Semantic Role Universals and Argument Linking: Theoretical, Typological, and Psycholinguistic Perspectives

Edited by
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Mouton de Gruyter

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Trends in Linguistics
Studies and Monographs 165

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Dedication

This volume is dedicated to the memory of Helma van den Berg (1965–2003). Helma participated in the conference that led to this volume and is co-author of one of the contributions, although her untimely death meant that she was unable to join in the final stages of production of the volume. An indefatigable investigator of the languages of the North Caucasus and a recent recipient of a prestigious research grant from the Netherlands Science Organization, Helma died prematurely of a heart attack while conducting fieldwork on the Dargi language in Derbent (Daghestan). We mourn the loss to her family, to science, and to ourselves.

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Introduction

Ina Bornkessel, Matthias Schlesewsky,
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1. Semantic roles as a core linguistic concept

Semantic roles have long played a major role in all domains of linguistic explanation, including theory of grammar, language typology and psycho-/neurolinguistics. This strong degree of interest is grounded mainly in the need for suitable interface representations that can mediate between syntax and semantics. Because semantic (thematic) roles can characterise core relational meaning with a certain degree of abstraction, they have been implicated in the linking between the relevant semantic aspects of an underlying meaning and the abstract requirements of the corresponding surface form. However, despite the obvious appeal of such interface representations and the high degree of interest afforded to them during the last decades of linguistic research, there is still no fully satisfactory model of how the syntax-to-semantics linking is accomplished. One reason for this appears to lie in the problems regarding the definition and scope of semantic roles that have continually reappeared since the very beginnings of research in this domain (Fillmore 1968; Gruber 1965; Jackendoff 1972). For example, researchers have vastly differed with regard to how many semantic roles should be assumed, how these should be characterised both in semantic and in syntactic terms, how the different roles can be dissociated from one another, and which syntactic phenomena should be derivable from them.

Essentially, the literature suggests two possible ways of overcoming these difficulties. On the one hand, it has been proposed that the hierarchical relations between semantic roles are more important with regard to the form-to-meaning mapping than the content of individual roles (Bierwisch 1988; Bresnan and Kanerva 1989; Grimshaw 1990; Jackendoff 1972; Wunderlich 1997). While the further degree of abstraction provided by a hierarchy-based approach resulted in a major advance in the characterisation of linking properties, the formulation of hierarchies in

terms of individual role labels is inherently subject to similar problems as the individual roles themselves. Thus, a number of conflicting hierarchies have been proposed (e.g. with respect to the relative ranking of Theme/Patient and Recipient/Benefactive), all of which can account for certain syntactic phenomena, but at the same time fail to provide a comprehensive solution to the challenges of argument linking.

A second type of approach to the problems described above lies in the assumption of "generalised semantic roles" (GSRs), which have been referred to as macroroles (Foley and Van Valin 1984), proto-roles (Dowty 1991) and hyperroles (Kibrik 1997). GSRs differ from individual semantic roles in that they abstract over the content of several individual roles and therefore allow for a highly reduced role inventory (typically including only two generalised roles). By focusing on a small number of role oppositions, GSRs appear well suited to modelling argument linking. However, this obvious advantage comes at the cost of a reduced degree of semantic resolution such that fine-grained differences between, say, volitional Agents and inadvertent Causers must be expressed at a different level of representation.

The advantages of both hierarchy-based and GSR-based approaches to argument linking also become apparent when the concept of semantic roles is applied to typological and psycho-/neurolinguistic investigations of language.

The typological approach brings to bear information gleaned from studying both the constraints on cross-linguistic variation with regard to semantic role-based phenomena and the systematic aspects of such cross-linguistic variation. Where identity or similarity is found across languages, then models must be developed that pay due attention to such robust properties of human language. Where there is variation, models are encouraged that encompass the relevant variation while paying due heed to the ways in which different features in different languages modulate the interpretation of generalised semantic roles – for instance through the use of semantic maps to unite core and more peripheral instantiations of a particular semantic role – and to the ways in which hierarchies of generalised semantic roles may play a part, varying across languages, in determining other morphosyntactic properties such as argument linking.

From the perspective of language processing, a precise characterisation of the representations involved in the mapping from form to meaning (and vice versa) is of particular importance, because linguistic disciplines such as psycho- and neurolinguistics seek to explain how this mapping is performed in real time. Thus, efficient communication requires that a

maximal degree of interpretation be inferred at each point of the incoming speech stream in spite of the fact that the information relevant for the interpretive processes may still be incomplete. Consider, for example, the difference between the sentences *John broke a vase* and *John broke a leg*. The two sentences are identical until the direct object is encountered, at which point *John* may either be disambiguated towards an Agent (or at least a Causer) or towards a Patient of the breaking-event. Nonetheless, the processing system cannot wait until this point before making interpretive decisions and must therefore already assign at least certain relevant properties to the argument *John* before the disambiguating object position is reached. Under the assumption that these crucial properties are equivalent to individual thematic roles, however, the indeterminacy of individual role properties in the absence of verb-specific information would lead to some kind of role-reanalysis in the vast majority of sentences. In view of these considerations, it appears more appealing to assume an on-line assignment of hierarchical role relations or GSRs rather than of individual semantic roles, especially for languages in which the arguments typically precede the verb.

2.   Semantic roles and argument linking

From the earliest approaches to semantic roles and their interface character between syntax and semantics, a central research focus has lain on defining the relation between these roles (both individual and generalised) and their corresponding syntactic categories. Thus, questions at the heart of the notion of "argument linking" concern both the precise semantic content of the assumed semantic role concepts and the nature of the syntactic notions to which they correspond (e.g. phrase structure positions or grammatical functions) as well as the way in which the correspondence between the two levels of representation is defined.

One of the strongest hypotheses with respect to the correspondence between semantic roles and syntactic structure was formulated in Perlmutter and Postal's *Universal Alignment Hypothesis* (UAH; Perlmutter and Rosen 1984) and Baker's *Universality of Theta Assignment Hypothesis* (UTAH; Baker 1988). Even though the two approaches are situated in different grammatical models (Relational Grammar vs. Chomsky's Principles and Parameters framework), both assume that the semantic role borne by an argument crucially determines that argument's position in the syntactic structure. The strictest interpretation of these approaches therefore

implies that a particular semantic role (e.g. Patient) is always realised in a particular syntactic position. However, as such a one-to-one correspondence appears too strong to be empirically adequate, slightly weaker versions of these mapping principles have been proposed. For example, in the extended UTAH, Baker (1988) proposes that a verb's thematic grid determines only the relative hierarchical ranking of its arguments in the syntactic structure, rather than their exact structural positions (e.g. as a complement of the verbal head).

A second class of approaches drawing upon the notion of a semantic role hierarchy has found its primary advocates in Jackendoff (1972) and Grimshaw (1990). These researchers have focused particularly on the way in which the hierarchical ranking of semantic roles with respect to one another constrains (a) the mapping of their respective arguments onto grammatical functions, and (b) the applicability of syntactic operations such as passivisation. This approach was motivated, for example, by the non-standard linking requirements of psychological verbs such as *to fear* and *to frighten*, which appear to require mutually inverse associations of Experiencer and Stimulus to grammatical functions. Grimshaw proposes that this apparent linking paradox in fact results from the interaction of two role hierarchies, one of which is thematic and the other of which is aspectual in nature. It is the output of this interaction that determines the syntactic realisation of an argument (i.e. its realisation as subject or object).

Syntactic argument realisation in terms of grammatical functions has also been modelled in accounts assuming generalised semantic roles, specifically in the macrorole approach pursued in Role and Reference Grammar (Foley and Van Valin 1984; Van Valin and LaPolla 1997) and in Dowty's protorole theory (Dowty 1991). However, these two approaches differ significantly with respect to the interpretive properties drawn upon in the linking process and as to the nature of the syntactic representation that is established. On the one hand, Van Valin and colleagues assume that the "privileged syntactic argument" is determined via the macrorole hierarchy, with precise correspondences subject to cross-linguistic variation (see Van Valin *this volume*). On the other, Dowty proposes that the argument with the higher number of proto-agent properties (e.g. volitionality) or the lower number of proto-patient properties (e.g. affectedness) is mapped onto the syntactic subject. The degree of role prototypicality therefore directly determines an argument's syntactic realisation. In an extension of the protorole approach, Primus (1999) assumes a linking correspondence between GSRs and morphological case markers, which are in turn associated with grammatical functions.

The notion that hierarchically organised role concepts are linked to case markers as a prerequisite for the syntactic realisation of an argument has been advanced by a number of researchers (e.g. Bierwisch 1988; Kiparsky 1987; Wunderlich 1997). For example, Wunderlich (1997; see also Wunderlich *this volume*) assumes that case markers serve as linkers between syntactic arguments and their hierarchical positions in the decomposed lexical structure of a verb. The correspondence between the two levels is represented via the features ±lr (there exists a lower role, there exists no lower role) and ±hr (there exists a higher role, there exists no higher role). While this type of approach is based on the assumption of an isomorphism between the lexical argument hierarchy and a hierarchical syntactic representation, it does not require a one-to-one correspondence between a semantic role and a particular syntactic position/grammatical function.

In summary, the argument linking approaches described differ with respect to (a) the way in which they define semantic roles and/or the hierarchical relations between them, (b) the definition of syntactic properties onto which these roles are mapped, and (c) the nature of the correspondence between the two levels of representation. Nonetheless, all emphasise the importance of semantic role concepts as interface representations between form and meaning.

3. Integrating different perspectives on semantic roles and argument linking

The present volume is based on a conference on generalised semantic roles and argument linking that was hosted by the Max Planck Institutes for Human Cognitive and Brain Sciences and for Evolutionary Anthropology in December of 2002. This conference aimed to bring together insights on the subject of semantic roles from a variety of perspectives, with a particular focus on the integration of theoretical, language typological and psycho-/neurolinguistic views. As the contributions to this volume show, these different linguistic subdisciplines have been concerned with very similar sorts of questions with regard to the topic in question. Thus, while approaching the issue of semantic roles and argument linking from different perspectives, the contributions to this volume explore the following common set of questions:

a.   How does semantic role information subserve argument linking (from semantics to syntax or vice versa) and how does it interact with other information types in this process?

b.   What is the conceptual content of a semantic role? Which aspects of this content may be assumed to be universal and which are language specific?

c.   Are semantic roles organised hierarchically? How should the role hierarchy be defined?

d.   In what way do semantic roles relate to the concept of a lexical argument hierarchy, i.e. the hierarchy of argument variables specified in the logical structure of a verb's lexical entry?

Despite these common questions and the partially overlapping approaches apparent in a number of the contributions, the volume adopts a "traditional" subdivision into the following three major sections: theoretical concepts, cross-linguistic considerations and psycho-/neurolinguistic evidence. In the first section, basic questions regarding the theoretical status of semantic roles are addressed, while the second and third sections apply some of these theoretical concepts to empirical issues in language typology and language processing in addition to drawing attention to some empirically warranted theoretical issues.

3.1.   Theoretical concepts

Firstly, the contributions in the theoretical section all present arguments for more fine-grained distinctions in the definition and implementation of semantic roles. Moreover, they address the question of which aspects of semantic roles may potentially be universal and which can be expected to vary cross-linguistically, thereby providing a direct connection to the typological approaches discussed later.

Dieter Wunderlich identifies four different semantic factors that may influence argument realisation (in terms of case marking and/or structural position): the lexically determined argument hierarchy, the semantic roles assigned by the predicate, the sortal/referential salience of an argument (in terms of inherent features such as animacy) and the informational salience of an argument (e.g. in terms of topic/focus). Languages differ as to which of these influences is most important, thereby leading to a typological classification into (a) languages in which argument linking is determined

very strongly by a variety of semantic factors, (b) languages which have developed a structural linking system based on the argument hierarchy and which is at most modulated by semantic factors, and (c) languages that employ a strictly position-based linking and which, as a consequence cannot systematically encode semantic factors via linking properties.

By contrast, **Beatrice Primus** focuses on the internal content of semantic roles and how different semantic features may differentially affect aspects of argument linking. She thus addresses the problem of apparent ranking paradoxes in semantic role hierarchies by proposing that the singular hierarchies previously assumed should be differentiated in a multi-dimensional manner. In this way, she assumes separate role hierarchies based on the features "involvement" and "causal dependency". She further argues that different morpho-syntactic properties (case marking vs. syntactic structure/position) are selectively sensitive to these different dimensions. Semantic role-based constraints on case marking and structural prominence are then modelled in an optimality theoretic account.

In the final chapter of the theoretical section, **Manfred Bierwisch** also focuses on the content of semantic (thematic) roles and seeks to identify its universal, language specific and idiosyncratic (i.e. lexically specified) aspects. In this regard, he contrasts two conceptions about semantic roles, the "extrinsic" and the "intrinsic" view. While the former assumes a (presumably universal) set of semantic role relations ranked according to their substantive content, the latter posits that the relations in question are an inherent property of the ranking between the argument variables in a lexical semantic form. He argues that the intrinsic view, in which semantic roles are anchored in an independently motivated semantic representation, is both empirically more adequate and more parsimonious than the extrinsic view. Thus, in this chapter, the concept of an argument hierarchy – the format of which is considered a universal property – also plays a crucial role in the characterisation of semantic role information. Beyond these universal conceptions, language-specific aspects determine the morpho-syntactic features involved in the realisation of semantic roles, while idiosyncratic properties include additional, lexically fixed options.

3.2.   Cross-linguistic considerations

The cross-linguistic section of the volume provides a natural extension to the theoretical concepts discussed in section 1. All of the four typological chapters focus on possible factors affecting argument linking and the

neutralisation of semantic roles in syntactic operations. Whereas Comrie and van den Berg's discussion of Daghestanian languages in Chapter 4 is very pertinent to the types of factors affecting argument realisation examined by Dieter Wunderlich in Chapter 1, Balthar Bickel's typology of privileged syntactic argument selection (Chapter 5) picks up on the concept of an argument hierarchy and contrasts this with the influence of morphosyntactic factors. In Chapter 6, Walter Bisang examines a number of problems for traditional conceptions of argument linking from semantics to syntax, and, finally, Georg Bossong (Chapter 7) accounts for accusative vs. ergative linking patterns in terms of linguistic "forces" relating either to the text or the predicate level. In each chapter, consequences of the typological considerations for theories of semantic roles are discussed.

Bernard Comrie and Helma van den Berg examine the grammatical and semantic properties of experiencer verbs in Daghestanian languages (East Caucasian). While all Daghestanian languages have distinct experiencer constructions, they differ as to which verbs employ this construction and as to whether the case marking of the experiencer argument varies between different verbs. Moreover, in terms of argument linking, it is typically the experiencer argument that displays "subject properties" in these languages. However, this general tendency can be modified and, in some cases, even overridden by various syntactic, semantic and pragmatic factors. In this way, this chapter provides important insights on the fine-grained nature of typologically informed, feature-based accounts of generalised semantic roles.

Further new typological variables with respect to argument linking are introduced by **Balthasar Bickel**. His chapter argues for a differentiation between (a) constructional PSAs (privileged syntactic argument, a cover term for pivots and controllers adapted from Role & Reference Grammar) linking to arguments as represented in lexical predicates, where they are defined in terms of semantic roles or of positions in decompositional semantic structure, and (b) constructional PSAs linking to arguments as represented in clause structure, where they are defined in terms of case and agreement morphology, phrase-structural position, projection level (bare N, NP, DP, PP etc), and other morphosyntactic expression forms. He presents evidence from German and two Sino-Tibetan languages, Belhare and Lai, which suggests that both language-specific facts and cross-linguistic differences are adequately captured by the proposed variable. This contribution therefore makes apparent the explanatory power of GSRs in accounting for the cross-linguistic realisation of particular syntactic properties.

Walter Bisang further qualifies theoretical conceptions of argument selection (linking) from a typological perspective by examining (a) cases in which semantic role and semantic role hierarchy information does not suffice for assigning semantic participants to syntactic categories, (b) cases in which the syntactic categories of a language provide no independent evidence for semantic roles and/or syntactic operations are not based on the neutralisation of semantic roles, and (c) cases in which semantic roles and argumenthood are not the main factors in determining subject and object assignments. He argues that the additional semantic properties can be captured quite naturally in a prototypical approach to semantic roles, while the two other domains raise problems for both generative and functional theories. The absence of subject-object asymmetries in languages such as Chinese suggests that there is no universal linking hierarchy incorporating the subject-object distinction. Furthermore, the existence of languages with a syntactically privileged position not based on a thematic hierarchy (Liangshan Nuosu) is generally problematic for linking conceptions. Finally, the assignment of syntactic categories on the basis of referential status information favours functional rather than formal linking theories.

The conceptual content of GSRs and their role in argument linking is discussed in detail by **Georg Bossong**. He examines patterns of markedness in argument linking by focusing on the semantic polarity of the two basic case role prototypes A (+agentive, +controlling, +conscious, +animate and +topical arguments) and O (displaying the opposite polarity of these features). Depending of whether syntactic processes treat the sole argument of an intransitive verb, S, in the same way as A (accusative pivot) or as O (ergative pivot), unmarkedness (i.e. null morphological marking) is assumed to encode independence or integration. Independence is defined as autonomy with respect to another category, and specifically, as autonomy between an unmarked noun phrase and a predicate (a typical subject property). Integration, by contrast, means that an unmarked noun can potentially be incorporated into a verbal complex, while a marked noun cannot. On the level of function, then, unmarkedness is shown to have two opposite values: it marks independence in the accumulation pattern S = A, whereas it signals integration in the accumulation pattern S = O. Pivots of the accusative pattern are adapted to the needs of story telling, they are functional with respect to text constitution. Pivots of the ergative pattern are adequate for verb-object integration, they are functional with respect to predicate building. There are two forces of attraction, from linguistic ranks higher or lower than the kernel sentence. Attraction from above (text) leads to accusativity, attraction from below (predicate) to ergativity. Both are

equally functional, but for a majority of languages the force from above seems to be stronger.

3.3.   Psycho-/neurolinguistic evidence

In the final section of the book, the theoretical and typological aspects previously discussed are enriched by a psycho-/neurolinguistic perspective on semantic roles and argument linking. The section is introduced by Robert Van Valin's contribution on the relationship between syntactic theory and language processing (Chapter 8), thereby providing a foundation for the theoretical relevance of the empirical results discussed in the following chapters. In Chapter 9, Maria Piñango argues for an event-structure based characterisation of semantic roles on the basis of findings from language impairments (Broca's aphasia). Finally, in Chapter 10, Ina Bornkessel and Matthias Schlesewsky propose a model of language comprehension incorporating the distinction between generalised semantic role-based argument linking and syntactic templates, thereby aiming to provide a first step towards a typologically adequate model of argument interpretation during real-time comprehension.

From the perspective of a theoretical grammarian, **Robert Van Valin** undertakes an important first step in integrating theoretical and psycho-/neurolinguistic concepts on argument linking. Adopting the position, following Kaplan and Bresnan (1982), that a syntactic theory should be relatable to a testable model of language processing, he goes on to explore the precise nature of this relationship. Using Role and Reference Grammar as a theoretical starting point, he examines the predictions of this theory's claims for both language production and language comprehension. Whereas the correspondence between a theoretical model and a model of language production appears relatively straightforward, the link between grammatical theory and language understanding requires a number of further qualifying assumptions in order for real-time comprehension to be successfully captured. Finally, the chapter explores how processing facts might impact on grammatical theories, thereby providing an important foundation for the remaining psycho-/neurolinguistic chapters and the importance of the findings discussed there for theoretical conceptions of semantic roles.

One of the major empirical research traditions with regard to language has drawn upon data from language impairments – and here, especially from Broca's aphasia – to explore the validity of concepts from linguistic

theory (cf. Zurif and Swinney 1994). From this perspective, **Maria Piñango** examines the correspondence between semantic roles and syntactic properties. Specifically, she argues that this mapping should be described in terms of a 3-tier model, in which the syntax-independent principles (e.g. affectedness and force-causality) that guide such a connection are derived from the event structure of the clause and are mediated by an interface level containing grammatical functions (GF) and discourse representations. This accounts for the apparent organization of semantic roles not in relation to their predicate but in relation to each other (e.g. Croft 1998; Jackendoff 1990; Krifka 1992). In this way, Piñango provides important evidence for the assumption that generalised representations are needed to mediate between a surface form and its interpretation.

In the final chapter of the volume, **Ina Bornkessel and Matthias Schlesewsky** describe a model of language comprehension making crucial reference to a representational level involving GSRs. Specifically, it is proposed that many existing neurophysiological and neuroanatomical results on on-line language comprehension are naturally accounted for with reference to a competence theory that assumes two levels of representation: syntactic templates and generalised semantic roles. Whereas the former underlie basic processes of constituent structuring during comprehension, the latter form the basis for a linking algorithm mediating between form (syntax) and meaning (semantics). Results on the processing of object experiencer verbs in German are taken as a starting point for a discussion of different theoretical concepts regarding GSRs. As such, this chapter shows how results from language processing might be drawn upon to provide converging support for theoretical approaches to these types of concepts.

