q_{0.1}$: {When did everything begin?}

$> > A_{0.1}$: C'est le 5 janvier que tout a commencé.

              it.is the 5 January that all has begun

              'It's on January 5th that everything began.'

Since our account of QUDs and information structure relies on context, it is not surprising that it has its limits precisely when no overt context is available, i.e. at the beginning of a discourse. As a consequence, especially when studying the information structure of lesser-studied languages, it is advisable not to draw premature conclusions from the beginnings of texts, which, in the absence of language-specific clues, will always be analyzed as all-new.

---

[10] On this *in medias res* effect, see also Firbas (1992:40).

[11] *Vivement dimanche!* by Charles Williams, Gallimard, 1963 (page 7).

4 Adding information-structural markup

Before presenting a second way to define QUDs in a text (and, in particular, the role of parallelism, see Section 5), we show in this section how the information structure of the assertions of a text can be straightforwardly annotated on the basis of the QUDs obtained by following the instructions detailed above. In line with different approaches to information structure theory, such as Vallduví (1992), Lambrecht (1994), as well as more contemporary work following the paradigm of *Alternative Semantics* (Rooth 1985, 1992, 1996), such as Krifka (2007), Beaver and Clark (2008), and especially Büring (2008, 2016), we assume that assertions contain an obligatory *focus* and an optional *background*. The combination of the focus and the (potentially empty) background is called a *focus domain* (marked by the ~ symbol originally defined in Rooth 1992). The availability of QUDs allows us to identify the focus (F) as that part of an assertion that answers its respective QUD, while the background (not labeled) corresponds to the lexical material already present in the QUD, which as we said, following Q-GIVENNESS, only consists of given material.[12]

A further category marked in the annotation is an *aboutness topic* (T). Along the lines of work such as Reinhart (1981), Portner and Yabushita (1994), Jacobs (2001), Krifka (2007) (see also McNally 1998 for a review of the literature on this notion), *topic* is intended here as a distinguished discourse referent identifying what the sentence is about. We will therefore simply label as T a referential expression (term) inside the background.[13] While all aboutness topics are necessarily backgrounded, not all material in the background clearly qualifies as a topic. Furthermore, one might argue that not all referential expressions inside the background are actually aboutness topics, but our procedure is not meant to single

---

[12] Or the repeated material of parallel sentences, see Section 5.

[13] We are aware of the fact that certain non-referential expressions may occupy typical topic positions in several languages (cf. Endriss 2006). Nevertheless, in this work, we assume referentiality to be a necessary property of aboutness topics (cf. also Jacobs 2001).

out the best topic candidate. At this point we do not intend to provide any rules to distinguish between better and worse topic candidates,[14] although our approach considerably facilitates such a selection since it excludes all focal expressions.

With these specifications at hand, we are able to perform an information-structural analysis of our data. For instance, the answers in (11) and (10) are analyzed as (15) and (16) respectively.

(15) [English, SNO]

A_7: There is a multilateral agreement for co-operation among the services

Q_8: {What about this multilateral agreement for co-operation among the services?}

> A_8: and [[this alliance of intelligence operations]$_T$ [is known as the Five Eyes]$_F$]~.

(16) [German, SWR]

A_3: Wir haben ja nun alle von Konflikten gehört,
'Now, we have all heard of conflicts'

Q_4: {What about conflicts?}

> A_4: aber [[es gibt immer]$_F$ [Konflikte]$_T$]~
'but [[there are always]$_F$ [conflicts]$_T$]~'

> Q_5: {What about the fact that there are always conflicts?}

> > A_5: und [[das]$_T$ [bedeutet nicht automatisch, dass dann Tausende von Flüchtlingen bis nach Deutschland kommen]$_F$]~.
'and [[that]$_T$ [doesn't mean per se, that thousands of refugees will be coming to Germany]$_F$]~.'

These examples show how the complete annotation – including both QUD structure and information structure – will look like in a text editor. The

---

[14] In order to pursue such an analysis, semantic and thematic role properties of the different topic candidates should be analyzed, see Brunetti (2009, and references quoted therein) for more details on this point.

information structure labels can then be transferred to some layered annotation tool such as Elan (Wittenburt et al 2006), Praat (Boersma and Weenink 2017), or other. As for the QUD structure, it does not seem impossible – though perhaps not ideal – to add it as a further additional layer. A technical solution more specific and appropriate to this kind of annotation is yet to be found. In the rest of the paper, all examples with a QUD structure will also display the corresponding information-structural markup.

5 QUDs and information structure in parallel structures

5.1 Parallel structures with a single variable

We said in Section 2 that an (implicit) QUD can only consist of given (or, at least, highly salient) material. However, a violation of this principle is acceptable at the beginning of a discourse, as we have seen at the end of Section 3. Another possibility is described in the current section. When it seems difficult to link an assertion directly to the previous discourse, this can be the signal that the assertion occurs within a parallel structure, i.e. a QUD is answered by a series of structurally analogous assertions. In these cases, the QUD is defined by the parallelism.[15] For example, in (17) the phrase *you can wire tap* is not present in the discourse preceding $A_{15.1'}$, and Q-GIVENNESS would only allow for Question Q_{15}. But the inclusion of this bit of information in $Q_{15.1}$ is motivated by the parallelism between $A_{15.1'}$ and $A_{15.1''}$. Structurally, the example corresponds to the tree in Figure 3.

(17) [English, SNO]
A_{14}: and then you realize the power you have.
Q_{15}: {What power do you *[i.e. the employees of the NSA]* have?}

---

[15] Note that what we call *parallelism* here is not confined to the discourse relation PARALLEL (cf. Asher and Lascarides 2003), but presumably also comprises all other *coordinating* discourse relations, including CONTRAST, NARRATION etc.

> Q$_{15.1}$: {Whom can you wire tap?}

>> A$_{15.1'}$: [[You]$_T$ can wire tap [the President of the United States]$_F$]~,

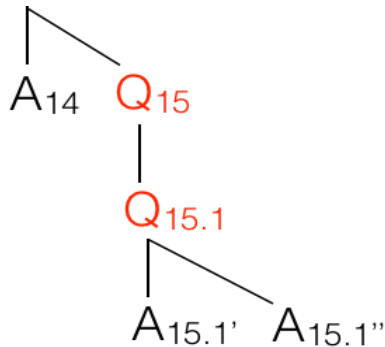>> A$_{15.1''}$: [[you]$_T$ can wire tap [a Federal Judge]$_F$]~

Figure 3. Question under Discussion with two partial answers

The parallelism can consist of two or more utterances. In the simplest case, two utterances are identified as parallel because they contain semantic-pragmatically identical (synonymous or coreferent) material and one syntactic position in which they differ (the focus variable). The identical material, in turn, helps us formulate their common QUD: the constant material must re-occur inside the QUD, while the alternating parts of the assertions correspond to the wh-word in the QUD. Parallel answers to the same question Q_i are labeled as $A_{i'}$, $A_{i''}$, $A_{i'''}$ etc., see example (17) and following ones. Note, furthermore, that we shall assume that discourse connectors at the beginning of an utterance, such as *and, or, but, although* etc., stand outside the focus domain. While they are essentially the signposts of discourse structure, they do not themselves take part in the information structure of a sentence. The same rule applies to discourse particles (like *even* or *also*), as far as possible, as shown in example (3), repeated below as (18) in its annotated form.[16]

---

[16] Note that from now on we will only indicate structurally necessary questions and leave out more general givenness-based questions (i.e. Q$_{15}$ in 17) on top of a narrow question that is licensed by a parallelism.

(18) [German, SWR]

A$_0$: Ein anderes Projekt, bei dem, die Arbeitgeber Sie mit dem
a   other   project   at   which the employers   you with   the

Bürokratievorwurf   überziehen, ist die Arbeitsstättenverordnung.
bureaucracy.accusation coat   is the workplace.regulation.bill

'Another   project   for   which   employers   are   accusing   you   of
bureaucratization is the workplace regulation bill.'