3.4. A final remark

In summary, this volume unites approaches from a number of linguistic subdisciplines that have referred extensively to the concept of semantic (or 'thematic') roles. Of course, none of the approaches presented here can provide a comprehensive answer to all of the common questions formulated above. Nonetheless, the entire set of contributions and the obvious cross-fertilisation between them indicates how integrative, multi-disciplinary research in the field of semantic roles can advance our knowledge with respect to this crucial aspect of linguistic theorising.

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Argument hierarchy and other factors determining argument realization

Dieter Wunderlich

1. Introduction

Most, if not all argument linking systems derive from generalizations based on agentive transitive verbs. Cross-linguistically, the creation of relational predicates (encoded in basic transitive verbs) is governed by a universal principle: the higher argument is more agent-like and more salient in terms of person, animacy and specificity than the lower one. Since also non-agentive types of verbs are possible, every language has to make certain generalizations covering these types of verbs, and since variation in the sortal or referential type of argument values is possible, every language has to make certain generalizations for non-canonical distributions of those values. Moreover, every language has to set off the set of transitive verbs from intransitive ones, for instance, to reflect conditions under which transitive verbs are reduced and, vice versa, intransitive verbs are enriched. Finally, every language has to make certain provisos of how to deal with 3-place predicates (to be encoded in ditransitive verbs or verb serialization), and to supply with further means of complex predicate formation.

The central function of agentive transitive verbs in a grammar is also reflected in the theories concerned with argument linking. Several theories, including classical generative grammar, only accept two true ('structural') arguments of a verb, designated by abstract case ('accusative' vs. 'nominative') or grammatical function ('object' vs. 'subject'). Semantically oriented theories distinguish between proto-agent and proto-patient roles (Dowty 1991), while Role and Reference Grammar (RRG; Van Valin 1993) mediates between semantic and structural properties by the two macroroles 'actor' and 'undergoer'. It is generally accepted that agents are more salient than patients, hence better candidates for topic, whereas patients are better candidates for focus.

Table 1.   Prototypical transitive verbs[1]

	λy	λx	VERB(x,y)
abstract case	accusative	nominative	
grammatical function	object	subject	
protoroles	proto-patient	proto-agent	
macroroles	undergoer	actor	
natural distribution of salience	less salient	more salient	
(person, animacy, specificity)			
natural candidate for	focus	topic	

Because of their design properties, all theories capture agentive transitive verbs sufficiently (in this respect they are compatible), but as soon as it comes to other types of verbs, they largely differ from each other. The crucial role of ditransitive verbs for a theory of grammar has been recognized only recently (Joppen-Hellwig 2001, Haspelmath 2005, Wunderlich 2005). One remarkable point is that ditransitive verbs in a language with positional linking (like English) behave differently from those in a language with morphological case (like German), as confirmed with data from passive.

(1)   a.   The woman gave him two books.
          He was (sg.) given two books.
      b.   Die Frau gab ihm zwei Bücher.
          Ihm (DAT) wurden (pl.) zwei Bücher gegeben.

In a system with positional double-object, the recipient (being the 'primary object') becomes syntactic subject in the passive, whereas in a system with morphological case, the theme (being the 'direct object') is shifted to nominative in the passive, while the recipient (the 'indirect object') stays in the dative.[2] In any case, the recipient should be considered a medial argument, as reflected by its place in the default word order, among others. This fact can be captured by the assumption of lexical decomposition, claiming that ditransitive verbs are constituted by at least two predicates.[3][4]

(2)   'give' verbs: λz λy λx {ACT(x) & BECOME POSS(y,z)}

Many theories of grammar have no adequate place for medial arguments. This can be seen if one tries to apply the criteria used in
Table 1 to the recipient of ditransitive verbs.

Table 2. No place for medial arguments in various linguistic theories

	λz	λy	λx	VERB(x,y,z)
abstract case	accusative	none	nominative	
grammatical function	object	prim. obj/ indir. obj	subject	
protoroles	proto-patient	mixed (recipient)	proto-agent	
macroroles	undergoer	none	actor	
natural distribution of salience (person, animacy, specificity)	less salient	more salient	more salient	
natural candidate for	focus	??	topic	

Not every language allows the expression of three arguments structurally, be it in the syntax or in the morphology. But this typological restriction does not mean that the existence of three structural arguments is forbidden in general, which many theories suggest. The concept of argument hierarchy seems to be more fruitful than the concept of abstract case because it gives the possibility to extend the number of structural arguments to more than just two.

A language with morphological case also allows dative marking in instances where the respective argument is either the lowest or the highest one; there is no similar option for positional languages.

(3) a. *Ich half dem Jungen (DAT).*
        I helped the boy.
     b. *Mir (DAT) gefiel das Haus.*
        I liked the house.

The case patterns <nom,acc>, <nom,dat> and <dat,nom> in German[5] collapse to just a single transitive verb class SVO in English. Lexical marking is a device that can potentially characterize verb classes in a semantic perspective.

Another area in which semantic factors come into play is the basic asymmetry of transitive verbs. As pointed out already, the higher argument of a transitive verb is likely to be more salient than the lower one, in terms of person, animacy or specificity. These circumstances constitute the direct setting; they are reversed in an inverse setting.

Table 3.   Direct and inverse settings of argument values

direct settings	inverse settings
λy λx VERB(x,y) 3 1 I hit him.	λy λx VERB(x,y) 1 3 He hit me.
λy λx VERB(x,y) -anim +anim The people surrounded the reed.	λy λx VERB(x,y) +anim -anim The reed surrounded the people.
λy λx VERB(x,y) -spec +spec The man hit someone.	λy λx VERB(x,y) +spec -spec Someone hit the man.

In order to avoid ambiguity, arguments must be distinguishable, preferably both in the morphology and in the syntax. Most fundamental is the following constraint.[6]

(4)   Avoid converse settings to be identically marked.

There are several ways to comply with this requirement: by different positions (as in a SVO language), by different sets of morphemes (such as *me* vs. *I*), by different morphological cases (accusative vs. nominative), by different agreement patterns, or other means. One, under cognitive aspects rather economic, device is that only particular kinds of inverse settings are marked (for instance, by ergative or accusative), while the corresponding direct settings are not. Such a split device (leading to a differential subject or object marking) then constitutes another way in which semantic factors enter argument linking (see below, section 4).

In summarizing, the factors that determine argument realization involve the following:

1.   Argument hierarchy: The argument roles of a predicate are ordered in a unique way.
2.   Semantic roles: The argument roles of a predicate can be distinguished by their participation in the 'event' denoted by the verb (such as agent, patient, or experiencer).
3.   Sortal (or referential) salience: The arguments of a predicate can be distinguished by their inherent values (such as person, animacy, or specificity).
4.   Informational salience: The arguments of a predicate can be distinguished by their informational status (such as topic and focus).

As a matter of fact, informational salience is nearly independent of semantic features of the verb (in principle, every argument can be focused upon), and thus cannot constitute an efficient argument linking device by itself, but it can be imposed on other systems. Regarding the observation that objects are more natural candidates for focus than subjects, it is interesting to note that the majority of Mayan languages developed an agent focus morpheme, which signals focus for the higher argument (Aissen 1999a, Stiebels 2003b), while some Bantu languages developed an antifocus morpheme, which blocks focus for the lower argument (Kimenyi 1980, Morimoto 2002). These facts are expected, while the reverse circumstances (a patient focus morpheme, or a morpheme that blocks agents from focus) are highly unexpected.

Sortal values often depend on the semantic content of a verb, thus, sortal salience can effectively distinguish the arguments for certain semantic classes of verbs. Sortal salience is a dominant factor in the Algonquian languages, where it is encoded both in the stems and in the morphology. The following examples are taken from Potowatomi (Hockett 1948).

(5) Sortal salience encoded in stems
    a. Inanimate objects: *n-wapt-an*   'I see it.'
        1-see-3
    b. Animate objects: *n-wapm-a*   'I see him.'
        1-see-DIR

(6) Sortal salience encoded in inverse morphology
    a. Direct marker: *k-wapm-a-wa*   'You (pl) see him.'
        2-see-DIR-pl
    b. Inverse marker: *k-wapm-ək-wa*   'He sees you (pl)'
        2-see-INV-pl

The direct and inverse markers take reference to both the argument hierarchy and the salience hierarchy imposed on the arguments (Wunderlich 1996); an argument linking device that is exclusively based on sortal salience would be rather unexpected.

In the following, I will concentrate on semantic roles in section 2, and argument hierarchy in section 3. I will argue that considering argument hierarchy is a much better device to indicate the role of arguments in a verb than considering their semantic participation. Finally, section 4 deals with the two already indicated ways in which semantic factors enter argument linking: by a lexical feature, or by a markedness condition for the argument values.

2. Semantic roles

Considering some recent stages of linguistic theorizing, one can observe that progresses in structural generalization are counter-balanced by attempts to give semantic factors more dominance. For instance, generative semantics was the answer to generative syntax, and later, Lexical Functional Grammar (LFG, Bresnan 1982) and Lexical Decomposition Grammar (LDG, Wunderlich 1997a,b), just to name these two, answered the purely syntactic accounts. Similarly, the increasing reference to semantic (thematic) roles reflects the need to overcome certain short-comings in the theory of abstract case. It is astonishing that many researchers try to find generalized semantic roles (such as proto-agent and proto-patient) with the same vocabulary that describes simple semantic roles. A generalization that counts for the grammar must lead to a certain structural property; one possibility is that 'agent' is generalized to 'the higher argument', and 'patient' to 'the lower argument'. In the following I will argue that semantic roles, besides of their function of constituting a convenient *façon de parler,* do not play any theoretical function.

Semantic roles characterize the function of the participants in the event denoted by the verb, and thus depend on the semantic content of the verb. Consequently, there are at least so many semantic roles as they are verbs, or small semantic subclasses of verbs. Larger semantic classes could be characterized by more general semantic roles, but still the question remains: how many classes do exist, and how are they defined? More general semantic roles also compete with eventive (or aspectual) roles (such as CAUSE and RESULT), which characterize the semantic function of the possible subpredicates of a verb.

The following examples (cited from Maling 2001: 433) show a collection of ditransitive clauses of Korean in which the putative semantic role of the dative argument is annotated.

(7) Datives in Korean ditransitive constructions, associated with a semantic role

    a. *Elun-tul-i   ai-tul-eykey senmul-ul   cwu-ess-ta.* Recipient
       adult-pl-NOM child-pl-DAT gift-ACC   give-PAST-IND
       'Adults gave children gifts.'

    b. *Ku sonyen-un tongmu-eykey phyenci-lul ssu-ess-ta.*
       the boy-TOP   friend-DAT   letter-ACC write-PAST-IND
       'The boy wrote (his) friend a letter.'

    c. *Chinkwu-ka   na-eykey ku muncey-lul   malha-yess-ta.* Hearer
       friend-NOM   I-DAT   the problem-ACC talk-PAST-IND
       '(My) friend talked to me about the problem.'

    d. *Na-nun   Tom-eykey cenyek-ul   sa-(a)ss-ta.*   Beneficiary
       I-TOP   Tom-DAT   dinner-ACC buy-PAST-IND
       'I bought Tom dinner.'

    e. *Na-nun   noin-eykey   panci-lul   sa-(a)ss-ta.*   Source
       I-TOP   old.man-DAT ring-ACC   buy-PAST-IND
       'I bought a ring from an old man.'

    f. *Na-nun   ku-eykey   panci-lul   ppayas-ass-ta.*   Source
       I-TOP   he-DAT   ring-ACC   rob-PAST-IND
       'I robbed him of a ring.'

Rather than speculating of whether Goal is a generalization that also captures Source, a much better way is considering the respective dative argument to be medial, either in a representation such as {ACT(x) & BECOME POSS(y,z)} or in a representation such as {ACT(x) & BECOME ¬POSS(y,z)}. Hence, the generalization is that the dative argument is associated with similar positions in semantic decompositions.

    Similarly, individual sentences with a dative argument can be ambiguous between several readings. These readings could be distinguished by using semantic roles, but it is likewise possible to state for each reading some predicate that contributes this reading. The following Albanian examples, adapted from Kallulli (1999: 269–270), illustrate readings induced by non-active morphology and correlated with a higher predicate: accidental causation in the aorist (8a–i), and a 'feel like' reading in the present (8b–i). Both sentences also allow readings with POSS, which are generally available for datives.

(8)   Datives and non-active morphology in Albanian

a.   *Ben-it   i-u   thye   dritar-ja.*
      Ben-the.DAT   he.DAT-NONACT.AOR   break.3sg   window-the.NOM
      i. 'Ben accidentally broke the window.   Causer
      ii. 'Ben's window (suddenly) broke.'   Possessor
      iii. 'The window broke to Ben.'   Maleficiary

b.   *Ben-it   i   lexo-het   një libër.*
      Ben-the.DAT   he.DAT   read-NONACT.PRES.3sg   a   book.NOM
      i. 'Ben feels like reading a book.'   Affectee
      ii. 'One can read Ben's book.'   Possessor
      iii. 'One can read a book to Ben.   Beneficiary

The notion of generalized semantic roles can be useful only if it exceeds the number of morphosyntactic distinctions of arguments. If transitive verbs can appear with several case patterns, some of them could be considered as lexically marked. The appearance of lexical marking may thus reflect certain (non-canonical) semantic roles, at least in some instances. However, in no way do semantic roles determine whether a verb is lexically marked or not. There are many minimal pairs of nearly synonymous verbs in which only one of these verbs is marked lexically. The following examples are from Icelandic (Maling 2002: 3).

Table 4.   Nearly synonymous verbs governing dative (lexically marked) vs. accusative (by canonical realization)

<nom,dat>	<nom,acc>
hjálpa 'help'	aðstoða 'help, support'
unna 'love'	elska 'love'
mæta 'meet'	hitta 'meet'
<nom, dat, dat>	<nom, dat, acc>
úthlata 'distribute, hand out'	skammta 'hand out, ration'
skila 'return, give back'	afhenda 'hand over, give back'

Knowing the semantic role of an argument does not help us much to predict how the argument is realized. One good example in question is the experiencer role, as it turns up in verbs describing mental effects or attitudes. It has been debated whether experiencers are entities in which certain effects

become manifest or rather entities that project their internal states onto an external target. Both alternatives are possible, as shown by transitive verbs from German, where the experiencer can be the higher or the lower argument.

(9) Experiencers in subject or object position
  a. *Ich fürchtete den Sturm.*   *experiencer – target*
      'I feared the storm.'   NOM   ACC
  b. *Der Sturm ängstigte mich.*   *stimulus – experiencer*
      'The storm frightened me.'   NOM   ACC

With an experiencer in the higher role it is also possible that this role is lexically marked for dative, so that exceptionally the nominative occurs with the lower role.

(10) Lexically marked experiencer role
  a. *Der Junge mag den Hund.*   *experiencer – target*
      the.NOM boy likes the.ACC dog   NOM   ACC
  b. *Dem Jungen gefällt der Hund.*
      the.DAT boy likes the.NOM dog   DAT   NOM

Furthermore, experiencers of intransitive verbs can be structurally 'downgraded' by the occurrence of an expletive subject. However, these experiencer verbs can also be inherently reflexive.

(11) Experiencer verbs with an expletive subject (a) or with an inherent reflexive (b).
  a. *Ihn   ekelte   es*   (vor Spinnen).
      he.ACC   disgusted it   (at spiders)
      'He was disgusted (at spiders).'
  b. *Er   ekelte   sich*   (vor Spinnen).
      he.NOM   disgusted himself (at spiders)
      'He was disgusted (at spiders).'

Obviously, a language such as German has no general solution of how to realize experiencers grammatically. German, as well as any other language, developed some structural generalizations for the realization of arguments, including certain types of impersonal constructions, and transferred these structural means historically, not taking reference to individual semantic types of verbs. Thus, if individual types are concerned, several options are

available. In the case of 2-place experiencer verbs of German, the best we can say it that experiencers are realized by nominative or dative as the higher argument, otherwise by accusative, depending on further factors;[7] however, dative subjects overwhelmingly are experiencers.

The concept of semantic role becomes less interesting for stative verbs, which lack a dynamic identification of roles,[8] and it breaks down with symmetric verbs, which, by definition, allow each argument in each position. There are always some classes of verbs for which semantic roles cannot predict argument linking

(12) Stative verbs
      a. The box contains apples.   *container   content*
      b. Apples fill the box.   *content   container*
      c. A wall surrounds the garden.   *surrounder   surrounded*

(13) Symmetric verbs
      a. Peter and Erna met (each other).   *Both are targets*
      b. Peter met Erna.
      c. Erna met Peter.

Another field in which the concept of semantic roles would have to prove useful is the formation of complex predicates. Causatives add a causer, affectives (in Basque) add an experiencer, and assistives (in Quechua) add an assistant in higher position (thereby downgrading the former agent to a causee or assistee), while applicatives add a beneficiary, an instrumental or a location in lower position (for some overview see Comrie 1985, Baker 1988, Stiebels 2003a). Similarly, resultatives add an object on which the result becomes manifest in lower position, and possessor 'raising' adds a possessor in either a higher or a lower position (Wunderlich 2000a). All these operations introduce a new semantic role in virtue of the fact that they add a predicate with a further argument. Therefore, the notion of semantic role is not necessary for capturing the resulting grammatical effects. More explanative is the notion of argument hierarchy because for argument linking it is more important whether the additional argument is a higher or lower argument. Some of the involved operations may also be characterized by an eventive role: causatives add a causing event, and resultatives add a resulting state.

That semantic roles only have little grammatical function is also obvious in the formation of verb-verb compounds (and, similarly, in serial verb constructions and control structures). If two verbs are tightly combined, at

least one argument must be shared, but mostly not because of identity of semantic roles. Instead, the decision is made either on structural grounds or in a broader semantic perspective, trying to integrate two events into a single one.

In no way can semantic or eventive roles motivate the systematic gaps occurring in complex predicates, an issue that is addressed in the next section.

3.   Argument hierarchy and structural arguments

For all the above mentioned operations forming complex predicates the concept of argument hierarchy is most promising: either a higher or a lower predicate is added and thus licenses a further argument connected with it. These operations often indicate a sequence of lexical compositional steps by overt morphology (Baker 1985, Stiebels 2002, 2003a). Other instances, lacking overt morphology, but with similar morphosyntactic effects, as well as similar semantic readings, can be framed similarly. There is good reason to assume lexical decomposition for basic ditransitive verbs, too, in the way suggested in (2) above. Given lexical decomposition of complex predicates, argument hierarchy can be predicted.

There is, however, one question in this context that must be answered: Why are certain arguments of a complex predicate blocked from realization? Neither semantic roles nor sortal factors can succesfully explain why this does happen. Consider the resultatives in (14). Both the intransitive verb + adjective combination and the transitive verb + adjective combination project on a 2-place construction, in which the result object (not selected by the verb) is preferred over the object of the base predicate (if transitive). In the semantic representation, the result predicate must be lower than the cause predicate, as required from a universal COHERENCE postulate (Kaufmann and Wunderlich 1998).

(14)   Strong resultatives
   a. The joggers run their shoes threadbare.
      $\lambda z \, \lambda x \, \{RUN(x) \ \& \ BECOME \ THREADBARE(z)\}$
   b. The guests drank the wine cellar empty.
      $\lambda z \, \lambda x \, \{DRINK(x,y) \ \& \ BECOME \ EMPTY \ (z)\}$

In (14b), the substance being drunk (y) cannot be realized structurally because y is in a 'wrong' structural position, as I will argue in the follo-

wing. There is no good semantic explanation why y is blocked from realization, in particular if dative is available for a medial argument. In the locative alternation shown in (15) the locatum argument (y) can be human, but is at best realized obliquely (with the preposition *mit* 'with') rather than by structural case.

(15)   Locative alternation
    a. *Sie setzte ihre Verwandten in die erste Reihe.*
      'She placed her relatives in the first row.'
      $\lambda P \, \lambda y \, \lambda x \, \{SET(x,y) \, \& \, P(y)\}$
    b. *Sie besetzte die erste Reihe mit ihren Verwandten.*
      'She occupied the first row with her relatives.'
      $\lambda z \, \lambda x \, \{SET(x,\mathbf{y}) \, \& \, BECOME \, LOCATED(\mathbf{y}, AT \, z)\}$

Likewise, if a prefix or particle is added, the object (y) selected by the verb must not be expressed, even if it is human (16). Note that the prefix *er-* and the particle *an* essentially add the same semantic contribution; here, the resulting argument structure is canonically ditransitive (Stiebels 1996, Wunderlich 1997b).

(16)   Prefix and particle verbs
    a. *Sie   erküßte   sich   den Partypreis.*
      she   er-kissed herself.DAT the.ACC party prize
      'She won the party prize through her kissing (people).'
      $\lambda z \, \lambda u \, \lambda x \, \{KISS(x,y) \, \& \, BECOME \, POSS(u, z)\}$
    b. *Sie   küßte   sich   einen Schnupfen an.*
      she   kissed   herself.DAT a.ACC cold   at
      'She got a cold through her kissing (people).'
      $\lambda z \, \lambda u \, \lambda x \, \{KISS(x,y) \, \& \, BECOME \, POSS(u, z)\}$

An even more puzzling example is given in (17); here, both the object and the directional complement of *stellen* are suppressed.

(17)   *Markus stellte den Keller (mit Möbeln) voll.*
    Markus put the cellar (with furniture) full
    'Markus put (*so many things into the cellar*) that (*as a result*) the cellar got full.'

The directional complement obviously competes with another result predicate (*voll* in this case). The following constraint explains why only one of these result predicates can be expressed.

(18)   PREDICATIVE ARGUMENTS. A predicate variable must occupy the lowest position in the semantic form. (Hence, there can be only one at the time.) (Wunderlich 2000a)

We have still to explain the occurrence of object gaps. If one shifts from semantic roles to eventive roles (such as CAUSE and RESULT), associated with the involved predicates rather than with their arguments, one could state that arguments of a result predicate take preference over those of a cause predicate. However, this explanation fails in examples with an ORIENTATION predicate added by the particle, illustrated in (19).[9] Here, the object of the verb again can only be expressed obliquely.

(19)   *Er sang die Freundin mit Arien an.*
       he sang the girlfriend with arias at
       'He sang arias to his girlfriend'
       $\lambda z \, \lambda x \, \lambda s \, \text{SING}(x,y)(s) \, \& \, \text{DIRECTED.TOWARDS}(z)(s)\}$

This suggests that the CAUSE-RESULT relationship as a possible semantic factor for suppressing arguments is generalized to other types of predicates. Hence, the crucial insight is that objects of a first predicate are never structural arguments.

Before formalizing this result, let us consider some interesting variation of verb-verb compounds in Japanese in which the first verb is transitive and the second intransitive. What is the resulting argument structure? First, resultative compounds show a similar behavior as the resultative constructions considered above: the object of the first verb can only be expressed obliquely.

(20)   Resultative verb-verb compounds in Japanese
       *Yumiko ga   {*wain o/ wain de}   nomi-tubure-ta.*
       Yumiko NOM   {*wine ACC/wine with}   drink-collapse-PAST
       'Yumiko drank herself unconscious (*with wine).'
       $\lambda x \, \{\text{DRINK}(x,y) \, \& \, \text{COLLAPSE}(x)\}$

Rather unexpected is that in some resultative compounds the agent of the first verb must be suppressed.

(21)   Unexpressed agents in Japanese verb-verb compounds
    a. *suupu ga   ni-tamat-ta.*
       soup NOM   boil (tr.)-be.packed-PAST
       'The soup boiled down.'
    b. * *Taroo ga   suupu o ni-tamat-ta.*
       * Taroo NOM   soup acc boil (tr.)-be.packed-PAST
       'Taro boiled the soup down.'
       $\lambda y \; \{\text{BOIL}(x,y) \; \& \; \text{BECOME BE.PACKED}(y)\}$

As in (20), the surface ordering of the verbs corresponds to the semantic ordering of the predicates; both ICONICITY (*cause* precedes *result* in the morphosyntactic structure), and COHERENCE (CAUSE commands RESULT in the semantic form) are satisfied. Japanese is, however, subject to a further restriction because the morphological head is to the right.

(22)   SUBJECT HEAD: The highest argument of a verb-verb compound must be identical with the highest argument of the morphological head (which is the second verb in Japanese V-V compounds). (Gamerschlag 2000)

Accordingly, the agent of the first verb cannot be expressed (as in (21)), except it is identified with the result object (as is (20)). Thus, either the subject or the object of a transitive verb in nonhead position must remain unexpressed. But, surprisingly, in a manner compound both subject and object of the first verb (the nonhead predicate) *can* be expressed.

(23)   *Watasi wa tegami o   sagasi-mawat-ta.*
     I TOP   letter ACC   search-**go.around**-PAST
     'I looked around for the letter'
     $\lambda y \; \lambda x \; \{\text{GO.AROUND}(x) \; \& \; \text{SEARCH}(x,y)\}$

Morphologically, *manner* precedes *path*. But since COHERENCE is irrelevant in the combination of these two predicates, the ordering in the semantic form follows the default requirement: the head predicate (PATH) commands the non-head predicate (MANNER). Given then the semantic form in the last line of (23), nothing prevents both x and y to be expressed structurally.

    These three instances of Japanese transitive-intransitive compounds thus illustrate three different possibilities: one in which an object gap occurs, one in which a subject gap occurs, and a third one in which both subject

and object are expressed. The choice between these options is determined by two factors: (i) which argument of the first verb is identified with the argument of the second verb (which in turn depends on sortal possibilities); (ii) whether there is a specific condition for composing the semantic form (which in turn depends on the eventive roles involved): a cause predicate must command the result predicate, but no such condition holds if a manner predicate is involved. Under the theory advocated here, these two choices suffice to predict the resulting argument structure of the compound (Gamerschlag 2003).

In the remainder of this section I will briefly outline some general aspects of *Lexical Decomposition Grammar* (LDG), in particular those that relate to argument hierarchy, a central concept of this theory (Wunderlich 1997a,b, 2000a). LDG mainly implements some of the fundamental ideas raised by Bierwisch (1989), see also Bierwisch (this volume); however, differences grew out in the details.

(i) Semantic form (SF) is considered a minimal semantic representation that allows us to predict the grammatical behaviour of a verb. More precisely, SF is a structured tree whose nodes represent logical types rather than grammatical categories, as will be illustrated below. If two verbs are expected to form a complex predicate, both the complex SF and the morphosyntactic realization have to be determined.

(ii) Semantic notions play a role in order to determine which argument of a basic transitive predicate is the higher/the lower one (e.g. agents are higher than nonagents), as well as which predicate of a complex predicate is the higher/the lower one (e.g. causes are higher than results). These circumstances reflect the internal dynamics of an event: only agents can instigate and control an event, and a causing event can temporally precede but not follow the result.[10] Apparently, only very few semantic notions are necessary to determine the relative rank of both the arguments and the predicates in SF. The ordering of arguments can also be tested by means of the Barss-Lasnik (1986) tests (including anaphoric binding, weak crossover, multiple questions).

(iii) Argument hierarchy is a purely structural notion based on SF. All argument-shifting operations (causative, applicative, possessor extension, locative alternation, prefixation, V-V compounding, etc), regardless of whether they are morphosyntactically overt or not, yield SF structures from which the particular argument hierarchy can be derived (iv), which in turn determines how the arguments have to be realized given a particular morphosyntactic profile of the language (v). Thus, the level of SF is a rather robust generalization of grammar, which allows the speakers to

refrain from all particular semantic knowledge. (Have in mind that there are still possible places at which further semantic knowledge can enter.)

(iv) The question now is how argument hierarchy derives from SF. The answer consists of two parts: DEPTH OF EMBEDDING (Bierwisch 1989) yields a partial ordering of arguments, which is further restricted by STRUCTURAL ARGUMENT (Wunderlich 1997a,b), making use of the notion L(exical)-command (defined for the nodes in SF representing logical types). STRUCTURAL ARGUMENT picks out a unique path from the highest to the lowest argument of a complex predicate; it selects the highest argument of every predicate, and all arguments of the lowest predicate.

(24)   Argument hierarchy
      a.   DEPTH OF EMBEDDING. Argument roles are abstracted according to their relative ranking: the deeper an argument role is embedded in SF, the lower [i.e. more to the left] is its position in the list of abstractors.
      b.   STRUCTURAL ARGUMENT. An argument is structural only if it is either the lowest argument or (each of its occurrences) L-commands the lowest argument. [Hence, every non-highest argument of a nonfinal predicate in SF is nonstructural.]
      c.   L-command is defined as follows: α L-commands β if the node γ, which either directly dominates α or dominates α via a chain of nodes type-identical with γ, also dominates β.

These notions are illustrated in the tree (25) with three arbitrary relational predicates A, B, and C. Only x, u and w L-command the lowest argument z; thus, only these four arguments are structural, and their ordering x>u>w>z is reflected in the list of λ-abstractors (the theta-roles). By contrast, the arguments y and v are nonstructural; they could be identified with other arguments, be gapped (left implicit), or be marked by explicit addressing their semantic role (i.e., obliquely realized).

(25)   Illustration of STRUCTURAL ARGUMENT
       λz λw λu λx {A(x,y) & B(u,v) & C(w,z)}
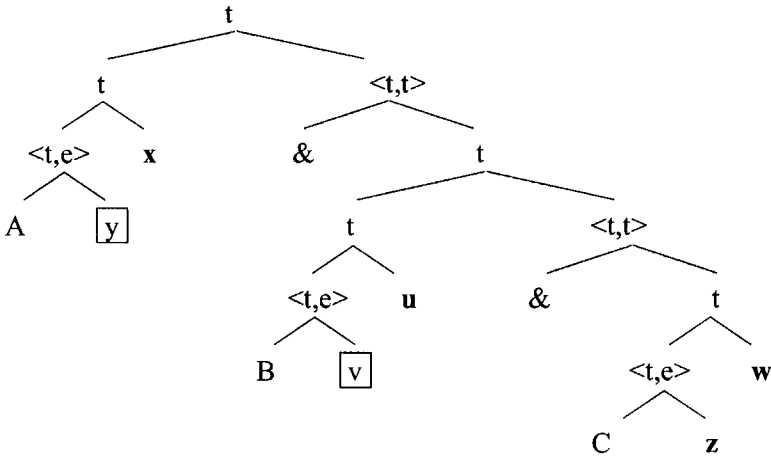
This mechanism is an optimal compromise between economy and expressivity. It is economical in reducing the number of possible structural arguments, and it is expressive in that every predicate is represented by an argument. Moreover, the special function of the lowest argument is respected: only this argument can be incorporated.

(v) Given the sequence λz λw λu λx, a simple feature system encodes each role by just two relative features: [+hr] for 'there is a higher role', and [+lr] for 'there is a lower role'.[11] The same features are used to specify morphological case, see (27), so that the case assignments attributed to the argument roles in (26) turn out to be optimal, hence canonical.

(26)   Featural encoding of the argument hierarchy, and case assignment

lowest	λz	λw	λu	λx	*highest*	
	+hr	+hr	+hr	−hr		
	−lr	+lr	+lr	+lr		
	ACC	DAT	DAT	NOM	accusative system	
	NOM	DAT	DAT	ERG	ergative system	

(27)   Structural cases:
       DAT   [+hr,+lr]
       ACC   [+hr]
       ERG   [+lr]
       NOM   [ ]

ERG is optimal for the highest argument, and ACC for the lowest argument, while all medial arguments are best realized by DAT. The choice of NOM follows from the requirement that an unmarked case is preferred (DEFAULT). Furthermore, UNIQUENESS forbids a particular case to occur more than once, that is, double-dative in 4-place verbs as in (26) is highly dispreferred though not excluded (Wunderlich 1997a, Joppen-Hellwig 2001). The following possessor-raising instance of Chocktaw (Muskogean) illustrates the accusative pattern of (26) with double-dative; only the 3rd person theme remains unmarked on the verb (Davies 1986: 54, 59).

(28)   Double-dative in Chocktaw
       Alla iskali   chim-im-a:-li-tok.
       child money   2.DAT-3.DAT-give-1.NOM-PAST
       'I gave your money to the child.'

     (vi) There is a general asymmetry involved: it is better to mark a lower argument than a higher one (Stiebels 2000, 2002).

(29) $[+hr] > [+lr]$

The higher argument is more prominent for raising and control structures, as well as for topicalization, and therefore should be unmarked morphologically. This asymmetry gives rise to the fact that cross-linguistically, ergative systems are much rarer than accusative systems, and it explains why ergative morphology can be coexistent with accusative syntax.
     (vii) The two features [+hr] and [+lr] encode a sequence of theta roles from its two endpoints, the lowest or the highest role. There is the logical alternative for encoding a sequence of roles by just one feature recursively (similar to counting).

(30) λz λw λu λx
       +hr   +hr   +hr   −hr
       +hr   +hr   −hr
       +hr   −hr

Since the morphological combination of [+hr] and [−hr] features is destructive, morphological cases that adapt to such an encoding system cannot exist. However, the ordering expressed in (30) can be mapped onto the linear order of syntactic arguments, which seems to be the default option for all languages. Positional linking systems with SVO, where only the

highest argument precedes the verb (exemplified in the Bantu languages), mostly realize the next-to-highest argument (u) as the 'primary object'. All the other objects (w, and z) have to follow the primary object. In positional linking systems the perspective of the lowest argument, characterized by the feature [−lr], does not play any role. Many languages also show morphological systems in which the recipient gets priority in object marking and passive; as predicted, these systems, which ignore the feature [lr], always lack dative.

4.   Structural case in the context of semantic factors

Categorial generalization could be *the* major feature of the human language capacity.[12] Once a category is introduced, it is better to follow the category than semantic classifications. For each category there are 'prototypical' instances, which are semantically defined and thus allow the language learner to acquire the category. In the course of generalization semantic factors become increasingly downgraded: once you have a category apply it for all instances. However, semantic factors remain present both as content and context. For the sake of semantic expressivity, categories may be relativized for some semantic factor. Theoretically, this can be done in two different ways, by marking the lexical item itself ('this is an exception'), or by marking the context ('this is an instance of an unusual context'). Therefore, one expects two kinds of reaction if a grammar has adapted a structural concept such as 'argument hierarchy determines the realization by case'.

The question is: How can structural case patterns become sensitive for semantic factors? Typological inspection reveals that indeed two reactions appear again and again, in nonrelated languages: (i) Semantic roles that differ from prototypical agents or patients are signalled by an additional lexical specification, which leads to either a noncanonical case pattern (such as 'experiencer dative') or to a pseudo-role (to be realized by expletives or inherent reflexives). Of course, lexical marking of this kind can become historically opaque.

(ii) The marked cases, bearing some processing load, are reserved for sortal values that are 'untypical' for an argument, while arguments with 'typical' values are realized by a less specified case (usually nominative). This phenomenon has been called 'differential object (or subject) marking'.

Lexical marking by a case feature leads to a noncanonical case pattern by which the respective class of verbs can be identified. This is exemplified

by two examples from German. The feature [+lr] invites the inference that a proto-agent property is present ('an argument that exerts some control by itself'), and the feature [+hr] invites the inference that a proto-patient property is present ('an argument that is somehow affected'). Together with the respective default feature for a lower or a higher argument, in both instances a feature combination is achieved for which dative is optimal. Therefore, any attempt to capture an exceptional dative by just one semantic role must fail under this approach.[13]

(31) a. *Sie folgte ihm.*
          She.NOM followed he.DAT

     b. λy λx FOLLOW(x,y)
       lexically   +lr
       default   +hr
               DAT

(32) a. *Ihr gefiel er.*
          She.DAT liked he.NOM

     b. λy λx LIKE(x,y)
       lexically   +hr
       default   +lr
               DAT

Lexical marking by a pseudo-role preserves the canonical pattern. A pseudo-role in the highest position (an expletive argument) virtually lowers the true argument, and thus invites the same inference as the feature [+hr] does ('is affected'). In contrast, a pseudo-role in a non-highest position (a reflexive argument) virtually raises the true argument, and thus invites the same inference as the feature [+lr] does ('exerts control'). Although the examples, repeated from (11) above, can refer to the same state of affairs, they slightly differ in just this respect. If an actor played the scene, only (34) would be adequate, but if one wants to describe how someone actually reacted in the presence of spiders, the construction in (33) is preferred.

(33) a. *Ihn   ekelte   es   (vor Spinnen).*
          he.ACC   disgusted   it.NOM   (at spiders)
          'He was disgusted (at spiders).'

     b. λz λx λy DISGUST(x,z)
       vor
           ACC   EXPL

(34) a. *Er*   *ekelte*   *sich*   *(vor Spinnen).*
      he.NOM   disgusted   himself   (at spiders)
      'He was disgusted (at spiders).'

    b. λz   λy   λx   DISGUST(x,z)
     vor
           REFL   NOM

In turning to the second type of phenomena in which semantic issues interact with argument hierarchy, the reader is reminded at the observation in the beginning of this article: the higher argument tends to be more salient in terms of person, animacy and specificity than the lower argument.[14] All these notions refer to sortal or referential values of the arguments, which they have independent of their semantic role in principle. The argument linking system can be sensitive to these contextual values by a differential object or subject marking, i.e., by a split between marked and unmarked case.

The concept of harmonic alignment of scales (Prince and Smolensky 1993/2004) can deal with such a phenomenon. Let me first consider the proposal made by Aissen (1999b, 2003). According to her account, harmonic alignment of the argument hierarchy in (35a) and one of the semantic scales in (35b) yields the preference scales in (35c), to be read as 'local person subjects (i.e. 1st or 2nd person) are preferred over 3rd person subjects' etc., while the reverse readings hold for objects. The reversal of these preference scales then gives the markedness hierarchies in (35), to be read as 'Avoiding 3rd person subjects is better than avoiding local person subjects' etc.

(35) Harmonic alignment of scales (Aissen 1999b)
    a. Argument hierarchy:
      subject (sb) > object (ob)
    b. Contextual semantic scales:
      person: loc   > 3
      animacy: +anim   > −anim
      specificity: +spec   > −spec
    c. Harmonic alignments:
      sb/loc   > sb/3   ob/3   > ob/loc
      sb/+anim > sb/−anim   ob/−anim > ob/+anim
      sb/+spec > sb−spec   ob/−spec > ob/+spec

    d. Contextualized markedness hierarchies:

*sb/3	» *sb/loc	*ob/3	» *ob/loc
*sb/–anim	» *sb/+anim	*ob/+anim	» *ob/–anim
*sb/–spec	» *sb/+spec	*ob/+spec	» *ob/–spec

These markedness hierarchies serve to describe of whether a given argument is preferably encoded as object (in an active clause) or as subject (in a passive clause), they do not imply anything about the choice between marked and unmarked case.[15] The crucial insight for understanding the relationship between harmonic alignment and morphological marking has been contributed by Comrie (1989) and Dixon (1994): Only arguments that deviate from what is expected should be encoded by a marked case. 3rd person subjects are less expected than local person subjects, and local person objects are less expected than 3rd person objects; therefore 3rd person subjects are preferably marked by ergative, and local person objects are preferably marked by accusative. (Similarly for the other types of salience.)

    This insight leads to the alternative proposal in (36). The relevant scale from which one has to start is not the argument hierarchy itself but the ranking of morphological features in (36a), already introduced in (29). The markedness hierarchies in (36c) now give the desired results: 'Avoiding ergative for local person is better than avoiding ergative for 3rd person', etc.

(36) Harmonic alignment in the presence of morphological factors (Stiebels 2000, 2002)[16]

    a. Morphological features:

       [+hr] > [+lr]   (ACC > ERG)

       ('It is better to mark objects than subjects')

    b. Contextual semantic scales:

person:	loc	>	3
animacy:	+anim	>	–anim
specificity:	+spec	>	–spec

    c. Contextualized markedness hierarchies:

*ERG/loc	» *ERG/3	*ACC/3	» *ACC/loc
*ERG/+anim	» *ERG/–anim	*ACC/–anim	» *ACC/+anim
*ERG/+spec	» *ERG/–spec	*ACC/–spec	» *ACC/+spec

On the basis of this result one expects possible effects in the lexical inventory of morphemes, as well as in the distribution of morphemes forming possible case patterns for a clause. The markedness constraints relate to economy; their effect is counterbalanced by faithfulness constraints relating to expressivity, such as Max(+hr) 'Realize the feature [+hr] by an accusative' and Max (+lr) 'Realize the feature [+lr] by an ergative'. These constraints can differently interpolate with the markedness hierarchies in (36c), thereby giving the individual languages their profile.

One of the expectations resulting from (36c) concerns the existence of languages that lack an ERG morpheme for local person, and those that lack an ACC morpheme for 3rd person. A typical instance of a language that meets both of these expectations is Yidiɲ (Australian), which has an ergative set for 3rd person, and an accusative set for 1st and 2nd person. There is also an overlapping region with human demonstratives, which show both an ergative and an accusative morpheme. Similar is Dyirbal, another Australian language, in this case without overlapping.

Table 5.   Gaps in the linker inventory of Yidiɲ (Dixon 1977)

		NOM	ACC	ERG
I	noun and adjective	∅	—	-ŋgu/-du
	DEM: −def, −anim,+gen	waɲi	—	waɲi:ndu
	DEM: +def,+hum	yiŋu	yiɲɟu:ɲ	yiɲɟu: ŋ
II	DEM: +def,+hum	yiŋu	yiɲɟu:ɲ	yiɲɟu: ŋ
	DEM: −def,+hum	waɲa	waɲɟu:ɲ	waɲɟu
III	1sg	ŋayu	ŋaɲaɲ	—
	1du	ŋali	ŋali:ɲ	—
	1pl	ŋaɲɟi	ŋaɲɟi:ɲ	—
	2sg	ɲundu	ɲuniɲ	—
	2pl	ɲund:ba	ɲundu:baɲ	—

Table 6.   Gaps in the linker inventory of Dyirbal (incomplete; Dixon 1994: 10/14)

		NOM	ACC	ERG
I	noun	∅	—	-ŋgu
	DEM: fem.sg	balan	—	baŋgun
	DEM: masc.sg	bayi	—	baŋgul
III	1pl	ŋana	ŋana-na	—
	2pl	ɲurra	ɲurra-na	—

The two constraint hierarchies that account for these inventory gaps (leaving out the overlapping region in Yidiɲ) are the following.