Q$_1$: {What will be prescribed?}

> A$_1$': [[Da]$_T$ sollen [Fenster in Teeküchen]$_F$ vorgeschrieben werden]~
there   shall   windows in staff.kitchens   prescribed   be

'There (in the bill) they are going to prescribe having windows in staff
kitchens'

>A$_1$'': oder auch [[die Helligkeit am   Heimarbeitsplatz]$_F$ ~~soll~~
or   also the   brightness   at.the home.workplace   ~~shall~~

~~vorgeschrieben werden~~]~.
~~prescribed   be~~

'as well as the brightness of home workplaces.'

The annotator will make sure that all the parallelisms provided by a text are
identified, thus acknowledging the text-internal coherence. We can say that finding
a common question to two or more assertions means to identify "the lowest
common denominator" of all the answers, i.e. a semantically constant element that
is contained in all answers, while the alternating parts are replaced by a
wh-phrase.[17] A slightly more complex example is given in (19).

---

[17] It may in fact occur that within a list of sentences sharing some semantic content, the first one is
not an appropriate alternative to the others. This happens, for instance, when the first sentence is a
presentational construction introducing a new referent, cf. *a wizard* in Lambrecht's (1994:177)
(slightly adjusted) example below. In this example, the first sentence will not be part of the
parallelism and will be preceded by a different (less specific) QUD (cf. *Q$_0$*).

ii. Q$_0$:   {What happened in the story?}

(19) [French, *www.monde-diplomatique.fr*]

Q$_{12}$: {In what other way is export beneficial?}

> A$_{12'}$: [[l'export]$_T$ [permet   également à   l'Etat   de   réduire
the.export   allows   also   to   the.state   to   reduce

quelque peu ses   engagements consentis
some   little   its   commitments   granted

au   titre du   soutien à   des   industries
in.the   name of.the support   to   INDEF   industries

nationales   d'importance stratégique]$_F$]~
national   of.importance strategic

'(arms) export also allows the state to slightly reduce its
commitments in supporting national industries of strategic
importance'

> A$_{12''}$: et [~~l'export~~ [contribue donc   à alléger ses dépenses budgétaires
and the.export contributes therefore to reduce its   expenses budgetary

en   matière de défense]$_F$]~.
in   matter   of defense

'and it therefore contributes to reducing the government's defense
spending.'

Consider finally example (20).

(20) [German, SWR]

A$_{38}$: von 2600 Euro, wenn man da   rechnet...
of   2600 Euros if   you   there calculate

'with € 2600, if you start calculating...'

> A$_0$: [[Once there was a wizard.]$_F$]~

> Q$_1$: {What about this wizard?}

> > A$_{1'}$:   [[He]$_T$ was [very wise,]$_F$]~

> > A$_{1''}$:   and [was [married to a beautiful witch]$_F$]~.

24

Q$_{39}$: {What does one need to reckon?}

> A$_{39'}$: [[Man]$_T$ [hat eine Wohnung]$_{F,}$]~
>
>   *one   has   an   apartment*
>
>   'You've got an apartment,'

> A$_{39''}$: [[man]$_T$ [will   was   essen]$_{F,}$]~
>
>   *one   wants something eat*
>
>   'you want to eat something,'

> A$_{39''}$: [[man]$_T$ [braucht Klamotten]$_{F,}$]~
>
>   *one   needs   clothes*
>
>   'you need clothes,'

> A$_{39}^{iv}$: [[man]$_T$ [hat Steuern]$_{F,}$]~
>
>   *one   has   taxes*
>
>   'you've got to pay taxes,'

In (20), not just two but four clauses are parallel, to the extent that they have the same subject, the generic pronoun *man* 'one'.

5.2   Parallel structures with two variables: contrastive topic + focus

There is a more complex case of parallelism we need to discuss. Such a parallelism (also referred to as a discourse-structural CONTRAST relation, cf. Asher and Lascarides 2003, Umbach 2004) involves two (or more) assertions, which are contrasted against each other at two different positions. An example is given in (21).

(21) [English, SNO]

A$_0$: In many countries, as in America, too, the agencies like the NSA are not allowed to spy within their own borders on their own people.

Q$_1$: {Who can spy on whom?}

> Q$_{1.1}$: {Who can the Brits spy on?}

>> A$_{1.1}$: So [[the Brits]$_{CT}$, for example, [they]$_T$ can spy on [everybody but the Brits]$_F$]~

> $Q_{1.2}$: {Who can the NSA spy on?}

> > $A_{1.2}$: but [[the NSA]$_{CT}$ can conduct surveillance [in England.]$_F$]~

A question – whom agencies can spy on in (21) – is sometimes not answered directly but broken down into partial answers about smaller parts or elements of the original term. Following the influential work of Büring (2003), these parts are called *contrastive topics* (and they are indexed in the annotation as CT). Note that the term *topic* used here in combination with *contrastive* does not express the same notion as that of (*aboutness*) *topic* (T) discussed in Section 4. In line with Büring's (2003) account, a CT represents the instantiation of a variable within the background, and therefore can, but need not, be referential. Only when a CT is a referential expression will it resemble a T. The structure resulting from the annotation in (21) is shown in Figure 4. Note that the *contrastive topics* are *backgrounded* with respect to the subquestions $Q_{1.1}$ and $Q_{1.2}$ but behave like *foci* with respect to the higher question Q_1.
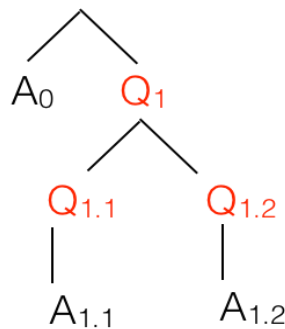

Figure 4. QUD with two entailed subquestions and answers

The reason why we use sub-numbers in such constellations is that the super-question Q_1 and the sub-questions $Q_{1.1}, Q_{1.2}$ stand in an *entailment relation*. This means that any answer to the sub-questions is, at the same time, a (partial) answer to the super-question, cf. Roberts (2012). Throughout the analysis task, whenever a question is identified as being entailed by its parent question, the entailment can be made visible using the convention of sub-numbering, even in the absence of CTs, see, for instance, Examples (13), (14), (17), or (23). Another example of complex parallelism is given in (22).

(22) [French, CFPP2000]

Q_{15}: spk1: et   ils   travaillaient dans quelle profession?
              and   they   worked   in   what   profession
              'and what was their *[=the addressee's parents']* profession?'

> $Q_{15.1}$: {What was your mother's profession?}

>> $A_{15.1}$: spk2: [[Maman]$_{CT}$ [elle]$_T$ (…) était [soudeuse (…) des agrafes]$_F$]~
              mum   she   was   welder   of   staples
              'My mum was a staple welder'

> $Q_{15.2}$: spk1: Et   votre père?
              and   your father
              'And your father?'

>> $A_{15.2}$: spk2: [Mon [père]$_{CT}$ [il]$_T$ était [monteur en bronze]$_F$]~
              my   father   he   was   fitter   in bronze
              'My father was a bronze fitter'

It is interesting to note that in this example, explicit and implicit QUDs alternate in the text: Q_{15} is explicit, the first sub-question $Q_{15.1}$ is implicit, and the second sub-question $Q_{15.2}$ is again explicit. An explicit question coincides with the QUD when, trivially, the answer given in the text actually answers it, as it is the case with $Q_{15.2}$ in (22). Sometimes, however, the interlocutor may decide not to answer an explicit question but to say something else – that is, to answer a different (implicit) question. In that case, an implicit QUD is inserted. In (22), the question about the interlocutor's parents is not answered immediately: the interlocutor rather answers a question about his mother, and then, after an explicit sub-question about his father, he completes his answer to the question about his parents.[18]

---

[18] An explicit question may sometimes not receive an answer at all. This is common in dialogues and conversations, where the goals and intentions of the participants may be different and sometimes contradictory (consider, for instance, an interview of a journalist with a politician who wants to avoid giving a compromising answer). In this case, an implicit QUD must be reconstructed while the explicit question is a terminal node in the tree.