(37)   a.   *ERG/loc » Max(+lr) » *ERG/3
       b.   *ACC/3   » Max(+hr) »   *ACC/loc

Of course, other languages may have other rankings. In particular, there can be rankings concerning properties such as specificity that do not induce gaps in the inventory of morphemes but rather in the realization of nominal arguments, i.e. in the distribution of case patterns for nominal arguments. The rankings in (37) give rise to four types of case patterns which exhibit the involved ergative and accusative splits.

Table 7.   Four possible case patterns

Direct setting (loc/3) 'We see the man.' NOM NOM	Inverse setting (3/loc) 'The man sees us.' ERG ACC
Symmetric setting (loc/loc) 'We see you.' NOM ACC	Symmetric setting (3/3) 'The man sees him.' ERG NOM

In summarizing, the interaction of argument hierarchy with semantic factors yields certain types of either noncanonical or underspecified case patterns. Semantic roles are accounted for by additional features (a relational device) that replace the default features as shown in the lower part of figure (38). 'Typical' sortal (or referential) values are accounted for by blocking the positive features (a purely local device), so that a less specific realization results.

(38) Two ways in which semantic factors can interact with argument
     hierarchy

*+hr	*+lr	markedness constraints result in underspecified case patterns
↓	↓	
λy	λx	VERB(x,y)
+hr	+lr	
↑	↑	
+lr	+hr	lexical features result in noncanonical case patterns
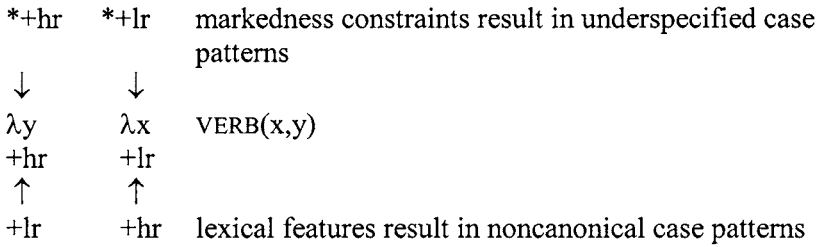
In the remainder of this section I will illustrate the four-way split enabled
by constraint hierarchies such as those in (37) with data from two unrelated
languages: Udi, a Northeast Caucasian language, and Hindi. Only the
conditions under which an ergative split appears differ in these languages.
Moreover, the formal means are slightly different. The Udi accusative
(traditionally called 'dative2') is derived by the suffix /-x/ from the dative
(one of the rare cases in which the accusative is morphologically more
marked than the dative), whereas in Hindi accusative and dative have been
syncretisized. Nevertheless, the general profile of splits is identical in these
two languages.

Table 8.   Four types of split in Udi (NE Caucasian)

Type of split	Characterization	Properties
Ergative split in the inventory	There are no ergative 1st and 2nd person pronouns.	Markedness: *[+lr]/local person
Salience split	In transitive verbs, accusative alternates with nominative. Accusative only occurs with definite, animate or pronominal objects.	Markedness: *[+hr]/low salience
Intentionality split	Intransitive verbs encode intentional body actions ('those that are thought to be controlled') by ergative rather than nominative.	Lexical feature: [+lr] ('controller')
Experiencer split	In transitive verbs, ergative alternates with dative. Dative occurs with perception verbs, but also with other kinds of verbs (exceptionally marked).	Lexical feature: [+hr] ('affected')

The examples below illustrate these statements (Schulze 2001).[17] (39) shows both the lack of an ergative form of the 1st person and the definiteness effect with objects. (40) shows an intransitive verb that assigns ergative under specific conditions. (41a,b) show different choices of subject marking: be²g 'see' with agentive reading selects ergative, while ak' 'see' with experiencer reading selects dative; in addition, (41c) attests that the object variation between nominative/accusative is independent of the case of the subject. The examples also show that subject agreement on the verb is either nominative or dative.

(39) Ergative and accusative split in Udi
   a. *zu   sum   / sum-ax   u<zu>k-sa.*
      I.NOM   bread.NOM / bread-ACC <1sgN>eat-PRES
      'I eat bread/the bread.'
   b. *śe-t'-in   sum   / sum-ax   u<ne>k-sa.*
      DIST-t'-ERG bread.NOM   / bread-ACC <3sgN>eat-PRES
      '(S)he eats bread/the bread.'

(40) Intentionality split in Udi
   a. *xinär axsum-ne-xa.*
      girl   laugh-3sgN-LV.PRES
      'The girl is laughing.'
   b. *xinär-en gölö   axsum-ne-xa.*
      girl-ERG much laugh-3sgN-LV.PRES
      'The girl is laughing very much.'

(41) Experiencer split in Udi
   a. *gädi-n-en   sa adamar   be²<ne>g/-i.*
      boy-n-ERG   one man.NOM <3sgN>see-AOR
      'The boy saw (observed) a man.'
   b. *gädi-n-a   sa adamar   a<t'u>k-i.*
      boy-n-DAT   one man.NOM <3sgD>see-AOR
      'The boy saw (perceived) a man.'
   c. *gädi-n-a   adamar-ax   a<t'u>k-i*
      boy-n-DAT   man-ACC   <3sgD>see-AOR
      'The boy saw the man.'

As already mentioned, Hindi exhibits the same types of case split as Udi, with only slightly different conditions.

Table 9.   Four types of split in Hindi

Type of split	Characterization	Properties
Ergative split is aspectually conditioned	Ergative is restricted to perfective forms.	Markedness: *[+lr]/−perf
Salience split	In transitive verbs, accusative only occurs with human, specific-animate or definite-inanimate objects.	Markedness: *[+hr]/low salience
Intentionality split	Some intransitive verbs alternate between ergative and nominative depending on whether the action is deliberately done or not.	Lexical feature: [+lr] ('controller')
Experiencer split	Transitive experiencer verbs (e.g. perception verbs) encode their subject with accusative. (Note that Hindi exhibits accusative-dative syncretism.)	Lexical feature: [+hr] ('affected')

The following examples, taken from Mohanan (1994), illustrate these state-ments. Both (42) and (43) show that the subject is marked by ergative in the perfect, but unmarked (nominative) in the future. In addition, (42) shows that for human objects, always marked by accusative, it is undeter-mined whether they get a definite or an indefinite reading, whereas inani-mate objects in the nominative only get an indefinite reading, as shown in (43).   These examples also illustrate four types of agreement behaviour (F = feminine, M = masculine): no agreement in (42a), agreement with the subject in (42b), agreement with the object in (43a), and agreement with the subject in the presence of another nominative argument, in (43b).

(42)   Ergative split in Hindi, human object

    a. *niinaa-ne*   *baalikaa-ko ut^haa-y-aa.*
       Nina.F-ERG   girl-ACC   lift-PERF-M
       'Nina lifted up a/the girl.'

    b. *niinaa*   *baalikaa-ko ut^haa-eg-ii.*
       Nina.F.NOM   girl-ACC   lift-FUT-F
       'Nina will lift up a/the girl.'

(43) Ergative split in Hindi, inanimate object
   a. *niinaa-ne   roTii   khaa-y-ii.*
      Nina.F-ERG   bread.F.NOM   eat-PERF-F
      'Nina ate bread.'
   b. *niinaa   kelaa   khaa-eg-ii.*
      Nina.F.NOM   banana.M.NOM eat-FUT-F
      'Nina will eat a banana.'

Hindi has a couple of intransitive verbs (such as *cillaa* 'shout', *naac* 'dance'), which alternate between ergative and nominative subjects, depending on whether the action is deliberatively done or not, whereas a few intransitive verbs (*nahaa* 'bathe', c^h $\~i$ $\~ik$ 'sneeze') take ergative subjects only; they are lexically marked with the feature [+lr]. Lexical marking with the feature [+hr] is shown in (44).

(44) Experiencer split in Hindi
         tuṣaar-ko   caand   dik^h-aa.
         Tushar-ACC moon.M.NOM   see-PERF-M
         'Tushar saw the moon'
      (Mohanan 1994:141)

Recall that Hindi does not have an overt dative, and thus shows ACC-DAT syncretism. In the tradition of Hindi grammar it is assumed that the postnominal clitic *-ko* is ambiguous between dative and accusative, a position that is defended by Mohanan (1994) and Butt (1995). One of their arguments is that in all constructions where dative is expected (experiencer subject constructions such as those in (44), and ditransitive verbs with a medial argument), a salience split is lacking. As the examples in (45) show, the medial argument of ditransitive verbs is always realized by *-ko*, and their lowest argument by the unmarked nominative.

(45) Ditransitive verbs in Hindi
   a. *Ravii-ne baalak-ko/*baalak baccaa/*bacce-ko   diy-aa.*
      Ravi-ERG boy-ACC/boy.NOM child.NOM/*child-ACC give.PERF-M
      'Ravi gave a/the child to a/the boy.'
   b. *Ravii-ne gaay-ko/*gaay   kelaa/*kele-ko*
      Ravi-ERG cow-ACC/cow.NOM banana.NOM/*banana-ACC
      k^hilaay-aa
      eat.CAUS.PERF-M
      'Ravi fed a/the cow a/the banana.'

One can nevertheless assume that -*ko* simply is an accusative morpheme (avoiding the problem of ambiguity). The realization of -*ko* is independent of animacy or definiteness just in those contexts in which the underlying role specification is [+hr,+lr]. The highest argument of the experiencer verbs, which is [+lr] inherently, is lexically marked for [+hr], and the medial argument of ditransitive verbs is [+hr,+lr] inherently. It is the existence of the feature [+lr], which blocks the possibility of a salience split regarding [+hr]. The feature combination [+hr,+lr] must always be expressed by maximal means, which is dative if it is available, otherwise accusative. Neither can the lowest argument alternate between accusative and nominative, because UNIQUENESS ('No marked case should appear more than once in a pattern') forbids a second accusative. The constraints assumed in the analysis by Wunderlich (2000b) successfully explain why not every [+hr] argument underlies the accusative-nominative split.

As illustrated above, Udi and Hindi have a quite similar structural case system, with the same types of alternations reflecting semantic factors. In contrast, their agreement systems are relatively poor and exclusively structural; here, Udi and Hindi choose different options. The Udi verb always agrees with the highest argument, regardless of whether it is nominative or ergative; and there are special agreement markers with dative subjects, which are lexically marked. The latter fact shows that agreement still plays some role in the argument linking system of Udi. In contrast, the Hindi verb only agrees with a nominative argument, and in case of double nominative with the higher argument. If no nominative is present, the verb takes the default form masc.sg. The agreement features are reduced to gender and number. Evidently, agreement does not take any part in the argument linking system of Hindi, it has at best discriminative function.

Table 10. Agreement in Udi vs. Hindi

Udi: the verb agrees with the highest argument		Hindi: the verb agrees with the highest nominative argument	
agr.N - NOM		agr - NOM	
agr.N - ERG		ERG	
agr.N - ERG	NOM/ACC	ERG	agr - NOM
		ERG	ACC
agr.N - nom	NOM/ACC	agr - NOM	NOM/ACC
agr.D - DAT	NOM/ACC	ACC	agr - NOM

Although the agreement systems of the languages considered here do not much contribute to argument linking, the impression that this would generally hold is certainly wrong. Many languages exhibit a rich system of head-marking, thereby indicating the argument structure of a verb by pronominal affixes attached to the verb. The structural properties of these head-marking systems are often very similar to those of dependent-marking systems, attributing morphological case to syntactic arguments. The different sets of pronominal affixes often can be described by the same notions as used for morphological case: dative, ergative, accusative, and nominative. The notion of *generalized case* can serve to subsume the common properties of morphological case and pronominal affixes. Both the claim that argument hierarchy is the crucial factor of argument linking and the claim that there are only two ways in which semantic factors can enter structural argument linking also hold for generalized case in general. That is, lexical marking for untypical argument roles, as well as differential object/subject marking in the context of salience factors, should be observed for pronominal affix systems as well, which indeed is true.

If head-marking looses its principal function for argument linking, it might be reduced to an agreement system which is relatively poor for argument linking, for instance, misses the pro-drop property. On the other hand, if free pronouns are clustered to clitics associated with the verb (or an auxiliary), this may be the first step to a head-marking system. One should not expect that in these transitional systems alternatives develop that also reflect the semantic factors considered here. Pure agreement morphemes seem to be too poor to preserve semantic sensitivity, and pure clitics seem to be too structural to react to semantic factors.

5.   Conclusions

Among the languages of the world, generalized case, be it instantiated by morphological case or by pronominal affixation, is not only the most common but also the most effective type of argument linking. I argued that this is so because this type of argument linking widely abstracts from semantic factors and uses argument hierarchy as its central concept. Although in basic 2-place predicates argument hierarchy itself is determined semantically, in all complex or derived predicates it is uniquely determined by L-command, which reflects the structure in which basic predicates are combined. All arguments that do not L-command the lowest argument are blocked from structural realization.

I further argued that there is a small and closed set of structural cases defined by features of argument hierarchy, which guarantees a canonical case pattern for every intransitive, transitive or ditransitive verb. At the same time, this set of structural cases is flexible enough to form noncanonical case patterns under particular semantic conditions. Either an argument position of the hierarchy is specified lexically by an additional feature, or the realization of its feature is made context-dependent. In other words, the particular argument is realized by a case which is more or less specific than in the canonical pattern. The former option concerns the underlying features and therefore can have global effects, whereas the latter option is always locally restricted.

It would not be adequate to describe the global effects as dependencies in a semantic sense; they always follow from two simple global constraints, namely DEFAULT ('Each case pattern should include nominative') and UNIQUENESS ('No case should appear more than once in a pattern') (Stiebels 2000, 2002; Wunderlich 2003), and mostly result in a less specified case for another argument. For instance, the feature [+hr] for the higher argument turns the canonical pattern <nom, acc> into <dat, nom> rather than <dat, acc> because of DEFAULT. The requirement of UNIQUENESS may also trigger semantic case on one of the arguments, as is exemplified in ditransitive verbs in languages that lack dative (Wunderlich and Lakämper 2001).

In this paper, I did not consider positional argument linking, which, however can be captured by similar means. The syntactic ordering of arguments mostly follows the argument hierarchy, regardless of the position of the verb, except that some V-initial languages prefer VOS. This ordering is affected by the informational status of the arguments as topic or focus, but never by semantic factors. A strict SVO positional system is unable to react to the semantic factors considered here.

From the point of typology, thus three linguistic types emerge: (i) languages that do not have acquired the property of generalized case (always languages with a considerable amount of morphology, such as the Algonquian languages with inverse morphology), (ii) languages that do inhere the property of generalized case (languages that must have at least some amount of morphology), (iii) languages that lack any morphology in argument linking (languages that only use SVO positional linking). Languages of the first type use semantic factors for determining argument linking in various ways. Languages of the second type have achieved a structural argument linking system and take semantic factors only additionally to the structural system in just two ways (or three ways, if one

includes the possibility of semantic case). Languages of the third type have lost any systematic way to react to semantic factors, they can only react to pragmatic factors.

Elaborating this view, one might find that these three linguistic types also characterize certain evolutionary stages. For 'early' languages the semantic factors are dominant. In the process of generalization, structural factors may become more important, leaving for semantic factors only some clearly structured ways. Having undergone a process of further generalization, 'late' languages ignore these semantic factors altogether, leaving pragmatic factors as the sole source for alternative argument linking.

Notes

1. The notation $\lambda y \, \lambda x$ VERB(x,y) (as well as its alternative $\lambda y \, \lambda x$ VERB(y)(x)) indicates that x is the higher argument and y the lower argument (which 'more narrowly' belongs to the verb). The higher argument is also called '(logical) subject', and the lower argument is called '(logical) object'. These notions are invariant cross-linguistically, whereas all morphosyntactic notions such as 'grammatical subject', 'direct object' or 'nominative' are language-dependent. Throughout this paper, the event argument of a verb is neglected.
2. The necessity of distinguishing between primary/secondary object versus direct/indirect object has been pointed out by Dryer (1986).
3. 'put' verbs constitute another potential class of ditransitive verbs, characterized by a change of location rather than a change of possession: λz $\lambda y \, \lambda x$ {ACT(x) & BECOME LOC(z,y)}. However, the location predicate is often realized by a prepositional phrase external to the verb, so that no three NP arguments occur with the verb. Pinker (1989), Krifka (2004), Wunderlich (2005) and others have argued that underlying to the 'dative' alternation of English is a shift in semantic representation (location vs. possession). In this paper, I disregard change of location verbs.
4. In a representation such as (2), '&' is an asymmetric coordination, which means that the predicate to the left commands the predicate to the right. In other words: {A & B} is bracketed as [A [& B]]; consequently, x in (2) is higher than both y and z (Wunderlich 1997a,b).
5. Notations such as <nom, acc> characterize the default ordering of arguments in the syntax, which the higher argument to the left. This order is reverse to the ordering of the λ-abstractors (theta-roles) in semantic representations associated with morphological case (ACC NOM. vs. <nom, acc>).
6. This constraint can be violated in certain contexts. Consider the following data from relativization in Welsh (Tallerman 1990: 296, 302). Because the basic word order is VSO, the gap in (ia) renders the relative clause

ambiguous: the gap can be related to either subject or object. This ambiguity, however, is resolved by pronominal doubling in (ib), and by consonant mutation in (ii).

(i)   a. y bachgen a   welodd   y ci
             the boy   COMP saw.3sg the dog
             'the boy who saw the dog'
             'the boy who the dog saw'
      b. y bachgen y   gwnaeth y ci   ei weld
             the boy   COMP did.3sg the dog he see
             'the boy that the dog saw'

(ii) a. y bachgen a   welodd   gi
             the boy   COMP saw.3sg dog (+MUT)
             'the boy who saw a dog'
      b. y bachgen a   welodd   ci
             the boy   COMP saw.3sg dog (−MUT)
             'the boy who a dog saw'

7. As Primus and her collaborators (Klein and Kutscher 2002) have shown, the choice between these structural options does not depend on a finer semantic classification of experiencers, but rather results from historical facts, namely whether a verb with a physical reading has been generalized so to opt also for mental readings.

8. Likewise, semantic roles postulated for the arguments of relational nouns (such as *uncle, nephew, shoulder*) and prepositions (such as *in, on*) would have only little explanatory force.

9. To express explicitly that the singing event is directed towards someone, I have added the situation argument.

10. It is interesting to note that static relational predicates often appear in converse pairs, such as *son-father, under-above*, whereas dynamic predicates mostly do not.

11. Similar features were invented by Kiparsky (1992), but conflicted with markedness considerations. In Kiparsky's system, the single argument of an intransitive verb is most marked (+F1,+F2), while the medial argument of a ditransitive verb is least marked (−F1,−F2), moreover, all morphological markers are defined in terms of minus-values, which in every respect is the opposite to what is desirable.

12. Some researchers believe that recursivity is the major feature, possibly adapted from other systems (such as numbering, spatial navigation, or social relationships) (Hauser, Chomsky and Fitch 2002). Categorial generalization is necessary in order to deal with an increasing vocabulary in economic ways. Once the categories noun and verb and the possibility to convert verbs into nouns have been invented, at least one way of recursion is straightforward. Thus, categorial generalization may have prepared the possibility to invent recursion (Wunderlich 2002).

13. Bornkessel and Schlesewsky (this volume) report that the processing of a dative-nominative word order deviates from that of a nominative-dative word order by a characteristic N400 effect, regardless of whether the verb belongs to the type (31) or (32). They argue that this result is consistent with the assumption that the dative argument is considered a non-macrorole. The result is in fact consistent with much more hypotheses, including the assumption that the dative argument is lexically marked in both instances. However, I would be surprised if *dass ihm sie folgte* und *dass ihm sie gefiel* were processed identically in every respect.

14. Other possible factors are humanness and definiteness, the informativity of the nominal category (demonstrative, pronoun, full noun), and number.

15. For this purpose, Aissen conjoins the markedness constraints with another type of markedness, namely whether the arguments are case-marked or not. This move is unnecessarily complex, and it does not pay regard to the distinction between ergative and accusative. As Stiebels (2002) shows, it also leads to wrong results.

16. For convenience, I use the case names ERG and ACC rather than the respective features, which would be more adequate in the general framework.

17. Both /t'/ and /n/ which precede the case ending are stem augments. The subject marker on the verb is infixed, which is characterized by '<infix>' added to the stem. -xa is a present allomorph, formed from the light verb pesun 'say'.

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Mismatches in semantic-role hierarchies and the dimensions of role semantics

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1. Introduction

The present paper deals with several still unsolved or highly controversial issues in role semantics. One of them is the mismatches in the semantic-role hierarchies found in the literature (cf. Newmeyer 2002: 65). Cf. (1):

(1) a. Agent > ... Patient (general assumption)
     b. Patient > ... Agent (for ergative languages, e.g. Dowty 1991; Van Valin and LaPolla 1997)
     c. Benefactive/Goal/Experiencer > Patient/Theme (e.g. Jackendoff 1972; Givón 1984; Grimshaw 1990; Speas 1990; Pesetsky 1995)
     d. Patient/Theme > Benefactive/Goal/Experiencer (e.g. Dik 1978; Larson 1988; Dowty 1991; Baker 1996)

Some researchers treat role hierarchies as basic (e.g. Dik 1978; Grimshaw 1990). Others derive them from role-semantic information, as the present approach (cf. also Primus 1999), from syntactic deep structure (e.g. Baker 1996) or from an argument selection principle which makes an implicit use of the grammatical hierarchy subject > direct object > indirect object (e.g. Fillmore 1968; Dowty 1991). In all of these cases, this means that the prominence in the semantic-role hierarchy is an epiphenomenon of a deeper prominence. But even if a semantic-role hierarchy is treated as epiphenomenal the question whether there is a systematic explanation for the hierarchization mismatches found in the literature is still open.