A QUD structure similar to the one shown above is constructed when a referent is semantically related to an antecedent in the previous discourse by some kind of *bridging* relation (Clark 1977, Asher and Lascarides 1998, Riester & Baumann 2017). The only difference with respect to the double contrastive-topic construction is that there aren't several parallel subquestions but just one. The analogous analysis is motivated by the fact that also in this case, the background contains information that is new with respect to a superordinate question, but given with respect to a sub-question whose answer partially answers the superordinate question. Consider the French example in (23) about arms sale by France. *Le ministre de la défense* 'the defense minister' in $A_{9.1.1}$ is linked by a bridging relation (specifically, a *necessary parts* relation, see Clark 1977), to *le gouvernement actuel* 'the present government' in the preceding assertion *(A_9)*: the government's action is conducted through the action by the defense minister. In order to account for the link between *le gouvernement actuel* 'the present government' and *le ministre de la defense* 'the defense minister', the questions preceding $A_{9.1.1}$ are taken to be subquestions of Q_9. Note that *le ministre de la défense* is marked as a contrastive topic although it does not actually *contrast* overtly with some other minister. The resulting tree is given in Figure 5.

(23)　[French, *www.monde-diplomatique.fr*]

Q$_9$:　　{What about the present government?}

> A$_9$:　[[Le gouvernement actuel]$_T$ [s'est fortement impliqué dans la
　　　　The government current itself.is strongly commited in the
　　　　conquête de marchés]$_F$.]~
　　　　conquest of markets
　　　　'The present government has committed itself strongly to conquering markets.'

> Q$_{9.1}$:　{What have different people in the government done to achieve this?}

>> Q$_{9.1.1}$:　{What has the defense minister done?}

>>> A$_{9.1.1}$: [[Le ministre de la défense]$_{CT}$, [a payé de sa personne,]$_F$]~
　　　　The minister of the defense has paid of his person
　　　　'The Secretary of Defense put in a lot of personal effort,'

$>>>$ Q$_{9.1.1.1}$: {By multiplying WHAT did the minister put in a lot of effort?}

$>>>>$ A$_{9.1.1.1'}$: [multipliant [les déplacements]$_F$]~

    multiplying   the   displacements

    'by multiplying trips'

$>>>>$ A$_{9.1.1.1''}$: et [[conciliabules]$_F$.]~
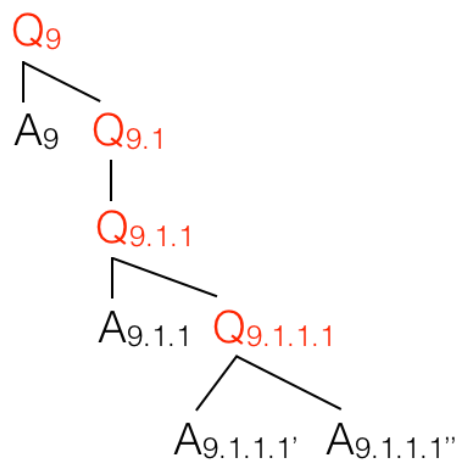
    and consultations

    'and meetings.'

Figure 5. A QUD followed by a subquestion that is followed by two parallel answers.

By adding subquestions *Q$_{9.1}$* and *Q$_{9.1.1}$*, we account for the fact that *A$_{9.1.1}$* does not directly respond to the same question *A$_9$* responds to. We also account for the fact that these two assertions are clearly not alternatives to each other, so they do not form a parallelism. Moreover, if we treated them as answers to independent questions we would miss the fact that both sentences talk about what is going on in the government (i.e. *Q$_9$*).

5.3   Embedded focus

Recall that it is part of the text preparation discussed in Section 2 that we split coordinated structures, which may make it necessary to reconstruct elided material. In this section, we talk about a special case of coordination which occurs in subordinate clauses. In this case, the reconstructed material will involve (at

least) the entire matrix clause. Note that, as in the previous sections, we are again dealing with a kind of parallelism, which allows us to account for the ellipses and to reconstruct the QUD. An example which illustrates this is given in (24).

(24)   [German, Stuttgart21]

A$_{18}$: Das Ziel des   Aktionsbündnisses, wie es immer erzählt wird, wie es
the goal of.the coalition.for.action   as it always told   is   as it

vermittelt   wird, ist einen integralen   Taktfahrplan in Stuttgart
communicated is   is an   integral   time.table   in Stuttgart

durchzuführen.
to.execute

'The goal of the cooperation, how it is always told, is to have an integral railway schedule in Stuttgart.'

> Q$_{19}$:   {What does that mean for trains to follow an integral railway schedule?}

>> A$_{19'}$: [[Das]$_T$ heißt, dass [alle Züge]$_T$ [zu einem bestimmten
this   means that all   trains   at a   certain

Zeitpunkt...[19] bis zu einem bestimmten Zeitpunkt eintreffen,]$_F$~
point.of.time   until to a   certain   point.of.time arrive

'This means that all trains will arrive at a certain point of time,'

>> A$_{19''}$: [Das heißt, dass dann [zwischen]$_F$ [allen Zügen]$_T$ [ein
this means that then between   all trains   a

Umsteigen möglich ist,]$_F$~
change   possible is

'that there will then be the possibility to transfer between all the trains'

>> A$_{19'''}$: und [das heißt, dass dann [alle Züge]$_T$ [nach und nach den
and this means that then all   trains   after and after the

Bahnhof   wieder verlassen.]$_F$~
train.station again   leave

---

[19] Speaker hesitates.

'and that the trains will then leave the station again one by one.'

In this example, the focus of the three utterances coincides with the predicates of the subordinate declarative clauses, while the shared background involves the matrix part and the topic *all trains*. In the example below, the focus is, again, part of a subordinate clause. The parallelism between $A_{25'}$ and $A_{25''}$ in (25) imposes a common question whose answer is given by the narrow focus inside the embedded clause. Due to syntactic constraints in English, [20] the question answered by an embedded narrow focus often looks like an echo question – see $Q_{25,}$ as well as $Q_{9.1.1.1}$ in (23) and the subquestions in (26).

(25) [French, EUR]
Q25: {Countries which are not European in WHAT sense of the word are knocking at the door?}
> A25': mais voilà que [maintenant des pays qui ne sont
but there.you.go that now INDEF countries that not are
pas européens au sens [géographique]F ~~du~~ ~~terme~~
not European in.the sense geographical ~~of.the term~~
~~frappent~~ ~~à~~ ~~la~~ ~~porte~~]~
~~knock~~ ~~at~~ ~~the~~ ~~door~~
'But now countries that aren't European in the geographical sense'
> A25'': ni même parfois [~~des~~ ~~pays~~ ~~qui ne sont pas europeéns~~
not even sometimes ~~INDEF~~ ~~Countries~~ ~~that not are~~ ~~not European~~
~~au~~ ~~sens~~ [historique]F du terme frappent à la porte]~
~~in.the~~ ~~sense~~ historical of.the term knock at the door
'and sometimes not even in the historical sense of the word are knocking at the door'

---

[20] Cf. the Complex NP Constraint (Ross 1967), which does not allow for extraction out of a clause (here, a relative one) modifying the Noun head of an NP. In *Q25 Countries which are not European in WHAT sense are knocking at the door?*, the phrase *in what sense* cannot be extracted out of the relative clause modifying the Noun *countries*, so it remains *in situ*.

In the previous example, the question is simply defined in the usual way, by the parallelism of the utterances. In the next example, we can see how the size of the focus constituent can sometimes shrink during a sequence of parallel assertions.

(26) [German, SWR]

Q₁₈: {What kind of people is the speaker concerned with?}

> A₁₈: [[Ich]_T beschäftige mich mit denjenigen, [die in diese
  I concern myself with those who into these
  Unterkünfte hineingehen,]_F(18)]~
  accommodations enter
  'I am concerned with those people who go into these accommodations,'

> Q₁₈.₁: {The speaker is concerned with people who do WHAT with the refugees?}

> > A₁₈.₁: [~~Ich beschäftige mich mit denjenigen,~~ [die mit [den
  ~~I concern myself with those~~ who with the
  Flüchtlingen]_T [reden,]_F(18.1)]_F(18)]~
  refugees talk
  'who talk to the refugees,'

> > Q₁₈.₁.₁: {The speaker is concerned with people who take the refugees WHERE?}

> > > A₁₈.₁.₁': [~~Ich beschäftige mich mit denjenigen,~~ [die [sie]_T
  ~~I concern myself with those~~ who them
  [mitnehmen auch [zu sich]_F(18.1.1)]_F(18.1)]_F(18)]~
  take also to themselves
  'take them home with them'

> > > A₁₈.₁.₁'': oder [~~ich beschäftige mich mit denjenigen,~~ [die sie
  or I concern myself with those who them
  [~~mitnehmen~~ [in den Sportverein]_F(18.1.1)]_F(18.1)]_F(18)]~
  take into the sports.club
  'or to the sports club.'

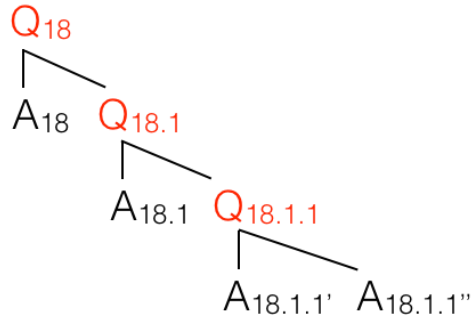The QUD-tree of (26) is represented in Figure 6.

Figure 6. A QUD followed by several subquestions. Each assertion answers both its own QUD as well as the higher questions.

In (26) it is necessary to introduce increasingly specific subquestions in order to capture the fact that, firstly, we are still dealing with a kind of parallel construction albeit, secondly, one in which the focus is getting narrower and narrower. The outermost focus, the answer to Q_{18}, is represented by the two overt relative clauses in A_{18} and $A_{18.1}$ respectively; however, a narrower focus (on the verb) must be assumed in order to account for the parallelism between the last three assertions, which all talk about the refugees; finally, a yet narrower focus is needed for the last two assertions, whose parallelism concerns taking the refugees to different locations. The subscripts of the foci indicate which of the questions they are answering. As can be seen, there is one focus indicated in A_{18}, two in $A_{18.1}$, and three in each of $A_{18.1.1'}$ and $A_{18.1.1''}$ (nested inside each other) but we assume that only the innermost focus in each of the assertions is the actual one (which is prosodically marked in German). Naturally, when the size of a focus gets smaller, its background is extended correspondingly. The elided material has again been reconstructed in order to make the interpretation of this complex example transparent.

6 Non-at-issue material

The parts of a clause that do not answer the current QUD can be grouped together under the notion of *non-at-issue material* (Simons et al. 2010). Note that there is some terminological confusion in the literature since, sometimes, backgrounded (as opposed to focal) material is also, in some sense, not at issue (and focal material is at issue). However, in our approach we would like to exclude background material from the class of non-at-issue material. What we have in mind is a stricter definition of *non-at-issue* content, equivalent to the notion of *conventional implicature* (Potts, 2005). In general, this term refers to *optional information* that does not contribute to the truth or falsity of the assertion. With respect to the QUD annotation procedure, non-at-issue material can be defined as a – discourse-new – part of the utterance that does not relate to the current QUD, or in other words, a part of the utterance that does not belong to the focus domain.

> **Non-at-issue material (relative to Q)**
>
> An expression X whose denotation is discourse-new and which is contained in an assertion A is non-at-issue with respect to the current QUD Q iff X is optional with respect to Q, where optional means that under deletion of X, A is still an answer to Q.

It is probably impossible to define non-at-issue material by referring to the syntactic form of an expression, because at-issueness mostly depends on the context in which the expression occurs. Nevertheless, there is a list of expressions which typically take the role of non-at-issue material in a sentence, and whose optional status the annotator should therefore always check.

The two major types of non-at-issue material are, firstly, *supplements* such as parentheticals, non-restrictive modifiers and other adjunct-like material. The second type of non-at-issue material consists of *evidentials* and other speaker-oriented expressions. In our annotations, we mark non-at-issue material by the feature NAI. A gray background additionally signals that this is material which – for the time being – does not contribute to the main structure of our discourse tree.

Examples of different kinds of supplements are given below: an apposition and a temporal adjunct phrase in (27), two appositions in (28), parentheticals in (29), and a concessive adjunct clause in (7), repeated below as (30).

(27) [French, *www.monde-diplomatique.fr*]

Q$_6$: {What did Patrice Bouveret do?}

> A$_6$: [Animateur de l'Observatoire   des   armements]$_{NAI}$ [[Patrice

leader   of the.monitoring.center of.the arms   Patrice

Bouveret]$_T$ [avait relancé, [lors   du   colloque organisé le mois

Bouveret   had   revived   at.the.time of.the conference organized the month

dernier par des   sénatrices communistes devant   un parterre de

last   by   INDEF senators   communist   in.front.of an audience of

syndicalistes]$_{NAI}$ une série de propositions pour un meilleur

trade.unionists   a   series of propositions for   a better

contrôle]$_F$]~.

control

'In his function as the leader of the Arms Monitoring Center, Patrice Bouveret revived, during a conference organized last month by some communist senators in front of an audience of trade unionists, a series of propositions for a better control'

(28) [English, *www.nytimes.com*]

Q$_{26}$: {Who was among those named in the Panama Papers?}

> A$_{26'}$: [Among those named *(in the Panama Papers)* were (...) [Mr
         Gunnlaugsson,]$_F$]~ [then the prime minister of Iceland]$_{NAI}$

> A$_{26''}$: *(and)* [among those named was [the former emir of Qatar]$_F$]~ [Hamad
         bin   Khalifa al-Thani]$_{NAI}$

(29) [French, *www.monde-diplomatique.fr*]

Q$_1$:   {What about French arms export?}

> A₁: Les exportations françaises d'armement ne font l'objet
the export French of.arms not make the.object

d'aucun débat en France
of.any debate in France

'French arms export isn't the object of any debate in France'

> Q₂: {What are the exceptions to this?}

> > A₂': sinon [en cas [de scandale]_F]~ [(frégates de Taiwan ou
except in case of scandal frigates of Taiwan or

Angolagate)]_NAI,²¹
Angolagate

'except in case of scandal (frigates of Taiwan, or Angolagate)'

> > A₂'': [[de drame]_F]~ [(l'attentat de Karachi)]_NAI
of drama the.attack of Karachi

'of drama (the suicide attack in Karachi)'

> > A₂''': ou [[lorsque l'exécutif se prend les pieds dans le
or when the.executive itself takes the feet in the

tapis]_F]~ [(comme avec cette vente de navires de projection
carpet like with this sale of ships of projection

et de commandement à la Russie (…))]_NAI
and of commandment to the Russia

'or when the executive is stumbling over (as with that sale of
demonstration and commanding ships to Russia)'

(30) [French, *www.monde-diplomatique.fr*]

Q₃: {What is the debate on linguistic policy about?}

> A₃: [Bien que les règles statutaires définissent des langues
even though the rules statutory define INDEF languages

officielles (...)]_NAI[[un monolinguisme de fait s'impose peu à
---

²¹ Since the NAI content in this example is sentence-final it can be treated as a separate assertion, cf. the discussion at the end of Section 6.

| official | | a | monolingualism | of fact | itself.establish | little | to |

peu.]F]~

little

'Although statutory rules define the official languages (...), monolingualism is in fact establishing itself little by little'

Examples of evidentials are given in (31), (32), and an expressive in (33).

(31) [German, SWR]

Q₂: {What is the current status of the bill?}

> A₂: [Jetzt heißt es,]NAI [[das Kanzleramt]F hat [diese Verordnung]T
now means it the Chancellery has this bill
[gestoppt]F]~.
stopped
'Now they are saying that the Chancellery has stopped this bill.'

(32) [French, *www.monde-diplomatique.fr*]

Q₁: {What about the English language in international organisations?}

> A₁: [Les défenseurs de l'anglais affirment]NAI [qu'[il]T [s'est
the defenders of the.English maintain that.it itself.has
internationalisé]F]~.
internationalized
'The defenders of the English language maintain that it has become internationalized.'

(33) [German, SWR]

Q₅: {What has changed because of the measures?}

> A₅: [(...) [[dadurch]T(...) sind [Gott sei Dank]NAI [die Anzahl
through.this are God be thank the number
der Toten (...) massiv zurückgegangen]F.]~
of.the dead massively decreased

'Because of that – Thank God! – the number of casualties has massively decreased.'

It might sometimes seem difficult to decide which parts of an utterance are at issue and which ones are not. However, once the QUD is formulated in accordance with the principles defined in Sections 3 and 5 this uncertainty should disappear.