An additional problem is that several roles occupy the same position in the hierarchy, e.g. Agent and Actor, Patient and Theme, and Benefactive, Goal and Experiencer. Obviously, roles that are in the same position have some common property, but it is unclear what this property is.

Another controversy is the question whether semantic roles are directly mapped to syntactic structure or to cases. While the first option characteri-

zes generative grammar, the second option is discredited as a superficial phenomenon in both generative and functionalist approaches.

The solution offered in this paper to these issues is based on the assumption that there are different dimensions of role semantics leading to different role hierarchies: these dimensions are involvement and causal dependency. The first dimension pertains to the degree and kind of involvement of a participant in the situation denoted by the verb (section 2). It is congenially captured by the Proto-Role approach of Dowty (1991) whose basic ideas will be implemented in an optimality-theoretic framework. Causal dependency pertains to the distinction between Agent and Patient (section 3). A representational format that captures both involvement and dependency is not a trivial enterprise. The outline of a possible solution will be offered in section 4 of this paper.

As to the mapping issue mentioned above, the paper will reveal that structure and case are sensitive to different dimensions. Morphosyntactic linking, i.e., case in the broader sense, responds primarily to the degree and kind of involvement (section 5), while structural linking responds to semantic dependency (section 6). This challenges the common assumption that structure and case are functionally equivalent means of coding semantic roles and equivalent manifestations of grammatical functions such as subject or object.

Previous research (e.g. Grimshaw 1990; Jackendoff 1990a) and most of the contributions in this volume also acknowledge different semantic-role dimensions and closely related semantic factors that determine syntactic argument realization. These are discourse and reference relations (cf. Bisang, Bossong, Wunderlich, this volume), hierarchical decomposition structure (cf. Wunderlich, this volume), event structure (cf. Piñango, this volume) and sortal selection (cf. Bossong, Wunderlich, this volume). Some contributions also reveal that there are different types of grammatical functions (cf. Bickel, Bornkessel and Schlesewsky, Van Valin, this volume). Closely related to our approach (cf. also Primus 1999) is the co-argument dependency hierarchy of Bornkessel and Schlesewsky and their dissociation between case and structural relations. The present approach extends this general line of research by exploring distinctions that have not been dissociated systematically and by connecting them to the division of labour between syntactic case relations and syntactic structural relations. The mismatches in semantic-role hierarchies that are found in the literature are to a large extent due to an indiscriminate view on involvement and dependency and their different syntactic coding by case and structure, respectively. By keeping these factors apart we can also explain which kind

of hierarchy is preferred in which kind of approach and for which kind of data, as will be shown in the following sections of this paper.

2. Involvement

Following Dowty (1991) semantic roles are viewed as cluster concepts, which are defined by a set of entailments of a class of predicates with respect to one of their argument types. The properties (or entailments) characterizing the Agent Proto-Role are listed and abbreviated as basic predicates in (2):[1]

(2) a. ctrl(x,s)   x controls the situation s denoted by the
                                 predicate
     b. exp(x,y)   x is sentient of y
     c. phys(x,y), phys(x)   x physically contacts or moves y, x moves
                                 or is active
     d. poss(x,y)   x possesses y

(2) lists both one-place and two-place basic predicates in which x is the variable for the Proto-Agent. Each of these basic predicates is semantically independent, though some of them tend to co-occur (e.g. control and movement) and one property may unilaterally imply another (e.g. control implies sentience). Control is used here as a more general term for volitionality or intentionality. It occurs in isolation with verbs such as in *John refrains from smoking*. Sentience comprises an emotion, a sensation, a specific mental attitude or the awareness of the situation denoted by the verb. Verbs which only have this role-semantic component are *like* and *fear* in English. Physical involvement is attributed to any form of activity, even for the first argument of *look at*. Verbs having possession as the only role-semantic component are *own* and *have* (see section 3 for further comments).

Individual semantic roles can be defined on the basis of the list of properties for a Proto-Role. Agents in the narrower sense have all Proto-Agent properties, with control being the crucial factor. Actors or Causers have all Proto-Agent properties except control. Experiencers in the traditional sense have no other agentive properties besides sentience. The Proto-Role approach also allows for arguments having both Proto-Agent and Proto-Patient properties. Such a role is usually called Recipient, Addressee or Benefactive and is found with verbs denoting a change in

possession (*x gave y something z, x baked y a cake z*) or a change in sentience (*x told y a story z, x showed y a picture z*). As a Possessor or an Experiencer, the argument *y* in these examples is a Proto-Agent relative to the third argument *z*. At the same time it is a Proto-Patient relative to the first argument *x*, which causes the change in possession and sentience (cf. also the analysis of the verb *geben* 'give' in (4) below). The cluster concept defined by this combination of agentive and patient-like properties is abbreviated in the present approach as Proto-Recipient, for convenience (cf. also Primus 1999: 54).

In sum, the way an agent-like participant is involved in the situation denoted by the verbal predicate is nothing new to the linguistic community: volition or control, change or movement, sentience and possession. For empirical reasons, the list can be amended in various ways without affecting the logic of the proposed constraints: one can substitute one basic concept with another (e.g. volition by control), split a concept into more basic ones (e.g. control into volition, responsibility, etc.) or drop it altogether. Such steps, however, are not crucial for the main line of argumentation in the present paper.

3.   Dependency and Proto-Patient

The most important departure of the present approach from Dowty is the basic status given to causation and to the distinction between independent and dependent involvement. In our view, causation is not an additional Proto-Agent property, but rather the underlying criterion that distinguishes the properties of Proto-Agent and Proto-Patient from each other. The Patient Proto-Role is defined by a co-argument dependency relation (cf. also Primus 1999, Bornkessel and Schlesewsky, this volume): its kind of involvement depends on the kind of involvement of another participant, the Proto-Agent. The list of properties characterizing the Proto-Patient is derivable from the basic notions involved in the definition of the Proto-Agent. Thus, for instance, causal affectedness in Dowty's Proto-Patient list is the converse of the causer property in the Proto-Agent list. In the present approach, the converse relation is generalized over all involvement properties: controller/controlled, mover/moved, experiencer/experienced ("stimulus"), possessor/possessed, etc.[2]

As to a deeper explanation for this dependency, we will take Lewis' (1973) dependency view on causation as a starting point: if an 'object' (i.e., event) had not been, the other 'object' i.e., event) would never have

existed. For our purposes, this criterion can be reformulated as follows: If a participant would not have a specific property, the event denoted by the predicate and the specific properties of the other participants in that event would not obtain.

The causation prototype is physical, mechanical causation. A well-known example is a rolling ball causing the movement of another ball. There must be a crucial asymmetry in the movement of the two objects in order to establish a causal relation. In situations where both participants move, e.g. *John threw the ball*, *John* is the Proto-Agent and *the ball* is the Proto-Patient by the criterion of causal dependency: If John would not have moved as specified by the meaning of *throw*, the ball would not have moved as specified by the meaning of *throw* either.

The other causal notions are psychological. Agents pursue goals and act voluntarily upon entities whose change is not necessarily physical and temporarily immediate (cf. the verbs *threat, console* or *promise*). The notion of control, the characteristic property of Agents and action verbs, is a special case of causation (cf. von Wright 1971; Leslie 1995). Imagine, for instance, a situation denoted by the sentence *Peter was working*: if Peter would not have had the impulse to act in a specific way and the ability to control that impulse, the event denoted by the predicate would not have taken place.

Another instance of a more subtle, psychological causal dependency relation is a sentience situation, which is congenially captured by Searle's (1992: 124) supervenience notion: mental states are totally dependent on corresponding neurophysiological states in the entity called Experiencer. A simple example reveals the difference between Experiencer and Stimulus in this respect: A flower has various properties that may cause sentience, a specific smell, colour and shape. But what the situation denoted by the verb means and how the Stimulus is involved depends on the kind of involvement of the Experiencer, i.e., on the question whether he or she smells, sees or likes the flower. With verbs denoting simple sentience situations such as *know, like* and *fear*, the Experiencer is the Proto-Agent and the Stimulus the Proto-Patient which leads to the hierarchical relation Experiencer > Stimulus (cf. Bickel, Bornkessel and Schlesewsky, Piñango, this volume). The causal and event structure of the situation is more complex, however, with verbs such as *frighten* or *please* in English (cf. section 6 below, and Piñango, this volume).

As to possession, Premack and Premack (1995: 193) point to the difference between the notion of group and that of possession. Both notions imply that two or more objects are physically connected and capable of co-

movement. But only possession requires a dependency of one participant upon the other. Ultimately, it is the ability to control the possessed object that counts according to Premack and Premack (1995). The ability to control the object is not specified in the meaning of possession verbs such as *own* and *have* (e.g. **Peter deliberately owns three houses*) because it depends on the terms involved. When possessing a house, for instance, control is manifest in the ability to sell or buy the possessed object, whereas it is the ability to control movement that counts when possessing an arm. The part-whole relation (e.g. *the chair has three legs*) can be subsumed under possession in the broader sense as there is a physical connection and a dependency relation between the two entities: the function of an entity as part of a whole is dependent on another object in the sense that it is inherently defined in terms of the other object, the whole (cf. also Vergnaud and Zubizarreta 1992).

In sum, various approaches to the notion of causality offer a promising way of explaining the dependency of Proto-Patients on Proto-Agents on the basis of causal dependency. Note that this dependency relation involves a concept of causality that is broader than the one used in CAUSE-BECOME-Decompositions (cf. Wunderlich, this volume), which cannot explain the Proto-Agent-Role of Agents, Experiencers and Possessors. Our co-argument dependency notion seems to be the tacit guideline for the logical notation of predicates such as POSS(x,y), or alternatively (POSS(y))(x), where *x* is always interpreted as the Possessor and *y* as the Possessum.

Note that the definition of Proto-Patient has to include a further involvement dimension that is closely related to verbal aspect. With some verbs, there is a homomorphism between the successive change of a participant and the successive accomplishment of the event denoted by the predicate. Some of these participants undergo a perceptible and existential change of state, such as in *build a house, write a poem* and *eat a cake*, but others do not, cf. *memorize a poem*. Such a role is classified as an incremental theme by Dowty (1991). Following Krifka (1989) the telicity of verbs selecting incremental themes parallels the reference property of this type of argument: a telic interpretation arises with terms that take a definite or indefinite determiner (e.g. *he built the/a house in one year*). Correspondingly, an atelic interpretation occurs with referentially indeterminate terms such as bare plurals and mass terms (e.g. *he built houses for a year*). This interdependence between the temporal structure of the predicate and the referential structure of the argument has to be distinguished from causal dependency, which is in the focus of the present paper. Causal

dependency must also be distinguished from selectional argument-verb dependency such as that between *drink* and its object. The notion of determinism that is used by Bossong (this volume, p. 260) in his claim that "the object determines the kind of action, but not the agent" is different from our causal notion. In causal terms, the kind of situation denoted by the verb and how the Proto-Patient is involved in it depends on the kind of involvement of the Proto-Agent, as shown further above.

To sum up the discussion of Proto-Patient arguments, their characteristic property is the causal dependency on a Proto-Agent argument or the interdependence between their referential status and the temporal structure of the event denoted by the predicate. A serious consequence of this approach is that arguments of different intransitive verbs can only be distinguished by the number of agentive properties they accumulate or by aspectual factors. An argument that does not bear any involvement property (e.g. *John is tall*) does not automatically qualify for a Patient or Theme, as often proposed in the literature. In the present approach such an argument is considered to be a Proto-Agent having none of the involvement properties specified in (2).

4.   Representing the two types of role-semantic information

Semantic dependency relations are most congenially represented by the ordering of variables in the semantic representation of a predicate. Given any predicate with more than one argument, pred(x,y), the first variable x is reserved for the independent argument, i.e., the Proto-Agent, and the second variable y for the Proto-Patient, i.e., the argument whose involvement is dependent on x. This interpretation is schematically illustrated in (3):

(3)   type of involvement of y depends on type of involvement of x =
         Proto-Patient
            |
     pred(x,y)
          |
     independent involvement of x = Proto-Agent
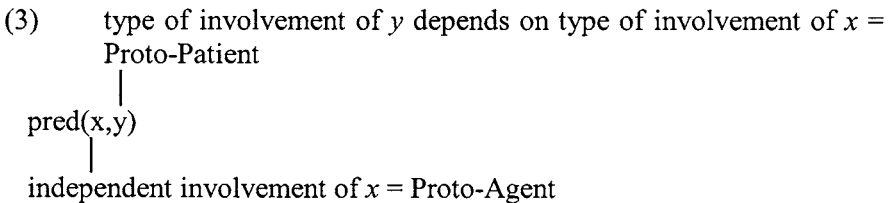
The types of involvement represented in (2) above by different basic predicates for the most common and uncontroversial instances are specifications of causal dependency with the order of arguments interpreted as in

(3). (4) illustrates the entailed basic predicates that define involvement and causal dependencies for the verb *geben* 'give' in one of its most common uses (e.g. German *Peter gab Maria einen Apfel* 'Peter gave Mary an apple'):

(4) Entailed involvement and causal dependencies for *geben* 'give' in German:
ctrl(x,s)
[exp(x,s)]
$<phys(x,z)^{s1}, phys(y,z)^{s2}>$
$<poss(x,z)^{s1}, poss(y,z)^{s2}>$
$exp(y,z)^{s2}$

The full event structure of the verb, including the parameter of incrementality (see section 3 above), is not represented (cf. Krifka 1989; Engelberg 2000). Only the succession of subevents for the poss- and phys-predicates has been added in order to capture the transfer of possession from x to y and the change in physical contact with z. The variables s1 and s2 denote subevents of s. If no subevent is specified, the participant is involved in the whole situation including the other participants, as stated for control and experience on the part of the Proto-Agent x which controls and experiences the situation and the kind of involvement of the Recipient y and the Patient z. The predicate exp(x,s) is bracketed since it is redundant: Control of an event unilaterally implies awareness of that event and of the other participants.

The argument structure, give(x,y,z), which is often found in the literature, can be derived from the set of basic predicates entailed by the verb meaning in (4) and their relative order. This structure can also be represented by the hierarchy Agent $>_{dep}$ Recipient $>_{dep}$ Patient. This argument hierarchy is derived as follows: Argument x is Proto-Agent relative to both y and z by the definition in (3) and the basic predicates in (4). Recall that ctrl(x,s) means that x is controller of the whole situation including the involvement of y and z. Argument y is Proto-Patient relative to x (cf. ctrl(x,s) with y in s) and Proto-Agent relative to z (cf. phys(y,z) and poss(y,z)). Argument z is Proto-Patient relative to both x and y, and accordingly, the lowest argument in the causal dependency hierarchy.

The case linking for German *geben* is nom^x, dat^y, acc^z. The next section will reveal that this is a default linking option that can be derived from the entailed involvement components of the verb, i.e., (4), and general role-semantic constraints on case selection.

5.   Case selection and involvement

Following Dowty, syntactic argument selection is determined by the number of consistent properties an argument accumulates for a given Proto-Role: "In predicates with grammatical subject and object, the argument for which the predicate entails the greatest number of Proto-Agent properties will be lexicalized as the subject of the predicate; the argument having the greatest number of Proto-Patient entailments will be lexicalized as the direct object" (1991: 576). The present approach differs from this proposal in several points: first, case functions and structural functions are dissociated; secondly, the number of consistent entailments for Proto-Agent or Proto-Patient is assumed to be relevant for case functions only; and thirdly, the most prominent case function, the nominative, is not indiscriminately linked to the Proto-Agent. The reason for this is that if one takes the maximal number of consistent properties for a Proto-Role as the basic criterion for argument selection, Proto-Agent and Proto-Patient are equally qualified for the nominative. This leads us to the general hierarchy schema (5a) and the special cases (5b):

(5)   a.   Involvement Scale: $\theta^{max} >_{invol} \theta^{min}$
      b.   Special cases:
           $A^{max} >_{invol} A^{min}$, i.e., Agent ($A^{max}$) $>_{invol}$ Recipient/Benefactive (A^{min}),

           Agent (A^{max}) $>_{invol}$ Experiencer (A^{min})

           $P^{max} >_{invol} P^{min}$, i.e., Patient ($P^{max}$) $>_{invol}$ Recipient/Benefactive (P^{min}),

           Patient (P^{max}) $>_{invol}$ Theme/Stimulus (P^{min})

θ^{max} is an abbreviation for a role with a large number of consistent Proto-Role properties; θ^{min} means that an argument accumulates a smaller number of consistent Proto-Role properties or none at all. The alignments in (5) have the conspicuous property that Proto-Agent (A) and Proto-Patient (P) are not ranked relative to each other. This explains the viability of the two hierarchy options found in the literature (see (1a,b) above): Agent > Patient and Patient > Agent. The ranking Agent > Benefactive/Recipient/Experiencer, another common assumption in the literature, is explained here as follows: Agents, which accumulate the highest number of Proto-Agent properties, outrank Benefactives, Recipients or Experiencers, which accumulate a smaller number of Proto-Agent properties. Because Recipients and Benefactives have both agentive and patient-like properties they

can be aligned relative to Patients as well. Maximally involved Patients dominate Recipients and Benefactives, which are defined by a smaller number of Proto-Patient properties. The criterion of involvement disconfirms Benefactive/Recipient/Experiencer > Patient/Theme (see (1c) above), which in our view is due to another type of role-semantic information, notably causal dependency, which is preferably linked to the structural hierarchy of arguments.

The constraint schemata for case selection link the maximally involved Proto-Roles A^{max} and P^{max} to the first two elements of a case markedness hierarchy 1C > 2C.[3] The ergative parameter links 1C to either A^{max} or P^{max}, and correspondingly C2 to either P^{max} or A^{max} so that the ranking options (6) and (7) are obtained:

(6)   Accusative Ranking (n ≠ 1; m ≠ 2)
    a. $A^{max}/1C \gg A^{max}/nC$
    b. $P^{max}/2C \gg P^{max}/mC$
(7)   Ergative Ranking (n ≠ 1; m ≠ 2)
    a. $A^{max}/2C \gg A^{max}/mC$
    b. $P^{max}/1C \gg P^{max}/nC$

The ranking relation is abbreviated as ">>". (6) and (7) are inverse rankings if nC = 2C and mC = 1C. Reranking is the method of capturing typological variation in OT. The case patterns selected according to the rankings in (6) are accusative constructions; those selected according to the rankings in (7) are ergative constructions. The constraints take role-semantic information as input and yield cases (or adpositions)[4] as output, though the model can also accommodate the other mapping direction.

(6a) states that the constraint linking a maximally involved Proto-Agent to the first case, the nominative, invariantly dominates the constraint linking a maximally involved Proto-Agent to another case (e.g. accusative, dative, etc.). In (6b) the constraint linking a maximally involved Proto-Patient to the second case, the accusative, invariantly dominates the constraint linking a maximally involved Proto-Patient to a case different from the accusative.

As to ergative constructions, (7a) states that the constraint linking a maximally involved Proto-Agent to the second case, commonly called ergative, invariantly dominates the constraint linking a maximal Proto-Agent to another case (e.g. nominative or dative, etc.). In (7b) the constraint linking a maximally involved Proto-Patient to the first case,

commonly called absolute or nominative, invariantly dominates the constraint linking this role to another case.

The difference to other proposals in the literature (cf. Légendre et al. 1993 for an OT treatment) is that an invariant ranking assumption is only made for maximally involved participants. Minimally involved participants are restricted by other constraints or by role-semantic constraints that are ranked on a language-specific basis.

Let us test the assumptions in (6) and (7) on the canonical ditransitive construction in an accusative and ergative language. We will start our discussion with the more familiar accusative construction. Cf. the German and Hungarian examples in (8):

(8)   German: *Der Lehrer*   *gibt*   *dem Schüler*   *das Buch.*
      Hungarian: *A tanár*   *adja*   *a diáknak*   *a könyvet.*
            The teacher(NOM)   gives the pupil(DAT) the book(ACC).

In an accusative language such as German or Hungarian, 1C is the nominative, 2C is the accusative, and 3C is the dative, and this decision is motivated independently by allomorphism complexity (cf. Primus 1999, Chap. 2) and syncretism patterns (cf. Eisenberg 1998: 163f. for German). In order to simplify matters, only the first three cases of a language will be taken into consideration. The input of the evaluation is the role-semantic meaning of the verb shown in (4) above. For convenience, the roles can be abbreviated for each argument as follows: x = A^{max} (Agent proper), y = A^{min} and P^{min} (Recipient), and z = P^{max} (Patient proper). Given three cases, there are 27 candidates, though for illustrative purposes, Table 1 only shows the five most interesting candidates.