Note that we do not analyze non-at-issue material in more detail, although it can be assumed that it has an information structure of its own (and therefore also its own QUD); for a discussion see Riester and Baumann (2013: 219ff). Importantly, however, we will analyze sentence-final non-at-issue material simply as if it represented a separate assertion (which it arguably *does*), cf. AnderBois et al. (2010), Syrett and Koev (2015). An example, already mentioned in (28), is shown in (34) (the sentence final expression is an apposition). See also the last QUD of example (23), which is answered by a VP adjunct. If the sentence-final expression is an evidential, its QUD will be a sort of meta-question about the speaker's attitude towards the preceding assertion.[22]

(34) [English, www.nytimes.com]
Q$_{26}$: {Who was among those named in the Panama Papers?}
> A$_{26}$: [Among those named (in the Panama Papers) were (...) [Mr Gunnlaugsson,]$_F$]~
> Q$_{27}$: {Who was Mr Gunnlaugsson?}
>> A$_{27}$: [then [the prime minister of Iceland]$_F$]~

---

[22] If we assume that all non-at-issue material (even of the non-sentence-final kind) answers an implicit QUD, then ways have to be found to represent this in the tree structure (see Onea 2016 for such an attempt). Although we do not include it in the current guidelines, it would be desirable to settle this issue in the future, especially since the same non-at issue material may occupy different syntactic positions cross-linguistically (e.g. head-final relative clauses in Chinese).

7 Conditionals

In this section we briefly address the treatment and analysis of conditionals. No new categories or structures will be introduced. Instead, we make use of concepts already defined in Sections 5.2 (on contrastive topics) and 6 (on non-at-issue material). Following Iatridou (1991), Haegeman (2003), or Ebert et al. (2014) we distinguish (at least) two types of conditionals. So-called *relevance conditionals*[23] "specify the circumstances in which the consequent is relevant" (Iatridou 1991: 51). An example is given in (35).

(35) [German, SWR]

Q$_{33}$: {What about the passion concerning Europe?}

> A$_{33}$: [Wenn man den   aktuellen ARD-Europatrend anschaut,]$_{NAI}$[dann ist
        if   you   the   current   ARD.Europe.Trend watch   then   is
         es mit   [der Leidenschaft]$_T$ [nicht so   weit her]$_F$]~.
        it with   the   passion   not   so   far   from
         'If you look at the current ARD Europe Trend (on German TV), then the passion leaves much to be desired.'

As can be seen in (35), the antecedent is simply treated as an – optional – adjunct clause, which is non-at-issue. The situation is different with ordinary (*hypothetical*) conditionals, example (36). These conditionals provide the reader with a true choice. We realize this using the pattern and discourse structure familiar from the CT-F pairs introduced in Section 5.2. [24]

(36) [German, Stuttgart21]

---

[23] They are also often called *biscuit conditionals,* in reference to the famous example (iii), by Austin (1961).

       iii.   There are biscuits on the sideboard, if you want them.

[24] Note that a third type of conditional is one that has a completely given (and therefore backgrounded) antecedent clause.

A₀: Wenn die Deutsche Bahn   auf die Idee kommt, solche Bahnhöfe
if   the German   railway on the idea comes   such   stations
vom Fernverkehr   abzuhängen, kann sie zumachen. (...)
from long-distance.traffic to.unhitch   can   she close.down
'If the German railway company starts to unhitch such train stations from long-distance connections, then they can close down.'

Q₁: {For which cities does it make sense to unhitch the main station?}

\> Q₁.₁: {Does it make sense in Kassel to unhitch the main station?}

\>\> A₁.₁: [Wenn sie in [Kassel]꜀ₜ den Hauptbahnhof abhängen, dann
           if   you in Kassel   the main.station   unhitch   then
           ist   [das]ₜ [richtig]ꜰ~.
           is   that   correct
           'If you unhitch the main station in Kassel then that makes sense.'

\> Q₁.₂: {Does it make sense in Stuttgart to unhitch the main station?}

\>\> A₁.₂: [Wenn sie   [es]ₜ in [Stuttgart]꜀ₜ machen, ist [es]ₜ [falsch]ꜰ~.
           If   they it   in Stuttgart   do   is it   wrong
           'If you unhitch the main station in Stuttgart then that doesn't make sense.'

The if-clauses in the example in (36) contain the contrastive topics, the cities Kassel and Stuttgart, and the main clauses contain the foci.

Note that the CT-F pattern, and its associated structure consisting of a super-question and several subquestions is a very powerful analysis tool, which is also applicable to other kinds of discourse-structuring expressions like ordinals (*Firstly, Secondly* etc.)*,* contrast markers *(on the one hand, on the other hand),* which all function as (semantically rather thin) contrastive topics. CTs can also play a role in polarity contrasts. *(He [didn't]꜀ₜ buy [apples]ꜰ but he [did]꜀ₜ buy [peaches]ꜰ.)* Finally, it is likely that also subsequent events in narratives can be analyzed in this way *(What happened at time t_1? What happened at time t_2?)*, but this clearly needs to be investigated more carefully.

8 Conclusions

In this paper, we have introduced our methodology for a combined analysis of naturally occurring data in terms of both discourse structure and information structure, using Questions under Discussion. We have identified the necessary steps of a procedure based on QUDs and demonstrated the method on authentic data taken from spoken and written English, French, and German corpora. We have defined pragmatic principles that allow us to derive the discourse structure, formulate adequate QUDs, and analyze the information structure of individual utterances in the discourse. Based on an analysis of authentic data, we have illustrated that the formulation of QUDs can be successfully guided by these principles, and that QUDs play a crucial role in accounting for discourse structural configurations. At the same time, they also provide an objective means to determine the information structure, including both the focus-background divide and non-at-issue material.

This research has interesting applications in several respects. On the one hand, a precise methodology for the analysis of the information structure in naturally occurring data provides the opportunity to empirically evaluate theoretical notions such as focus, contrastive topic, or non-at-issue content. For instance, we have suggested a number of practical applications for contrastive topics, or we have pointed out how to identify focus constituents in embedded sentences. On the other hand, being independent from linguistic form, our methodology has two important applications. Firstly, it constitutes a valuable instrument to identify the exact information structure of an utterance when the linguistic means to express it are underspecified or unclear. As an example, consider French subject clitic left dislocations (*Maman, elle était soudeuse* 'Mum, she was a welder'). The interplay between syntax, prosody and the pragmatic function of the "dislocated" subject NP is not clear and the NP can be a topic, a contrastive topic, or part of the focus (see Brunetti et al. 2012 for discussion, and references quoted in there). Naturalistic data that are independently annotated according to our scheme would provide a powerful resource to understand which syntactic and, more importantly, prosodic markings might be related to the different pragmatic functions of the dislocated

subject. Speaking more generally, annotated spoken corpora can be used to complement existing laboratory-phonetic investigations on the prosody of various languages, which typically rely on constructed data.

Secondly, our research constitutes a valuable instrument to discover and analyze linguistic means to express information structure. This point is particularly important if a language is poorly described. For instance, a straightforward recipe for fundamental research in the domain of the information structure of lesser-described languages would be to annotate a body of data gathered in fieldwork using our method, to formulate a hypothesis about the default constituent order (of agent, verb, and patient in transitive clauses, for instance), and to test whether deviations from the default are correlated with specific constellations of the annotated information-structural categories. Inversely, the annotation procedure can help single out specific information-structural patterns and lead to hypotheses on their potential linguistic marking. As an illustration, consider example (37) from Sumbawa, a Malayo-Polynesian (Austronesian) language spoken in Indonesia, cf. Riester and Shiohara (to appear).

(37) [Sumbawa]

Q$_3$:   {What if we eat pork undeliberately or knowingly?}

> Q$_{3.1}$:   {What if we do it undeliberately?}

> > A$_{3.1'}$:   [lamin   [nongka   tu=sangaja]$_{CT}$ [no   sikuda]$_F$]~

           if   NEG.PST   1PL=act.deliberately   NEG   problem

           'If we don't act deliberately, it is no problem.'

> Q$_{3.2}$:   {What if we do it knowingly?}

> > A$_{3.2}$:   tapi   [lamin   [ka=tu=to]$_{CT}$ [kan]$_{NAI}$ [no roa]$_F$ [dean   nan]$_T$]~

           but   if   PST=1PL=know   you.know   NEG confortable   the   that

           'but if we know, we are not comfortable with that, right?'

This example shows a clear case of complex parallelism. QUD and information structure annotations on data from this language will therefore be a valuable starting point to make hypotheses concerning the marking of such constructions in Sumbawa.

Finally, this research provides the opportunity to study the characteristics of texts themselves, namely their coherence and clarity, their genre, etc. Do the speakers answer explicit questions or rather their own implicit ones? Does a speaker return to her original question or not? Is the discourse actually a set of separate mini-discourses? etc. The QUD structure may also help identify the specific features of different text genres. For instance, a narrative text might be recognizable by the high frequency of parallel topic-sharing assertions. By contrast, we may suppose that an expository or descriptive text will contain more variety concerning both the presence of subquestions and the depth of their embedding, or that an argumentative text will contain more parallel structures with two variables, which help in expressing contrast and comparison. We will leave such a thorough investigation of possible links between QUD structures and genuine text properties to future research.

Acknowledgements

References

AnderBois, Scott; Brasoveanu, Adrian and Henderson, Robert (2010). Crossing the appositive/at-issue meaning boundary. In N. Li and D. Lutz (eds.) *Proceedings of Semantics and Linguistic Theory 20*, Vancouver, pp. 328-346.

Asher, Nicholas and Lascarides, Alex (1998). Bridging. *Journal of Semantics* 15(1): 83-113.

Asher, Nicholas and Lascarides, Alex (2003). *Logics of Conversation*. Cambridge

University Press.

Austin, John (1961). Ifs and cans. In *Philosophical Papers,* pp. 153-180. Oxford University Press.

Beaver, David and Clark, Brady (2008). *Sense and Sensitivity: How Focus Determines Meaning.* (Explorations in Semantics 5). Oxford: Wiley-Blackwell.

Boersma, Paul and Weenink, David (2017), Praat: doing phonetics by computer [Computer program]. Version 6.0.36, retrieved 11 November 2017 from http://www.praat.org/

Branca-Rosoff, Sonia; Fleury, Serge; Lefeuvre, Florence and Pires, Mat (2009). *Discours sur la ville. Corpus de Français Parlé Parisien des années 2000 (CFPP2000).* http://ed268.univ-paris3.fr/CFPP2000/

Brunetti, Lisa (2009). On the semantic and contextual factors that determine topic selection in Italian and Spanish. In G. van Bergen and H. de Hoop (eds.), *The Linguistic Review, Special issue on Topics Cross-linguistically*, 26(2/3): 261–289.

Brunetti, Lisa, Avanzi, Mathieu and Gendrot, Cedric (2012). Entre syntaxe, prosodie et discours: les topiques sujet en français parlé. *Actes du Congrès Mondial de Linguistique Française*, pp. 2041-2054.

Büring, Daniel (2003). On D-Trees, beans, and B-Accents. *Linguistics & Philosophy* 26(5): 511-545.

Büring, Daniel (2008). What's new (and what's given) in the theory of focus? In *Proceedings of the 34th Annual Meeting of the Berkeley Linguistics Society*, pp. 403-424.

Büring, Daniel (2016). *Intonation and Meaning.* Oxford University Press

Clark, Herbert (1977). Bridging. In *Thinking,* P. Johnson-Laird and P. Wason (eds.), pp. 411-420. Cambridge University Press.

Dalrymple, Mary (2005). Against Reconstruction in Ellipsis. In: R. Elugardo and R. Stainton (eds.). *Ellipsis and Non-Sentential Speech, Studies in Linguistics and Philosophy*, pp. 31-55. Dordrecht: Springer.

Ebert, Christian; Ebert, Cornelia and Hinterwimmer, Stefan (2014). A unified analysis of conditionals as topics. *Linguistics and Philosophy* 37: 353-408.

Eckart, Kerstin and Gärtner, Markus (2016). Creating silver standard annotations for a corpus of non-standard data. In S. Dipper, F. Neubarth and H. Zinsmeister (eds.) *Proceedings of the 13th Conference on Natural Language Processing (KONVENS).* Volume 16 of Bochumer Linguistische Arbeitsberichte, pp. 90-96.

Eckart, Kerstin, Riester, Arndt and Schweitzer, Katrin (2012). *A Discourse Information Radio News Database for Linguistic Analysis*. In C. Chiarcos; S. Nordhoff and S. Hellmann (eds.), Linked Data in Linguistics. Representing and Connecting Language Data and Language Metadata, pp. 65-75. Heidelberg: Springer.

Endriss, Cornelia (2006). Quantificational topics. A scopal treatment of exceptional scope phenomena. PhD dissertation, Universität Potsdam.

Fiengo, Robert and May, Robert (1994). *Indices and Identity*. Cambridge Massachusettss: MIT Press.

Firbas, Jan (1992). *Functional Sentence Perspective in Written and Spoken Communication.* Cambridge University Press.

Geurts, Bart and Beaver, David (2011). Presupposition. In Edward Zalta (ed.) *The Stanford Encyclopedia of Philosophy*, http://plato.stanford.edu

Ginzburg, Jonathan (2012). *The Interactive Stance.* Oxford University Press.

Grosz, Barbara and Sidner, Candace (1986). Attention, intentions, and the structure of discourse. *Computational Linguistics* 12(3): 175-204.

Gussenhoven, Carlos (1999). On the limits of focus projection in English. In P. Bosch and R. van der Sandt (eds.), *Focus – Linguistic, Cognitive and Computational Perspectives,* pp. 43-55.

Haegeman, Liliane (2003). Conditional clauses: External and internal syntax. *Mind and Language* 18(4): 317-339.

Hajičová, Eva; Partee, Barbara and Sgall, Petr (1998). *Topic-Focus Articulation, Tripartite Structures, and Semantic Content.* Dordrecht: Springer.

Halliday, Michael A. K. (1967). Notes on transitivity and theme in English, part II. *Journal of Linguistics*, 3:199–244.

Hardt, Daniel (1999). VPE as proform: Some consequences for binding, In F. Corblin, C. Dobrovie-Sorin & J.-M. Marandin (eds), *Empirical Issues in*

Formal Syntax and Semantics 2: Selected Papers from the Colloque de Syntaxe et Semantique a Paris. The Hague: Thesus.

Heim, Irene (1991). Artikel und Definitheit, In A. von Stechow and D. Wunderlich (eds.), *Semantik: ein internationales Handbuch der zeitgenössischen Forschung*, 487-535. Berlin: de Gruyter.

Hobbs, Jerry (1985). On the coherence and structure of discourse. Technical Report CSLI-85-37, Stanford University, 1-36.

Hunter, Julie and Abrusán, Márta (2017). Rhetorical Relations and QUDs. In M. Otake et al. (eds.), *New Frontiers in Artificial Intelligence: JSAI-isAI 2015 Workshops LENLS, JURISIN, AAA, HAT-MASH, TSDAA, ASD-HR, and SKL, Kanagawa, Japan, Revised Selected Papers*, 41-57. Springer.

Iatridou, Sabine (1991). Topics in Conditionals. PhD dissertation, Massachusetts Institute of Technology, Cambridge.

Jacobs, Joachim (2001). The dimensions of topic-comment. *Linguistics* 39: 641-681.

Jasinskaja, Katja and Zeevat, Henk (2009). Explaining conjunction systems: Russian, English, German. In A. Riester and T. Solstad (eds.), *Proceedings of Sinn und Bedeutung 13*, Stuttgart, 231-245.

Klein, Wolfgang and von Stutterheim, Christine (1987). Quaestio und referentielle Bewegung in Erzählungen. *Linguistische Berichte* 109: 163-183.

Krifka, Manfred (2007). Basic notions of information structure, in C. Féry and M. Krifka (eds.) *Interdisciplinary Studies on Information Structure* 6. Potsdam, pp. 13-56.

Kuno, Susumo (1973). *The structure of the Japanese language*. Cambridge, MA: MIT Press.

van Kuppevelt, Jan (1995). Discourse structure, topicality and questioning. *Journal of Linguistics* 31: 109-147.

Lambrecht, Knut (1994). *Information structure and sentence form.* Cambridge: Cambridge University Press.

Lang, Ewald and Umbach, Carla (2002). Kontrast in der Grammatik: spezifische Realisierungen und übergreifender Konnex. *Linguistische Arbeitsberichte* 79: 145-186.