Table 1.   Eval *geben*

Input: see (4)	$A^{max}/$ NOM	$A^{max}/$ CASE≠NOM	$P^{max}/$ ACC	$P^{max}/$ CASE≠ACC	DISTINCT
a) acc^x, dat^y, nom^z	*!		*!		
b) nom^x, acc^y, dat^z		*	*!		
c) dat^x, nom^y, acc^z	*!			*	
d) nom^x, acc^y, acc^z		*		*	*!
e) ☞nom^x, dat^y, acc^z		*		*	

Constraints with the same input role have to be ranked because they compete with each other. They are aligned in pairs in such a way that the

first constraint dominates the second. The non-competing constraints are separated by a double line in order to show that their relative ranking is irrelevant. This leaves A^{max}/NOM, P^{max}/ACC, and DISTINCT as the three dominating constraints that have to be taken into consideration first, in free relative order. If there is a candidate that does not violate any of these dominating constraints, it will win (cf. ☞); all other candidates will be definitive losers (cf. *! for a fatal violation). Since the evaluation in Table 1 is decided at the three dominating constraints, violations of the two lower constraints are irrelevant (cf. the shaded columns). DISTINCT, a constraint that penalizes case frames with non-distinct case functions, has been added to show that case selection for A^{min} and P^{min}, the Recipient, may be constrained by additional constraints not included in (6)–(7).

The winning candidate $<nom^x, dat^y, acc^z>$ is the default case pattern for verbs with the meaning of *give* or a similar role-semantic meaning in German, Hungarian and other accusative languages that have an appropriate oblique (dative) case.

Let us pass on to ergative languages with examples from Basque and Laz in (9)–(10):

(9)   Basque (Saltarelli 1988: 149):
       aita-k   ama-ri   gona gorri-a   erosi dio
       father-ERG mother-DAT   skirt red-NOM   buy   AUX
       'Father bought mother a red skirt. '

(10)   Laz (Hopa dialect, Harris 1985: 308):
       baba-k   cxeni   mečhu skiri-s
       father-ERG horse(NOM)   gave child-DAT
       'The father gave his son a horse.'

In the ergative ditransitive and simple transitive construction, the highest ranking and morphologically least marked case C1, called nominative or absolutive, is used for the Patient of a (di)transitive clause while the Agent is expressed by the second, more marked case, usually called ergative.[5]

Table 2 illustrates the effect of the ergative ranking in (7). For illustrative purposes, the verb *erosi* 'buy' in Basque and the verb stem -*č*- 'give' in Laz have been assumed to have the same involvement components as German *geben* in (4).

Table 2.   Eval *erosi, -č-*

Input: see (4)		$A^{max}/$ ERG	$A^{max}/$CASE $\neq$ERG	$P^{max}/$ NOM	$P^{max}/$ CASE$\neq$NOM	DISTINCT
a)	☞erg^x, dat^y, nom^z		*		*	
b)	nom^x, erg^y, dat^z	*!		*!		
c)	dat^x, nom^y, erg^z	*!		*!		
d)	erg^x, nom^y, nom^z		*		*	*!
e)	nom^x, dat^y, erg^z	*!		*!		

The winning candidate, <erg^x, dat^y, nom^z>, is the default morphosyntactic pattern for this type of verb in ergative constructions.

Ergative constructions differ from accusative constructions in the morphosyntactic linking pattern for the maximally involved roles, A^{max} and P^{max}.[6] Minimally involved roles such as Proto-Recipient do not establish the typological ergative-accusative distinction, as predicted by the ranking schemata in (6)–(7) and are therefore allowed a crosslinguistically more variable case selection. The case of the Proto-Recipient in the winning patterns in Table 1 and Table 2 is usually called "dative", but nothing depends on this terminological convention, which has been chosen for convenience only. The selection of the dative is forced in Table 1 and Table 2 by the distinctness constraint, but in other languages Proto-Recipients may pattern like Proto-Agents or like Proto-Patients.

In conformity with Dowty's aim, the role-semantic constraints in (6)–(7) capture default patterns only. Similar roles leading to the same evaluation result are selected by verbs such as *offer*, *buy*, *tell*, *show* or *ask* (cf. section 2 above), although there is some language variation with respect to finer-grained distinctions that have to be captured by additional constraints in language-specific rankings. Thus, in German and Chinese verbs denoting loss of possession on the part of the Recipient, i.e., verbs entailing <poss(y,z)^{s1}, poss(x,z)^{s2}>, such as German *nehmen* 'take' or *stehlen* 'steal', have the same case pattern as *geben* 'give'. This contrasts with the situation in English where this is not the case (cf. Zhang 1998).

Furthermore, there are idiosyncratic patterns that have to be captured by different means (cf. Hammond 1995; Golston 1996 for the treatment of lexical exceptions in OT). Thus, <nom^x, acc^y, acc^z>, a losing candidate in Table 1, is selected by a few ditransitive verbs such as *lehren* 'teach' and *abfragen* 'question somebody about' in German, which means that DISTINCT is violated by individual verb lexemes.

Note that the present paper does not consider patterns of typological case variation that arise due to case markedness constraints (cf. Primus 1999; Woolford 2001). Thus, for instance, a case markedness constraint against the dative (*DAT) eliminates the default candidate <nom^x, dat^y, acc^z> if it dominates the competing role-semantic constraints that license a dative, e.g. DISTINCT. This ranking characterizes English. If the accusative is also penalized, there are no case distinctions available to distinguish the three arguments of a ditransitive verb, as in Chinese. The above-mentioned language-specific or parochial patterns of variations have to be accounted for by additional constraints, but they do not challenge our role-semantic assumptions.

In order to complete our overview on hierarchy mismatches, let us discuss the relationship between Agent, Experiencer and Patient. In Dowty's treatment, Experiencer is subsumed under Proto-Agent and not under Proto-Patient, unless it is causally affected by the Stimulus. In our approach, this treatment is motivated by causal dependency: volitional, active Agents and Experiencers are both characterized as the superordinate roles in causal dependency relations (see section 3 above). The ranking assumption of other approaches, Agent > Experiencer, is based in our view on the difference in involvement, which can be captured schematically as $A^{max} >_{invol} A^{min}$: A volitional, active Agent accumulates more Proto-Agent properties than an Experiencer, which is only characterized by the entailment of sentience.

For the accusative ranking, the role-semantic constraints on case selection predict that the nominative is the semantically determined default case for an Agent, but not for an Experiencer, even if the Experiencer does not have any Proto-Patient properties, for instance, because the sentience property of the referent is not caused by the Stimulus. The explanation for this case linking difference between Agents and Experiencers is their difference in involvement: while A^{max}/NOM >> A^{max}/CASE≠NOM corresponds to an invariant accusative ranking (cf. (6a) above), A^{min} does not participate in this ranking. The impact of the invariant ranking on the case linking options of an action verb is illustrated in Table 3 for the German verb *arbeiten* 'work':

Table 3.   Eval action verb

Input: ctrl(x), phys(x), ...	A^{max}/NOM	A^{max}/CASE ≠NOM
☞ich (nom) arbeite		*
mich (acc) arbeitet	*!	

As predicted, action verbs such as *arbeiten* 'work' show an invariant case linking pattern in accusative languages because the semantically determined case, the nominative, also conforms to case markedness constraints. In ergative languages, a variation may occur (cf. Tsova-Tush = Batsbi, Holisky 1987) that is due to the competition between A^{max}/ERG and case markedness constraints that penalize non-nominative cases including the ergative.

Contrary to maximally involved Agents, Experiencers show a remarkable tendency towards case variation in both accusative and ergative languages, as amply documented in the literature (cf. Bossong 1998b for a more recent overview). This variation is illustrated with intransitive sentience verbs in German in (11):

(11)   a. *Ich* (nom) *friere*. 'I feel cold. '
       b. *Mich* (acc) *friert*. 'I feel cold.'
       c. *Mir* (dat) *ist kalt*. 'I feel cold.'

The German examples are congenial since they show that *frieren* 'feel cold' has a variable case marking for one and the same reading. Usually only one pattern, either the oblique (cf. *mir ist übel* 'I feel sick') or the nominative (*ich bin traurig* 'I feel sad') is lexicalized. Very often, the case variation is accompanied by a meaning variation (cf. German *ich bin kalt* 'I am cold/of a cold body temperature' vs. *mir ist kalt* 'I feel cold').

Case variation is explained in our approach by the fact that minimally involved roles do not participate in the invariant ranking proposed for maximally involved roles. Lack of variation, as with the intransitive sentience verbs of English, is assumed to be due to other constraints, for instance case markedness constraints (cf. Primus 2004b). Even in languages with variable case marking, the case pattern of each individual sentience verb is fixed, with the exception of a few verbs such as *frieren* in German. Our claim is that the lexical distribution can be explained by constraints on the lexicon organization and not by additional role-semantic constraints that take Experiencers as an input (cf. Klein and Kutscher 2003).

Let us summarize the results of this section. Our hypothesis is that role-semantic constraints on case selection make crucial reference to the dimension of involvement of a participant in the situation denoted by the verb. This dimension is captured by basic semantic relations such as control, physical manipulation, sentience or possession. Following the spirit of Dowty's approach (1991), argument linking is assumed to be

sensitive to the number and kind of basic semantic relations an argument accumulates. On the basis of this assumption the hierarchy mismatch Agent > Patient vs. Patient > Agent is explained by the fact that both Agents and Patients may be maximally involved. These alternative hierarchies form the basis of the typological ergative-accusative distinction. In ergative phenomena, the Patient of a transitive clause and the sole argument of an intransitive clause show the behaviour of a primary, i.e., subject-like, grammatical relation (cf. Sasse 1978; Dixon 1994). In accusative phenomena this primary status is given to the Agent of a transitive clause and the sole argument of an intransitive one.[7]

The aspect of involvement is preferably tied to morphosyntactic functions, i.e., case in a broad sense. This hypothesis implies the additional, widely validated assumption that ergative phenomena are case-based, in general.[8] This means that they are found in morphosyntactic linking patterns, as shown in this section, and in syntactic rules that depend on the morphosyntactic form of the argument in question. Verb agreement and passive or antipassive formation are syntactic rules that are not necessarily, but more likely to be determined by cases than reflexive pronominalization, causative clause formation or basic order. This makes verb agreement and antipassive a favourite locus for ergativity besides case linking itself (cf. Croft 1991; Dixon 1994).[9] Syntactic phenomena that are preferably determined by causal dependency relations such as reflexive pronominalization, causative clause formation, and to a lesser extent also basic order do not pattern ergatively in general (cf. Dixon 1994, and the discussion in the next section below). Our explanation for this fact is that *Proto-Patient $>_{dep}$ Proto-Agent is not a valid option in terms of causal dependency.

The sensitivity of case selection to the dimension of involvement was also shown here by the ditransitive construction, specifically by the coding of the Patient and the Recipient or Benefactive. As long as the Patient accumulates more Proto-Patient properties, which is usually the case, it outranks the Recipient or Benefactive in terms of involvement. If under these circumstances Patient and Recipient/Benefactive are coded by different cases, the default option is the following: the higher ranking case is selected for the Patient (the accusative in accusative constructions and the nominative in ergative constructions) while the lower ranking case (e.g. the dative) is chosen for the Recipient or Benefactive.

As to the relative rank of a volitional, active Agent and an Experiencer, involvement predicts Agent $>_{invol}$ Experiencer as well as the following case linking defaults: the nominative as the default case for the Agent in intransitive and (di)transitive accusative constructions and the ergative as a

default for (di)transitive verbs in the ergative ranking. But it does not predict a semantically determined default case for the Experiencer.

The ranking options discussed in this section follow from the dimension of involvement. In the next section we will show that causal dependency predicts other rankings and that these rankings are crucial for structural phenomena such as the basic order of verbal arguments and antecedent-anaphor relations.

6. Structural linking and co-argument dependency

The basic principle for structural linking (cf. Primus 1999: 136, 142) is formulated in (12):

(12)   Structural Expression of Dependency: If a non-head constituent Y depends on a non-head constituent X, then X precedes and/or c-commands Y. (X c-commands Y if and only if X and Y do not dominate each other, and the first branching node that dominates X dominates Y.)

(12) defines a family of constraints because there are several types of co-argument dependencies besides causal dependency that can be taken as input. The fact that antecedent-anaphor and scope relations are dependency relations and that they are structurally severely restricted, as predicted by (12), is well-known. We will focus on structural linking itself, i.e., the basic order of verbal arguments,[10] antecedent-anaphor relations and the claim that an antecedent must precede or c-command its anaphor and an anaphor must not be c-commanded by its antecedent. This means that anaphor binding is restricted by asymmetrical c-command. We do not claim that the constraints defined by (12) hold strictly for every language. They may be violated if they have a low rank.

Let us apply (12) to the causal dependency relations among the arguments of a ditransitive construction such as *I showed Mary a picture*. We take an English example because this language has been most thoroughly analysed in structural terms within generative grammar. Additionally, the double object construction of English has the desired property of lacking a morphosyntactic distinction between Proto-Recipient and Proto-Patient so that the two roles are distinguished from each other only in structural terms. In accordance with generative grammar and other approaches we assume that semantic-role information determines the basic struc-

tural position of an argument. A departure from this position implies syntactic movement.

Adapting ideas put forward by Holmberg and Platzak (1995: 185) and Radford (1998: 198), let us discuss a structural analysis that uses more than one VP shell for double object constructions. Cf. (13) as the basic structure for *I showed Mary the picture*:

(13)
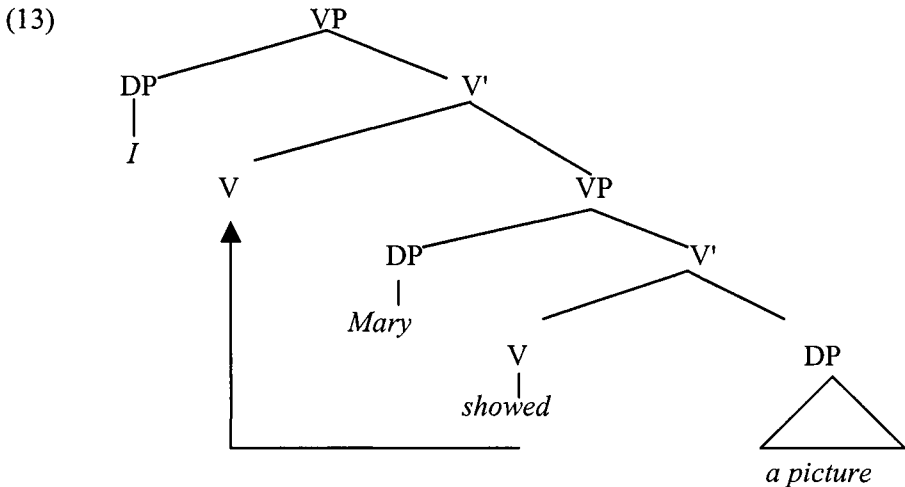
Let us see if this structural analysis is in conformity with the role-semantic analysis defended here. The meaning of the verb *show* includes a control basic predicate ctrl(x,s) and a sentience basic predicate exp(y,z) which is in *s* and thus in the scope of the control predicate. This analysis can be roughly paraphrased as follows: *x* volitionally causes a situation in which *y* becomes sentient of *z*. In the example (13), *x* is the speaker, *y* is a person called *Mary* and *z* is a picture. Further involvement properties of these arguments are not at issue as they do not affect the causal dependency relations established by the ctrl- and exp-predicates.[11]

Following Wunderlich (1997: 38), we can show that the configuration in (13) mirrors the above-mentioned meaning composition of the verb and the causal dependency relations between the arguments of the verb proposed here. The inner VP shell is interpretable as the syntactic correlate of the basic predication exp(y,z). The verb *show* is base generated as the head of this inner VP shell in order to discard its theta-roles locally, i.e., within its maximal projection VP, to *Mary* and *a picture*. As a control verb, *show* also licenses an outer vP shell, which is the structural correlate of the superordi-

nate control predication. The control predicate in small v discards its theta-roles locally to the structural subject position occupied by *I* and to VP, the sentience predication, which is in its scope.

In generative grammar the analysis in (13) is defended by various syntactic phenomena (cf. Holmberg and Platzak 1995: 185f.; Radford 1998: 198). Here, we focus on basic order and reflexivization, cf. (14)–(15):

(14)   I showed Mary a picture.
       *I showed a picture Mary.

(15)   I showed Mary$_j$ herself$_j$ in the mirror.
       *I showed herself$_j$ Mary$_j$ in the mirror.

The rigid Recipient-Patient order[12] and the fact that the Proto-Recipient may bind the Proto-Patient but not the other way around can be captured if the Proto-Recipient has its own structural slot that asymmetrically c-commands the slot of the Proto-Patient. This is clearly the advantage of the structural configuration shown in (13).

The analysis in (13) has the disadvantage that the underlying verb position does not correspond to its superficial position. Therefore, the analysis relies on verb movement, as indicated in (13). An alternative analysis posits a flat VP structure with no c-command asymmetry between Proto-Recipient and Proto-Patient (cf. Barss and Lasnik 1986; Jackendoff 1990b), as shown in (16):

(16)
```
                        VP
              _____|_____
             /          |          \
            V          DP          DP
            |          /\          /__\
          show       Mary        a picture
```
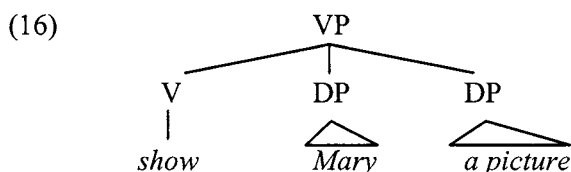
Since in this structure the two objects c-command each other, this analysis relies on precedence in order to capture the rigid order and the binding asymmetry of the Proto-Recipient and Proto-Patient.

In sum, both analyses capture the causal dependency of a Proto-Patient on a Proto-Recipient in terms of c-command or precedence as predicted by the structural linking principle in (12) above.

Note that one could call the prediction of (12) into doubt on the basis of the alternative prepositional construction *I showed a picture to Mary*. In

this construction, a Proto-Patient precedes or c-commands a Proto-Recipient, at least *prima facie*. Cf., for instance, Baker's (1996: 20) analysis shown in (17):

(17)   [*John* ᵥₚ[*the ring* ᵥ'[*passed* [*Mary*]]]]

In Baker's view, this underlying structure is motivated by the following universal principles that map semantic roles onto structural positions (1996: 29):

(18)   a. Path arguments (including Goals, Benefactives) map onto the
            complement of V.
        b. Theme/Patient arguments map onto the (lowest) specifier of V'.
        c. Agent/Actor arguments map onto a position outside the (minimal)
            VP.

In Baker's analysis, the double object construction (e.g. *John passed Mary the ring*) is derived from (17) by movement of the verb and of the Goal/Benefactive argument. Larson (1988) also argues for an argument hierarchization in which Patients asymmetrically c-command Recipients, Benefactives or Goals in both constructions.

    In our view, the main problem of this approach is that it does not distinguish Path or Goals from Benefactives or Recipients. As a consequence, it posits an illicit meaning changing transformation. In fact, several detailed semantic analyses (e.g. Pinker 1989; Krifka 2003 for English, and Herslund 1986 for Danish) demonstrate that the constructions are semantically not equivalent. The double object construction codes a possessive or sentience relation between the second and the third argument, i.e., poss(y,z) or exp (y,z), while the prepositional construction is based on a locative relation, move(z,TO(y)). A change in possession or sentience can be conceptualized as a movement event, which explains why verbs such as *give* and *show* in English participate in both constructions (cf. Krifka 2003). The structure in (17) mirrors the dependency relation represented in the formula move(z,TO(y)) with *z*, the Patient or Theme, in the first argument position, and *y*, the Goal, in the second argument position iso-morphically, and is, therefore, no counterexample to our structural linking principle in (12).

    Let us finish the discussion of the ditransitive constructions with a few typological remarks. The above observations about the structural superiority of the Proto-Recipient over the Proto-Patient corroborate

Dryer's (1986) observation that there are languages in which the Proto-Recipient is the Primary Object and the Proto-Patient the Secondary Object (cf. also Croft 2001: 142). According to Dryer, the Proto-Recipient in the double object construction in English, Danish, Indonesian, Vietnamese, Swahili or Kinyarwanda is a Primary Object. In other languages or constructions, the Proto-Recipient is the Indirect Object and the Proto-Patient is the Direct Object. In Dryer's view the argument that is marked by a preposition in the prepositional construction of English is an Indirect Object.

We agree with Dryer's assumptions with the following two qualifications. First, the double object construction and the prepositional construction differ in meaning, at least in some languages. In this event they cannot be taken as the basis for a linking typology. A better term of comparison for the double object construction is the dative construction in a language such as German, in which the dative argument cannot be interpreted as a locative Goal. The following data show that the Proto-Recipient is an Indirect Object in terms of case linking, reflexivization[13] and passivization. Cf. (19):

(19) a. Ich habe der Frau ein Bild gezeigt.
          'I showed the woman (DAT) a picture (ACC).'
      b. *?Ich habe der Frau sich selbst im Spiegel gezeigt.
          'I showed the woman herself in the mirror.'
      c. *Die Frau wurde ein Bild gezeigt.
          'The woman was shown a picture.'

Secondly, Dryer's object typology is biased in a direction which is predicted by our hypothesis of division of labour between case and structure: Primary Object constructions tend to lack a case distinction between Proto-Recipient and Proto-Patient, Indirect Object constructions tend to distinguish these roles by cases (cf. Haspelmath 2005).

The difference between structural linking and case linking is also manifest in German. In terms of case, the Proto-Recipient is the Indirect Object as shown in (19). In terms of structure, it is the Primary Object. (19a) above illustrates the basic order of this construction, in which the Proto-Recipient precedes and asymmetrically c-commands the Proto-Patient under the plausible assumption that the verb has a clause-final basic position.

Admittedly, there are a few Primary Object languages that seem to code the distinction between Proto-Recipient and Proto-Patient by cases or

adpositions (Dryer 1986: 816), e.g. Khasi (Mon-Khmer) and Lahu (Lolo-Burmese). These constructions use the same adposition for the Proto-Recipient of the ditransitive construction and the Proto-Patient of the simple transitive construction and a different, overtly zero case for the Proto-Patient of the ditransitive construction (cf. also Croft 2001: 145). This pattern is similar to the situation found in Romance languages with animate or definite arguments, cf. Spanish *El pueblo odia al dictador* 'The people hate the dictator (PP)', *El pueblo le dio un gran triunfo a Allende* 'The people gave Allende (PP) a great victory'. It is difficult to assess which of the constructions mentioned by Dryer and Croft are definitive evidence against our approach because they do not deal with issues that are important for us. One issue, which was mentioned above, is the subtle semantic difference between the various ditransitive constructions; another issue is the basic function of a linking system. Note that our hypotheses are only applicable to linking patterns that are determined by semantic-role information. We do not assume that case and structure may not serve other functions. Thus, for example, the case linking pattern illustrated by the Spanish examples above is determined by animacy and definiteness (cf. Bossong 1998a for an overview).

Finally, we pass on to the causal dependency relation between Proto-Agents and Proto-Patients. We will start our discussion by showing the plausibility of Agent $>_{dep}$ Patient and the implausibility of *Patient $>_{dep}$ Agent. Ergative constructions are a congenial testing ground because the reverse hierarchy Patient > Agent is clearly manifest in morphosyntactic linking, as shown in section 3 above.[14] The structural prediction that Patients do not precede Agents as a basic order has been validated on large language samples that include ergative languages in typological research (e.g. Tomlin 1986; Siewierska 1988; and Primus 1999: 161f. for counterexamples and their explanation in terms of other structural constraints).

Another structural prediction is that languages in which Patients bind Agents and Agents do not bind Patients in antecedent-reflexive relations do not exist or are extremely rare. Accusative languages are less revealing because Patients are in the accusative and therefore cannot qualify as subjects. Ergative constructions are a better testing ground because Patients are in the nominative and Agents in an oblique case, the ergative. In an ergative syntactic rule, a nominative Proto-Patient is expected to be the preferred antecedent. The fact that binding of a reflexive pronoun does not seem to pattern ergatively is strong evidence for our hypothesis (cf. Dixon

1994: 138). Cf. the following data from Basque (Hualde and de Urbina 2003: 621–622):

(20) *Mirande-k*   *bere burua*   *hil*   *zuen.*
      Mirande-ERG   REFL (NOM) kill   AUX
      'Mirande killed himself.'

(21) **Bere burua-k* *Mirande*   *hil*   *zuen.*
      REFL-ERG   Mirande (NOM)   kill   AUX
      'Himself killed Mirande.'

The reflexive expression is complex in Basque. It is derived diachronically from the noun *burua* 'head' and the possessive pronoun, *bere* in the above examples. The examples show that in an ergative construction, the antecedent must be in the ergative and the anaphor in the nominative (or absolutive) but not vice versa. We claim that the antecedent-anaphor relations in Basque mirror Proto-Agent $>_{dep}$ Proto-Patient. Other ergative languages in which an ergative Agent antecedent binds a nominative Patient reflexive pronoun, but not vice versa, are Abaza (cf. Anderson 1976: 4), Burushaski (Dixon 1994: 138) and Tsakhur (Comrie and van den Berg, this volume).

   Our conclusion is challenged mainly by reflexivization patterns with sentience predicates that are more difficult to estimate with respect to their causal structure. Saltarelli (1988: 113) offers an example with a psychological predicate (*lilura* 'enchants') in which a nominative binds an ergative argument, a pattern that is not admitted with action verbs, as shown in (20)–(21) above. Dixon himself mentions further critical cases involving psychological predicates (1994: 138, Fn. 34). Georgian, Nepali (LINGTYP information) and Bagvalal (Comrie and van den Berg, this volume) also have reflexives in ergative Agent function but they also have the predicted pattern with the ergative Agent as the antecedent. This means that reflexivization is not restricted by causal dependency in these languages. Languages in which Patients bind Agents and Agents cannot bind Patients, the genuine counterexample to our claim, have not been found apparently.

   In sum, Basque shows a syntactic split that is typical for ergative languages: Proto-Patient is the primary role for case linking and case-based rules; Proto-Agent is the primary role for semantic dependencies such as that between an antecedent and a reflexive pronoun. This is the situation predicted by our hypothesis that involvement and dependency are separate factors that are tied to different syntactic coding systems.

Another assumption of the present approach is the causal dependency hierarchy Experiencer $>_{dep}$ Stimulus in non-causative sentience situations. Structural linking and semantic dependencies are expected to mirror this hierarchy. Returning to Basque, the distribution of reflexive pronouns with psychological predicates corroborates our assumption. Cf. the following data (Hualde and de Urbina 2003: 630–631):

(22) *Ni-ri*   *batez ere*   *neure burua-k* *ematen* *dit*   *beldurra*
       I-DAT   above-all   REFL-ERG   give   AUX   fear(ABS)
       'Above all myself gives me fear.'

(23) *Jon-i*   *asko gustatzen*   *zaio*   *bere burua*
       Jon-DAT   much like   AUX   REFL(ABS)
       'John likes himself a lot.'

In these examples, a dative Experiencer binds a Stimulus in the ergative (cf. (22)) or nominative (cf. (23)). The expected binding asymmetry between oblique Experiencers and nominative Stimuli and the parallel behaviour of Agents and Experiencers is also found in Tsakhur (cf. Comrie and van den Berg, this volume).

Another good testing ground for our approach are sentience verbs in English. The characteristic trait of English is that the selection of the nominative and the objective is an epiphenomenon of structural linking (cf. Chomsky 1981 and subsequent research in generative grammar). The prediction for a purely structural linking is that the Experiencer is tied to the structural subject position if and only if the Stimulus is the Target or Theme of sentience and not its Causer. If the Stimulus is the Causer of the sentience situation, the Experiencer is causally dependent upon it and has to be linked to the object position. As amply documented in earlier research, English sentience verbs are found in two patterns with structural cases, cf. (24):

(24) a. Subject-Experiencer: *x likes y, x fears y, x believes y*
      b. Object-Experiencer: *y pleases x, y frightens x, y strikes x as P*

Dowty (1991: 587) explains the linking difference as follows. The Object-Experiencer verbs allow an inchoative reading in which the Stimulus causes a change of state in the Experiencer. Thereby, the Experiencer has the Proto-Patient entailment of change of state. The Subject-Experiencer verbs do not have the inchoative-causative reading. With these verbs, the

Experiencer has only the Proto-Agent property of sentience. This semantic difference also shows up in the progressive (cf. (25)) and in *wh*-clefts with the verb *happen* (cf. (26)):

(25)   **Mary is liking the birthday party. / The birthday party is pleasing Mary.*

(26)   **What happened to Mary was that she liked the birthday party. / What happened to Mary was that the birthday party surprised her.*

Pesetsky (1995, Chap. 4) makes the additional stronger assumption that in Object-Experiencer constructions, the Stimulus is causing the mental state of the Experiencer without necessarily being its Target. According to Pesetsky, a statement such as *The article angered Bill but he was not angry at the article* is semantically non-anomalous and may be true if Bill is angered at something else, for instance, the government corruption as revealed in the article. In Subject-Experiencer constructions the Stimulus is always the Target.

The irrelevance of structural linking to involvement distinctions is manifest in the fact that exp(x,y), the representation of the non-causative sentience situation in which the Experiencer has only one Proto-Agent property and no Proto-Patient property, is systematically coded the same way transitive action verbs with maximally involved Proto-Agents and Proto-Patients such as *write* and *kill* are coded. Furthermore, sentience verbs with this role structure behave syntactically like transitive action verbs (cf. Iwata 1995). We will choose antecedent-anaphor relations to illustrate this point. In the non-causative construction we unequivocally have Experiencer $>_{dep}$ Stimulus, and accordingly, a perfect binding option in which a subject Experiencer binds an object Stimulus reciprocal pronoun (cf. (27a)). This constellation parallels the situation found with transitive action verbs (cf. (27b)). The causative Object-Experiencer construction is also unequivocal if the Stimulus is agentive, cf. (27c):

(27)   a.   The politicians feared/hated/liked each other.
       b.   The politicians greeted each other.
       c.   The children frightened each other by jumping out. (agentive reading)

The behaviour of Object-Experiencer verbs with a Stimulus that is a non-volitional causer is more equivocal (cf. Grimshaw 1990: 158). Cf. (28):

(28) $^?$The politicians depress/worry each other. (non-agentive reading).

A plausible explanation for the mild ungrammaticality of (28) is that the causal dependency between Stimulus and Experiencer is not as clear-cut as in the instances illustrated in (27). The Stimulus is causally superordinate due to the fact that it causes the sentience of the Experiencer which is causally superordinate due to its sentience. Note that the reciprocal construction strongly favours the reading in which the Stimulus is the Target of sentience and subordinate to the Experiencer in this respect (cf. Grimshaw (1990: 158) for a similar explanation).

In this section, we presented evidence for the claim that a Proto-Patient is semantically dependent on a Proto-Agent, and not the other way around, schematically Proto-Agent $>_{dep}$ Proto-Patient. This dependency between the two Proto-Roles has at least three special cases, which were discussed here: Agent $>_{dep}$ Patient, Recipient $>_{dep}$ Patient, and Experiencer $>_{dep}$ Stimulus in non-causative sentience situations. The evidence we focused on was based on the additional claim that this dependency is crucial for structural linking, and accordingly, that it is most clearly revealed in the structural hierarchy of verbal arguments and structurally determined phenomena such as anaphor binding. Only constructions were at stake in which cases made another prediction, were epiphenomenal or non-distinctive.

Agent $>_{dep}$ Patient was tested in ergative constructions. Contrary to the cased-based prediction that nominative arguments are favoured as antecedents, nominative Patients do not bind ergative Agents; if they do, ergative Agents also bind nominative Patients. Apparently there are no languages in which Patients bind Agents and Agents do not bind Patients. Agents also preferably c-command or occur before Patients in the basic order if basic order is not determined by pragmatic or other factors.

Recipient $>_{dep}$ Patient was examined in double object constructions, which have no case distinction for these roles. Rigid Recipient-Patient order and a binding constellation in which Recipients bind Patients but Patients cannot bind Recipients have been shown to corroborate our assumptions.

The discussion of sentience verbs has revealed that semantic-role hierarchies with a fixed position of Experiencer and Stimulus and one-dimensional roles cannot capture crucial but subtle differences in verb meanings. But such data are good evidence for our view that semantic roles are multidimensional and that role hierarchies are derived from the meaning components of predicates. Subject selection in English, in which case is an epiphenomenon of structure, was shown to be a reliable indicator

of the dependency relation between Experiencer and Stimulus that is established by two classes of verbs. With causative sentience verbs, the Subject-Stimulus causes the sentience of the Object-Experiencer without necessarily being its Target. Experiencer $>_{dep}$ Stimulus holds unequivocally only if the Stimulus does not cause the sentience of the Experiencer. In this event, we find the expected structural argument hierarchy with the Experiencer in structural subject position, and the expected binding configuration in which the Experiencer binds the Stimulus. Experiencer $>_{dep}$ Stimulus is also mirrored in the distribution of reflexive pronouns in ergative languages such as Basque.

7. Summary and outlook

A conspicuous result of the present investigation is that there is no fixed universal semantic-role hierarchy. Approaches that postulate a unique hierarchy do not distinguish different types of role-semantic information such as involvement and causal dependency, which lead to different semantic-role hierarchies and which have been shown to be independent factors in syntactic argument selection. Approaches that postulate a unique hierarchy are confronted with the additional problem that they cannot cope with verb- or construction-specific roles and role hierarchies. Generalized, multidimensional roles such as proposed by Dowty (1991) fare much better in this respect if they are organized in such a way as to capture the different dimensions of role semantics more systematically than in Dowty's approach. Construction-specific as well as construction-independent differences in the hierarchization of semantic roles can be explained more adequately.

This paper has presented evidence in favour of the following hypothesis of division of labour: Case has a universally preferred function that is distinct from that of basic structure. It is sensitive to the degree and kind of involvement of a participant in the situation denoted by the verbal predicate, whereas basic structure is sensitive to causal dependencies between co-arguments. This hypothesis challenges the assumption defended in generative grammar that there is a universal subset of cases that can be derived from the structural position of the argument in question (cf. also Bornkessel and Schlesewsky (this volume) for experimental evidence against this assumption).

Why should cases be sensitive to involvement distinctions and structure to dependency and not the other way around? Despite the evidence

presented in this paper and elsewhere (cf. Primus 1999, 2004a), our knowledge is not sufficient to allow a firm conclusion. Therefore, let us explore a more general functional explanation. Dependency is a binary relation that is congenially expressed by binary syntactic relations such as precedence and c-command. In the present approach, causal dependency is a local co-argument relation that can be partially computed before encountering the specific verb lexeme. The verb lexeme specifies the kind of involvement. Involvement distinctions are too varied for a binary system. Such an intricate system cannot be expressed in a functionally optimal way by word order and structural relations. One can invoke the fact that structural relations are able to differentiate a lot of distinct syntactic positions. But such finer structural distinctions are highly ambiguous in actual language parsing. In contrast to structural relations, the expressive power of a case system is much greater than that of precedence and c-command, particularly if we do not only take pure cases, but also adpositions into consideration. In addition, when computing the kind of involvement, one has to take the causal structure into consideration in order to be able to distinguish a Proto-Agent from a Proto-Patient. As shown above, cases do not necessarily mirror the causal dependency between the two Proto-Roles isomorphically but they have to discriminate them in a systematic way. In contrast to cases, precedence and c-command mirror causal dependencies isomorphically.

   In conclusion, cases are better suited for the various differences in involvement than precedence and c-command, which, in turn, are well suited to express binary dependency distinctions.

Notes

1. As a departure from Dowty (1991: 572), (2) includes possession, following, among others, Jackendoff (1990a), and omits causation, which is given a special status in the present approach (see section 3 below).
2. Cognitive approaches also suggest that causality is the relevant cluster concept and agentivity the derived manifestation of it (cf. Lakoff and Johnson 1980, Premack 1990, Leslie 1995, Premack and Premack 1995).
3. The case markedness hierarchy of a language is stipulated as an axiom and is not derived from a structural or semantic hierarchy as in some other approaches. It serves as a basis for explaining various phenomena including case selection, verb agreement or allomorphism asymmetries (cf. Primus 1999). These phenomena motivate the case hierarchy on a heuristic level.

4. In typological research verb agreement is subsumed under morphosyntactic linking, but it is not always directly linked to semantic roles. Quite often it is a syntactic rule that takes another type of information, for instance, the case, animacy or definiteness of a verbal argument, as an input. A good indicator of the difference between a linking device and a syntactic rule is that the former has lexical, idiosyncratic exceptions which the latter lacks (cf. also Bornkessel and Schlesewsky, this volume, for the dissociation of case and agreement).

5. The nominative also codes the only argument of an intransitive clause. This is not predicted by role-semantic constraints, but by a dominating case markedness constraint banning the use of a more marked case in favour of the unmarked first case (cf. Primus 1999; Woolford 2001).

6. The cut off point between A^{max} and A^{min} on the one hand and P^{max} and P^{min} on the other hand can only be decided on a language specific basis. In the German example in Table 3 further below, A^{max} for *arbeiten* 'work' is established on the basis that ctrl(x,s) entails exp(x,s) and is reinforced by phys(x), i.e., physical activity. No other type of intransitive verb in German establishes a higher number of Proto-Agent properties for its argument.

7. What is ergative or not is a matter of definition, of course. The present paper takes the narrow, more restrictive definition given above. Sasse's (1978) term "primary grammatical relation" is more restrictive than Dixon's (1994) pivot term. Phenomena that treat the Patient or Object of transitive clauses the same way as the sole argument of intransitive clauses are quite often attested in accusative languages. For example, *ne* clitization in Italian is such a rule (cf. Burzio 1986), which has been called ergative occasionally (cf. Grewendorf 1989). But the detailed analysis of the distributional facts and their formal treatment in generative grammar clarify the crucial point that *ne* clitization is restricted to underlying objects, i.e., to verbal arguments that are not primary by other criteria. This means that the phenomenon is definitively not ergative in the strict sense. But such phenomena challenge the view that in every syntactic rule or construction the primary grammatical relation is uniquely eligible for it, as suggested by Dixon's pivot term. On the heuristic level, such phenomena make it more difficult to identify the primary grammatical function (cf. Croft 2001).

8. Most counterexamples are of the type discussed in Fn. 7 above and do not conform to the stricter definition of ergativity suggested by Sasse (1978) and referred to above. More critical are the data in Donohue and Brown (1999).

9. This does not mean that structurally determined agreement does not exist in an ergative language (e.g. Udi and Warlpiri, cf. Primus 1999, Chap. 6.3). In this type of agreement, the agent is preferred over recipient and patient as an agreement trigger, and recipient over patient as predicted by the causal dependency hierarchy.

10. Our structural linking claim does not hold for surface order in a variable order language. As demonstrated experimentally by Bornkessel and Schlesewsky

(this volume), surface order in German is not a reliable indicator of co-argument dependencies in performance.

11. If subevents are not specified, the ctrl- and poss- or exp-predicates do not correspond to different subevents and do not establish secondary predicates ("small clauses"), as suggested by some approaches on the double object construction (cf. Herslund 1986). The basic predicates are meaning components, i.e., meaning features.

12. As demonstrated on a larger language sample elsewhere (cf. Primus 1998), if Proto-Recipient and Proto-Patient are not distinguished by case, a rigid Recipient-Patient order is the only attested option in the sample.

13. In German, reflexivization is determined by several factors including case (cf. Primus 1999, Chap. 5.1). The example in (19b) is only meant to show that a dative argument cannot serve as an antecedent.

14. Accusative constructions are equivocal for our purposes. By linking Proto-Agent to the nominative and Proto-Patient to the accusative (or the dative), the canonical accusative construction indicates causal dependency by both basic order and case (cf. Bornkessel and Schlesewsky (this volume) for experimental evidence that in German case is a strong indicator of co-argument dependency in performance).

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Thematic roles – universal, particular, and idiosyncratic aspects

Manfred Bierwisch

1. General orientation

Thematic Roles (or Theta-Roles) are theoretical constructs that account for a variety of well known, more or less clearly delimited empirical facts. In other words, Theta-Roles are not directly observable, but they do have content that is open to empirical observation. The objective of the present paper is to sketch the nature and content of Theta-Roles, distinguishing their universal foundation as part of the language faculty, their language particular realization, which depends on the conditions of individual languages, and idiosyncratic properties, determined by specific information of individual lexical items.

According to general agreement, the properties related to Theta-Roles concern the morpho-syntactic realization of semantic connections between parts of complex linguistic expressions. A rather simple case in point is shown in (1), where the relation between *Brecht, Villon* and *adaptation* in (1a) is semantically parallel to that between the corresponding elements in the morpho-syntactically different verbal construction (1b):

(1) a. *Brecht's adaptation of Villon*
     b. *Brecht adapted Villon*

Theta-Roles must account for parallel properties of these constructions, but also for the differences between them. The overall orientation of such an account must meet the usual conditions of parsimony and adequacy, where

(A) <u>Parsimony</u> requires stipulations to be minimized, and
(B) <u>Adequacy</u> requires all relevant empirical facts to be covered.

According to (A), the theory of Theta-Roles must not set up principles or entities that can be derived from independently motivated and necessary assumptions, according to (B) it has to capture semantic, syntactic, morphological, and other phenomena that are related to Thematic Roles, a requirement that is clearly in need of clarification, because there is no simple and a priori delimitation of the phenomena to be included. Some preparatory observations might be helpful in this respect.

2.   Five basic observations

(I) <u>Interface Character:</u> The essence of Theta-Roles is to establish the correspondence between semantic relations and morpho-syntactic properties. This correspondence is not necessarily simple and uniform, however. As already shown in (1), the same semantic relations can be expressed by different formal means. But the same formal means can also correspond to different semantic relations. Consider simple cases like (2), where both possibilities show up:

(2)   a. *Peter zog seinen Sohn an.*   (Peter dressed his son)
      b. *Peter zog einen Mantel an.*   (Peter put a coat on)
      c. *Peter zog seinem Sohn den Mantel an.*   (Peter helped his son to put his coat on)

On the one hand, the recipient of the action expressed by *anziehen* (dress) is realized by the direct object *seinen Sohn* in (2a) and by the indirect object marked by the oblique case, *seinem Sohn*, in (2c). On the other hand, the direct object of *anziehen*, which represents the recipient in (2a), realizes the object of the action, *den Mantel*, in both (2b) and (2c). In other words, Theta-Roles must be able to reconcile the same semantic relation with alternative grammatical conditions and also the same morpho-syntactic properties with different semantic relations. To this effect, they must have access to semantic as well as syntactic and morphological information, participating in at least two levels of representation. In this sense, Theta-Roles are (part of) the interface mediating between formal or morpho-syntactic and semantic or conceptual aspects of linguistic expressions.