Latrouite, Anja and Riester, Arndt (to appear*).* The role of information structure for morphosyntactic choices in Tagalog. In Riesberg, S. et al. (eds.*) Information Structure in Austronesian Languages.* Berlin: Language Science Press.

Mann, William and Thompson, Sandra (1988). Rhetorical Structure Theory: Towards a functional theory of text organization. *Text* 8: 243-281.

Matić, Dejan and Wedgwood, Daniel (2013). The meanings of focus: The significance of an interpreation-based category in cross-linguistic analysis. *Journal of Linguistics,* 49:127-163.

McNally, Louise (1998). On recent formal analyses of topic. In Ginzburg, J., Khasidashvili, Z., Vogel, C., Lévy, J.J., and E. Vallduví (eds.), *The Tbilisi Symposium on Language, Logic, and Computation: Selected Papers,* pp. 147-160. Stanford, CA: CSLI Publications.

Merchant, Jason (2001). *The Syntax of Silence: Sluicing, Islands and the Theory of Ellipsis.* Oxford University Press.

Onea, Edgar (2016). *Potential Questions at the Semantics-Pragmatics Interface.* Leiden: Brill.

Polanyi, Livia (1988). A formal model of the structure of discourse. *Journal of Pragmatics* 12: 601-638.

Portner, Paul, and Katsuhiko Yabushita. 1998. The semantics and pragmatics of topic phrases. *Linguistics and Philosophy*, 21-2.

Potts, Christopher (2005). *The Logic of Conventional Implicatures.* Oxford University Press.

Portes, Cristel (2004). Prosodie et économie du discours: spécificité discursive et portée pragmatique de l'intonation d'implication. PhD dissertation, Université Aix-Marseille.

Reinhart, Tanya (1981). Pragmatics and linguistics: An analysis of sentence topics in pragmatics and philosophy I. *Philosophica* 27(1):53-94.

Reyle, Uwe and Riester, Arndt (2016) Joint information structure and discourse structure analysis in an Underspecified DRT framework. In J. Hunter, M. Simons and M. Stone (eds.) *Proceedings of the 20th Workshop on the Semantics and Pragmatics of Dialogue (JerSem),* pp. 15-24, New Brunswick,

NJ, USA.

Riester, Arndt (2015). Analyzing Questions under Discussion and information structure in a Balinese narrative. In *Proceedings of the Second International Workshop on Information Structure of Austronesian Languages*, pp. 1-26. Tokyo.

Riester, Arndt (to appear). Constructing QUD trees. In Malte Zimmermann, Klaus von Heusinger and Edgar Onea (eds.) *Questions in Discourse*. Vol. 2: Pragmatics. CRiSPI Series. Leiden: Brill.

Riester, Arndt and Baumann, Stefan (2013). Focus triggers and focus types from a corpus perspective. *Dialogue and discourse* 4(2): 215-248.

Riester, Arndt and Baumann, Stefan (2017). *The RefLex Scheme – Annotation Guidelines.* Vol. 14 of SinSpeC. Working papers of the SFB 732. University of Stuttgart.

Riester, Arndt and Shiohara, Asako (to appear). Information structure in Sumbawa: A QUD analysis. In Riesberg, S. et al. (eds.) Information Structure in Austronesian Languages. Berlin: Language Science Press.

Roberts, Craige (2012). Information structure in discourse: Towards an integrated formal theory of pragmatics. *Semantics and Pragmatics 5(6): 1-69.* (1996 version: OSU Working Papers in Linguistics 49. The Ohio State University.)

Rooth, Mats (1985). Association with Focus. Doctoral Dissertation, University of Massachusetts, Amherst.

Rooth, Mats (1992). A theory of focus interpretation. *Natural Language Semantics* 1(1): 75-116.

Rooth, Mats (1996). Focus. In *The Handbook of Contemporary Semantic Theory*, Shalom Lappin (ed.), 271-297. London: Blackwell.

Ross, John R. (1967). Constraints on variables in syntax. Doctoral dissertation, Massachusetts Institute of Technology.

van der Sandt, Rob (1992). Presupposition projection as anaphora resolution. *Journal of Semantics* 9(4): 333-377.

Schwarzschild, Roger (1999). GIVENness, AvoidF, and other constraints on the placement of accent. *Natural Language Semantics* 7(2): 141-177.

Schultze-Bernd, Eva and Simard, Candide (2012). Constraints on noun phrase

discontinuity in an Australian language: The role of prosody and information structure. *Linguistics* 50(5), 1015-1058.

Selkirk, Elisabeth (1995). Sentence prosody: Intonation, stress and phrasing. In John Goldsmith (ed.), *The Handbook of Phonological Theory*, pp. 550-569. London: Blackwell.

Shiohara, Asako (forthcoming). Conversation of the Sumbawa Besar Dialect of Sumbawa *Asian and African Languages and Linguistics,* vol.12.

Simons, Mandy; Tonhauser, Judith; Beaver, David and Roberts, Craige (2010). What projects and why. In: *Proceedings of Semantics and Linguistic Theory 20*, Vancouver, 309-327.

Syrett Kirsten and Koev, Todor (2015). Experimental evidence for the truth-conditional contribution and shifting information status of appositives. *Journal of Semantics* 32(3): 525-577.

Taboada, Maite and Mann, William (2006). Rhetorical Structure Theory: Looking back and moving ahead. *Discourse Studies* 8: 423-459.

Umbach, Carla (2004). On the notion of contrast in information structure and discourse structure. *Journal of Semantics* 21(2): 155-175.

Vallduví, Enric (1992). *The Informational Component*. New York: Garland.

Velleman, Leah and Beaver, David (2016), Question-based models of information structure, in C. Féry and S. Ishihara (eds.), *The Handbook of Information Structure,* pp. 86-107. Oxford University Press.

Williams, Edwin (1997). Blocking and anaphora. *Linguistic Inquiry* 28(4): 577-628.

Wittenburg, P., Brugman, H., Russel, A., Klassmann, A., Sloetjes, H. (2006), ELAN: a Professional Framework for Multimodality Research. In: Proceedings of LREC 2006, Fifth International Conference on Language Resources and Evaluation. https://tla.mpi.nl/tools/tla-tools/elan/

Appendix 1

The following corpora have been or are currently in the process of being

analyzed/annotated for discourse and information structure, using QUDs (amount of data indicated).

CFPP2000: Parisian Spoken French Corpus (Branca-Rosoff et al. 2012); French interviews to inhabitants of different districts of Paris, about life in their district. Two interviews of 47 minutes and 70 minutes are currently being annotated.

EUR: Europe corpus (Portes 2004); French radio conversation, ca. 45 minutes (completely annotated).

SWR: Stuttgart SFB 732 Silver Standard Collection (Eckart and Gärtner 2016); German radio interviews from SWR2 public radio (*Interview der Woche,* 13 interviews of 10 minutes each are currently being annotated, in total 24,114 word tokens, 1,356 sentences).

SNO: Interview with Edward Snowden (English), ARD TV, January 2014 (various sections annotated).

Some scattered examples were also taken from written texts and web resources (see examples in the text for specific references) as well as from the following corpora:

DIRNDL: German radio news corpus (Eckart et al. 2012)
STUTTGART21: German panel discussion, Phoenix TV, Oct – Nov 2010

Appendix 2: Summary of instructions

a) Read the entire text carefully and make sure to understand what it is about and whether it makes sense.
b) Segment the text at sentence boundaries and at sentence-level conjunctions so to isolate assertions.
  b') Do not separate sentential arguments from their verbal heads.
  b") Separate sentence-final adjuncts from their verbal heads.
  b"') Segment coordinated units. It is helpful to reconstruct elided material.

c) For each assertion, formulate the respective QUD, in accordance with the principles below:

Q-A-CONGRUENCE:

QUDs must be answerable by the assertion(s) that they immediately dominate.

MAXIMIZE-Q-ANAPHORICITY:

Implicit QUDs should contain as much given material as possible.

Q-GIVENNESS:

Implicit QUDs can only consist of given (or, at least, highly salient) material.

Specific instructions:

c') An assertion at the very beginning of a text should be preceded by a very general QUD, such as: *What is the way things are?*,

c") An explicit question may coincide with the QUD, if the answer is congruent with it.

d) Parallelism

d') Find a common QUD for two or more assertions such that it contains "the lowest common denominator" of all the answers, i.e. semantically constant elements (including synonymous or coreferent material) that are contained in all answers, while the alternating parts are replaced by a wh-phrase. Structure:

$$Q_{15}$$
$$A_{15'} \quad A_{15''}$$
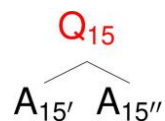
d'') Parallel assertions that vary in two syntactic positions give rise to a structure with a superquestion and a subquestion for each of the assertions:

$$Q_{15}$$
$$Q_{15.1} \quad Q_{15.2}$$
$$A_{15.1} \quad A_{15.2}$$
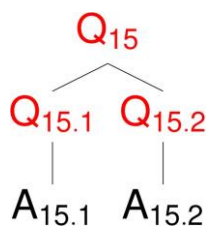
e) Non-at-issue (NAI) (relative to *Q*)

An expression *X* whose denotation is discourse-new and which is contained in an assertion *A* is non-at-issue with respect to the current QUD *Q* iff *X* is optional with respect to *Q*, where optional means that under deletion of *X*, *A* is still an answer to *Q*

Typical NAI content:

e') *supplements*: parentheticals, non-restrictive modifiers and other adjunct-like material.

e'') *evidentials* and other speaker-oriented material

f) Information structure, label inventory

Tag	Definition
Focus (F)	The part of a clause that answers the current QUD
Focus domain (~)	A piece of discourse containing both a focus and, usually, some background. In general, the focus domain directly corresponds to the QUD. If a sentence is thetic (i.e. all-focus), the focus and focus-domain coincide, and the respective QUD is of the kind *What happened?* or *What is the way things are?*
Background	The non-focal part of a focus domain (that part which is already mentioned in the current QUD)
(Aboutness) topic (T)	A referential entity ("term") in the background which constitutes what the utterance is about.
Contrastive topic (CT)	The instantiation of a variable within the background, which signals the existence of a superquestion-subquestion discourse structure. CTs are backgrounded w.r.t the subquestion and focal with respect to the superquestion.
Non-at-issue content (NAI)	The part of a clause which provides optional information with respect to the current QUD

Table 1 Inventory of information-structure labels

Appendix 3

An example annotation

(38) [English, SNO]

Hubert Seipel, journalist:

Q$_1$: Mr Snowden did you sleep well the last couple of nights?

> Q$_2$:   {Why is the interviewer asking this question about Snowden?}

> > Q$_{2.1}$: {What about Snowden?}

> > > A$_{2.1'}$:   because [I was reading that]$_{NAI}$ [[you]$_T$ [asked for a kind of police protection]$_F$]~.

> > > Q$_3$: Are there any threats?

> > > > Q$_{3.1}$: {What kind of threats are there to Snowden?}

Edward Snowden:

> > > > > A$_{3.1'}$: [There are [significant]$_F$ threats]~

> > > > > Q$_4$: {How does Snowden sleep, given these threats?}

> > > > > > A$_4$: but [[I]$_T$ sleep [I]$_T$ sleep [very well]$_F$]]~.

> > > > > Q$_{3.1.1}$: {What kind of significant threats are there?}

> > > > > > A$_{3.1.1}$: [There was [an article that came out in an online outlet called Buzz Feed]$_F$]~

> > > > > Q$_5$: {What officials did they interview in that article?}

> > > > > > > A$_5'$: [[where]$_T$ [they]$_T$ interviewed officials [from the Pentagon]$_F$]~,

> > > > > > > A$_{5''}$: [[they]$_T$ interviewed officials [from the National Security Agency]$_F$]~

> > > > > > > Q$_6$: {What did the reporters allow these people to do in these interviews?}

> > > > > > > > A$_6$: and [[they]$_T$ [gave]$_F$ [them]$_T$ [anonymity]$_F$]~

> > > > > > > > Q$_7$: {Why did they give them anonymity?}

> > > > > > > > > A$_7$: [[to be able to say what]$_F$ [they]$_T$ [want]$_F$]~

> > > > > > > > > Q$_8$: {What did these people tell the reporter that they wanted to do with Snowden?}

> > > > > > > > > A$_{8'}$: and [what [they]$_T$ told the reporter was that [they]$_T$ wanted [to murder]$_F$ [me]$_T$]~

> > > > > > > > > A8″ [[These individuals]T [– and these are acting government officials –]NAI [they]T said [they]T would be happy, they would love [to put a bullet in]F [my]T [head]F]~,

> > > > > > > > > A8‴: [[to poison]F [me]T]~

> > > > > > > > > Q9: {When would they want to poison Snowden?}

> > > > > > > > > > A9: [as [I]T [was returning from the grocery store]F]~

> > > > > > > > > A8iv: and [have [me]T [die]F]~

> > > > > > > > > Q10: {Where would they have him die?}

> > > > > > > > > > A10: [[in the shower]F]~

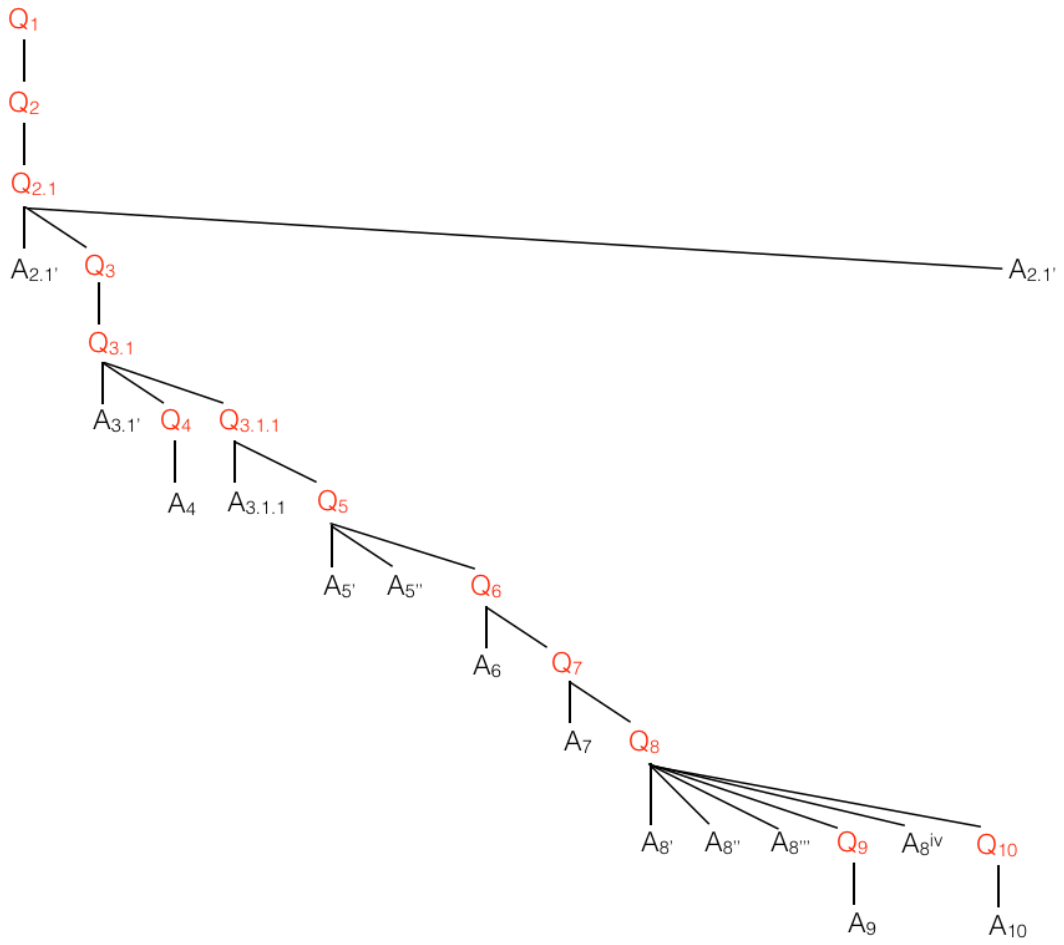*Journalist:*

> > > A2.1″: But [fortunately]NAI [[you]T [are still alive with us]F]~ .

Figure 7. QUD-tree of example (38)