(II) <u>Semantic and Categorial Selection:</u>   Theta-Roles   select   the   co-constituents a lexical item can or must combine with in order to build up

complex linguistic expressions. According to the interface character, this selection operates in two ways: Categorial or c-selection determines the syntactic and morphological requirements that optional or obligatory complements of an expression must meet, while Semantic or s-selection specifies the corresponding semantic constraints. For example, both *fürchten* (fear) and *grauen* (shudder) semantically select a person and a content of the emotional attitude, but they differ with respect to their syntactic properties, as *fürchten* is either a standard transitive verb, or requires a reflexive pronoun, while *grauen* c-selects what might be called an oblique subject, as shown in (3) and (4):[1]

(3)   a. *Er fürchtet das Experiment.*   (He fears the experiment)
    b. *Er fürchtet sich vor dem Experiment.* (He is afraid of the experiment)
    c. **Ihm fürchtet vor dem Experiment.*

(4)   a. **Er graut das Experiment.*   (*He shudders the experiment)
    b. *?*Er graut (sich) vor dem Experiment.*
    c. *Ihm graut vor dem Experiment.*   (He shudders at the experiment)

(III) <u>Cross-Categorial Properties</u>: Theta-Roles are primarily studied with respect to verbs. They are, however, not restricted to one particular syntactic category, as already shown in (1a) vs. (1b). As a matter of fact, Theta-Roles show up with all major syntactic categories, as shown in (5) – (9):[2]

(5)   a. *The kids*$_{Th}$ *entered the room*$_{Goal}$
    b. *The kids'*$_{Ag}$ *run into the room*$_{Goal}$

(6)   a. *Peter*$_{Ag}$ *criticized the proposal*$_{Th}$
    b. *Peter's*$_{Ag}$ *critique of the proposal*$_{Th}$

(7)   a. *She*$_{Th}$ *is similar to her brother*$_{Rel}$
    b. *She*$_{Th}$ *resembles her brother*$_{Rel}$

(8)   a. *The boy*$_{Th}$ *at the corner*$_{Loc}$
    b. *The boy*$_{Ag}$ *was lurking at the corner*$_{Loc}$

(9)   a. *She*$_{Exp}$ *expected* [*him*$_{Ag}$ *to call*]$_{Th}$
      b. *Her*$_{Exp}$ *expectation* [*of his*$_{Ag}$ *call*]$_{Th}$

Theta-Roles with the same semantic background show up in Nouns and Verbs, as in (6a) and (b), or (9a) and (b), but also in Verbs and Adjectives, as in (7a) and (b). In much the same way, Prepositions must be considered heads supporting Theta-Roles like Theme and Location in (8a), corresponding to those pf the Verb in (8b).
Similarity across categories does not mean, though, that there are no crucial differences between syntactic categories in this respect. As already shown by simple cases like (1) or (6), the c-selection induced by Nouns differs from that of Verbs. More generally, systematic differences in the conditions imposed on thematic Roles are a core point in the content of lexical categories. More technically, the features identifying the categories V, N, A and P relate crucially to conditions imposed on Theta-Roles, a point to which we will return below.

(IV) Hierarchy of Argument Structure: The Theta-Roles of a linguistic expression E constitute the Argument Structure AS of E, sometimes called its Theta-Grid. This grid is not an unstructured set, but a hierarchy of Theta-Roles, which are ordered on the basis of their semantic content and with respect to their grammatical realization as subject, direct, oblique, or prepositional object of E, etc. This is illustrated by the ranking of *er*, *seinem Sohn*, and *den Mantel* in (2c). The same or similar semantic relations do not necessarily lead to the same grammatical hierarchy, however, as shown by cases like (10) and (11), where the Theme is higher than the Experiencer in (a), while (b) shows the inverse relation:

(10)   a. *The dog*$_{Th}$ *didn't frighten Eve*$_{Exp}$
       b. *Eve*$_{Exp}$ *didn't fear the dog*$_{Th}$

(11)   a. *Der Erfolg*$_{Th}$ *freut Karl*$_{Exp}$ (The success pleases Karl)
       b. *Karl*$_{Exp}$ *freut sich über den Erfolg*$_{Th}$ (Karl enjoys the success)

(V) Systematism with Lexical Provisos: The Argument Structure is organized by systematic principles, on which idiosyncratic specifications can be imposed by individual lexical entries. For example, the semantic relation that shows up according to regular conditions as direct object with Accusative Case in (12a) is idiosyncratically realized as Genitive in (12b):

(12) a. *Der Patient braucht sorgfältige Pflege.*   (The patient needs careful tending)
      b. *Der Patient bedarf sorgfältiger Pflege.*   (The patient requires careful tending)

An even more idiosyncratic option is shown by the Argument Structure of *fürchten* und *grauen* in (3) and (4) above, where *fürchten* exhibits the regular transitive pattern of German, while *grauen* is an expression of emotional attitude with completely idiosyncratic Case requirements.

Yet another type of idiosyncrasy is shown in (14), the German counterpart of the English (un)ergative constructions in (13). Obviously, one of the two ways to realize the non-causative use of the German counterpart of *break* and *bend* must be lexically marked.[3]

(13) a. *Paul broke the branch.*   vs.   *The branch broke.*
      b. *Paul bent the branch.*   vs.   *The branch bent.*

(14) a. *Paul zerbrach den Ast.*   vs.   *Der Ast zerbrach.*
      b. *Paul bog den Ast.*   vs.   *Der Ast bog sich.*

A particular type of idiosyncrasy is also involved in the different realization of Theme and Experiencer noted in (10) and (11).

The overall point illustrated by these and a wide range of other cases is the fact that (a) there are idiosyncratic cases besides regular conditions, (b) idiosyncrasy presupposes systematic principles to deviate from, and (c) these systematic principles are again of different sorts, belonging either to the general organization of natural languages, i.e. to Universal Grammar UG, which specifies the structure of the language faculty, or to the regularities of individual languages, i.e. the rules and categories of a particular Grammar G, such as the inflectional system or choice of morphological categories of a particular language.

3. Necessary and plausible conditions on formalization

Given these observations, a number of necessary, or at least plausible, conditions on any theoretical account of Theta-Roles can be identified.

(a) <u>S-selection</u>: A systematic account of s-selection requires a Theta-Role Θ_i of an expression E to be anchored in principle in the Semantic Form SF

of E (where SF captures the invariant conditions which E contri-butes to the conceptual interpretation). The natural way to relate Θ_i to SF is to provide an empty slot to which it is bound, or more technically: a variable x_i that bears the relevant semantic relation in SF and is controlled by Θ_i. The actual realization of this requirement depends on the theory of SF one adopts. I will return to this point immediately.[4]

(b) <u>C-selection</u>: A natural treatment of c-selection should rely on the features that specify the syntactic and morphological properties a consti-tuent to which the Theta Role can be assigned must meet. There are various ways to make this condition explicit. The relevant proposals include mechanisms of unification, filtering, saturation, or checking of features, which the two expressions connected by a Theta-Role must exhibit.[5] In any case, the features in question must be associated with the Theta-Role to be assigned to the constituent it selects. For instance, the features requiring the idiosyncratic Dative in *ihm graut* (he shudders) must be associated with the Role usually called Experiencer.

(c) <u>Association of s- and c-selection</u>: The most direct way to meet the conditions formulated in (a) and (b) is to construe a Theta-Role Θ_i as a pair $< \lambda x_i, F_i >$, where λx_i is an operator abstracting over the variable x_i in SF(E), and F_i is a set of morpho-syntactic features to be matched by (or unified with) the categorization of the pertinent co-constituent. In other words, each Theta-Role Θ_i is anchored in SF by its λx_i, and determines by means of the features F_i the c-selection of an appropriate constituent to saturate the variable x_i.

(d) <u>Type Structure and Lambda Abstraction</u>: Theta-Roles as characterized so far are abstractors associated with (sets of) morpho-syntactic features. The abstractors have access to semantic variables, and it is these variables which carry the semantic relation which Theta-Roles rely on. This, of course, presupposes semantic representations that provide the variables in question. To this effect, SF must be construed as a representational system which is made up of constants and variables as basic elements, combined in terms of a functor-argument-structure by means of combinatorial types, by which these elements are classified.[6] In the end, the configurations of these elements must be based on the conceptual interpretation of SF. In other words, Theta-Roles can be treated as operators applying to type-structures according to the general principles of Lambda abstraction.

It might be noted that these are parsimonious assumptions, very much in line with condition (A) above, as conceptual representations need some sort of general organization anyway. Type structure is the minimal framework that provides the necessary generalizations[7]. On this background, three conjectures with fairly general consequences are to be made.

(e) First conjecture: Propositionality. The SF-representations of major syntactic categories (i.e. of expressions categorized as N, V, A, or P), are propositions, i.e. configurations of type t. This assumption makes explicit what most approaches to natural language semantics assume in one way or the other[8], namely that each major syntactic constituent expresses a more or less complex condition that specifies a kind of situation.

This conjecture has certain immediate consequences. First, the operators in AS, i.e. the Theta-Roles of an Expression E, turn E semantically in an n-place propositional functor by means of lambda-abstraction, yielding one-place, two-place predicates, etc.[9] Second, merging major category expressions into larger units therefore amounts semantically to the systematic combination of propositional units. This combination is crucially mediated by the Theta-Roles, which determine the way in which the combined constituents contribute to the derived Semantic Form. Third, this is only possible through the intervention of so-called Functor Categories (Determiners, Complementizers, etc.), which make the SF of major constituents fit for the combination in question. For example, to derive the SF of a PP like *into the room* requires the propositional content of *room* to participate in the identification of an individual denoted by *the room*, which then becomes the Relatum merged with the Preposition *into*. In other words, the Determiner *the* turns the SF of *room* into the description of an individual, which then serves as the PP's object.[10]

(f) Second conjecture: AS-Hierarchy. The hierarchy of Theta-Roles within AS is crucially related to the content of SF, over which the operators λx_i abstract. This is an important point, which concerns the interface character of Theta-Roles, as the hierarchy in AS is important for the syntactic realization of Argument Positions. There are at least two conceptions about the way in which this aspect is realized. They will be discussed in section 3.

(g) Third conjecture: Grammatical Regularity. The number of Theta-Roles supported by an expression E, their status (obligatory or optional), their morpho-syntactic features and the type of their variable depends to a large extent on general principles, which may be universal or language particular.

Thus, for expressions categorized as [+ N], i.e. Nouns and Adjectives, Theta-Roles for Complements are usually optional, while for [-N]-expressions, viz. Verbs and Prepositions, complements are obligatory.[11] For the sake of illustration, consider English Verbs like *encounter* or *support*, the object of which is obligatory, while the corresponding Nouns have an optional complement, which furthermore can only be realized by a PP or a Genitive. Thus, we have *he supported the candidate* alongside with *his support (of the candidate)*. Similarly, in German Prepositions like *über* (above), *unter* (below), *hinter* (behind), etc., which are categorized as [-N], require an obligatory object, as opposed to Adjectives like *angenehm* (convenient), or *langweilig* (boring) with the feature [+N], whose complement is optional.

A particular aspect of grammatical regularity concerns the features F_i associated with the Theta-Role Θ_i in the AS of an expression E. This association appears to be determined by principles and rules of different degrees of generality, which depend, among others, on the syntactic category of E, the position of Θ_i in AS, and the morphological categories a given language provides. These principles and rules can be universal or language particular, and they admit for specific types of lexical idiosyncrasy. The latter possibility is instantiated in German by the idiosyncratic Genitive of *bedürfen* (require, need) in (12a) above, as opposed to the regular Accusative of *brauchen* and *benötigen* (need), as (12b). Likewise, the regular pattern for ditransitive Verbs in German, with Dative and Accusative for the indirect and the direct object, as shown in (15a), can be superseded in rather specific cases by a second Accusative assigned to the indirect object, as shown in (15b).[12]

(15)   a. *Peter*_{Nom} *hat ihr*_{Dat} *etwas*_{Akk} *gesagt.*   (Peter said something to her)

   b. *Peter*_{Nom} *hat sie*_{Akk} *etwas*_{Akk} *gefragt.*   (Peter asked her something)

A different phenomenon shows up in the contrast illustrated by (16a) and (16b). The Recipient of *überreden* (persuade) comes with the Accusative of the direct object, while the Recipient of *vorschlagen* (propose) realizes the Dative of an indirect object. As a consequence, the infinitival complement provides an optional Theme in (16a), but obligatory direct object in (16b).

(16)   a.   *Sie*_{Nom} *hat ihn*_{Acc} überredet, *zu bleiben.*

             (She persuaded him to stay)

     b.   *Sie*_{Nom} *hat ihm*_{Dat} vorgeschlagen, *zu bleiben*

             (She suggested to him to stay)

Regularities of this type as well as their idiosyncratic supersession are, of course, not restricted to Theta-Roles of Verbs, but apply equally to Nouns, Prepositions, and Adjectives. For instance, German temporal Prepositions require by rule a Dative object, as in *vor / in / nach der Pause* (before / in / after the break), while *während des Treffens* (during the meeting) idiosyncratically requires the Genitive.

It might be noted that a great deal of work on Argument Structure and its grammatical aspects concerns precisely the principles envisaged by the Grammatical Regularity-conjecture.[13] An important effect of the distinction between universal, regular, and idiosyncratic conditions on c-selection is the fact that predictable features need not be part of underspecified, redundancy free lexical representations, which corresponds to the fact that they need not be learned individually. Hence, in lexical representation, F_i might be an empty set in many cases.[14]

A notational format that accounts for the assumptions discussed so far is sketched in (17), where PF indicates the Phonetic Form of an expression, and Cat its morpho-syntactic categorization.

(17)   / ----- / $[\pm \text{N}, \ldots]\lambda x_n \lambda x_{n-1} \ldots \lambda x_0$ $[[\text{P} \ldots [\text{Q} \ldots x_n] \ldots x_{n-1}] \ldots x_0]_t$

                     $[F_n]\ [F_{n-1}]$ $[F_0]$

          $\underbrace{\qquad}$ $\underbrace{\qquad}$ $\underbrace{\qquad\qquad\qquad}$ $\underbrace{\qquad\qquad\qquad\qquad}$

         PF   Cat   AS   SF

A provisional instantiation of this schema, anticipating certain assumptions to be discussed below, would be the entry (18) for the German Preposition *auf* (on):

(18)   /auf/ $[- \text{N}, -\text{V}, - \text{Dir}]$ $\lambda x\ \lambda y$ $[y\ \text{LOCATED-AT}\quad \text{SURFACE}\quad x\ ]$

                            $[\text{Dat}]$ | | | |

                                 e $\langle e,\langle e,t\rangle\rangle$ $\langle e,e\rangle$ e

$$\langle e,\langle e,t\rangle\rangle \quad \langle e,e\rangle \rightarrow e \quad \langle e,t\rangle \rightarrow t$$

The Dative required for the object of the Preposition is the regular option, hence it doesn't need to be specified lexically. The type-structure given in (18) merely indicates the organization of SF – it simply follows from the types of the basic elements and need no representation of its own.

4.   Two conceptions about Theta-Roles

Returning to the AS-Hierarchy-conjecture, essentially two traditions to look at the semantic aspect of Theta-Roles are to be noted. They might be called the intrinsic and extrinsic view, respectively. The extrinsic view assumes a (presumably universal) set of relations, fixed independently of the items to which they are attached and ranked according to their substantive "content". The intrinsic view considers the relations in question as an inherent aspect of the items they rely on, with no independent status, content, or ranking outside these structures. Both views are compatible with the independently motivated assumption that Theta-Roles can formally be construed as abstractors over appropriate variables in SF. I will discuss the two approaches in turn and then compare their perspectives.

4.1.   The Intrinsic View

According to this conception, the variables which Theta-Roles rely on are inextricably involved in the functor-argument-structure which specifies the semantic aspect of linguistic expressions. The specific "content" of Theta-Roles as well as their ranking relative to each other derives exactly from role and position of these variables. More specifically, the Intrinsic View is concerned with two aspects of Theta-Roles: their substantive content and their hierarchical ordering. Both aspects can be seen in (18), where the relation LOCATED-AT and the function SURFACE define the content of their arguments x and y as well as their relative ranking (in this case y higher than x). As a more complex example, consider the lexical entry for the verb *show* in (19). As a general property of Verbs, the SF of *show* contains in addition to the variables x, y and z for participants of the event, a variable s over situations (or eventualities in the sense of Bach (1986)), which identifies the event as a whole and is connected by the colon to the proposition it instantiates.[15]

(19)   /show/   [+V]
λx λy λz λs   [s: [[ACT$_{\langle e,t \rangle}$ z]$_t$ [CAUSE$_{\langle t,\langle t,t \rangle \rangle}$ [BECOME$_{\langle t,t \rangle}$ [y [SEE$_{\langle e,\langle e,t \rangle \rangle}$ x]$_{\langle e,t \rangle}$]$_t$]$_t$]$_{\langle t,t \rangle}$]$_t$]$_t$

$\underbrace{\hphantom{aaaaaaaa}}$ $\underbrace{\hphantom{aaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaaa}}$
     AS   SF

It might be added that Theta-Roles are not restricted to variables of type e (for individuals or eventualities). Thus, the entry (20) for the inchoative copula *get* includes a variable P for one-place predicates, on which the Argument Position λP for the predicative is based:

(20)   /get/   [+V]
     λP λx λs   [s: [BECOME$_{\langle t,t \rangle}$ [P$_{\langle e,t \rangle}$ x]$_t$]$_t$]$_t$

In a case like *Mary got sick*, the SF of the Adjective *sick* would ultimately replace the variable P, just like the SF of *Mary* replaces the variable x.

Looking more closely at the first aspect – the content of Theta-Roles – , we first observe that the Intrinsic View is based on the following general principle:

(21)   Each functor of SF establishes a characteristic relation to each of its arguments, thereby restricting the choice of appropriate arguments.

Instead of striving for an explicit definition of the concepts "characteristic relation" and "appropriate argument", I will point to their intuitively obvious purport by means of simple examples. The content of the verb *see* for instance requires one argument that is capable of visual perception and one argument that specifies the content of perception. Thus [x [SEE y]] indicates not only asymmetrical relations between SEE and its arguments x and y, but also the fact that x and y play specific roles within the relation specified by this configuration. Likewise, the meaning of a preposition such as *before* requires an entity that can be located and an entity which provides a place or time for the location in question. Thus [x [BEFORE y]] specifies a relation between x and BEFORE, which makes x the Thema, and a relation between y und BEFORE, which turns y into the Relatum.

Notice that (21) provides a systematic origin of the s-selection imposed by Theta-Roles without any stipulation beyond the independently needed specification of SF.

For the representation of meaning by means of SF, some sort of lexical decomposition, as indicated in (18)–(20), seems to me appropriate or even unavoidable. Hence basic elements of SF like ACT, CAUSE, BEOME, SEE, ALIVE, LOCATION, SURFACE, etc. will be assumed. The central motivation for this assumption is the fact that decomposition in this sense provides a more systematic representation of the grammatically relevant aspects of meaning.[16] With this proviso, the relations and restrictions referred to in (21) can be reduced to the basic components, which eventually determine the conceptual (or truth-conditional) interpretation of SF. For instance, the argument of ACT must be an individual involved in an action, the two arguments of CAUSE specify cause and effect of a causal connection, the argument of BECOME defines a resulting state, etc. On this basis, the Theta-Roles assigned to the direct and indirect object of the verb *show* derive directly from the Roles assigned to the object and subject of the verb *see* mentioned before, if the analysis in (19) is correct, because SEE belongs not only to the SF of both items, but also determines the corresponding Argument Positions. Similar considerations apply to verbs like *give* and *have, bring (to)* and *be at* or German *tränken* (make drink) and *trinken* (drink), and lots of other more or less obvious cases.[17]

Turning next to the second aspect – the ranking of Theta-Roles –, we notice first that the functor-argument-structure of SF induces a strictly hierarchical organization made explicit in (18) by a labeled tree and in (19) and (20) by labeled bracketings. Within this hierarchy, each element has a definite structural position relative to other elements. A straightforward way to characterize this position turns on the fact that a functor forms a constituent with its argument[18] by means of an asymmetrical relation, which might be called a-command (for argument-command) and defined as follows:

(22)   If φ is a functor and ψ its argument, then every (improper) part of φ a-commands ψ and all its parts.

In other words, an argument and all constituents it is made up from are subordinate (in terms of a-command) to its functor and its constituent parts. A simple means to make the content of (22) visible is the so-called Polish notation, which systematically places a functor to the left of its arguments.[19] In this notation, each unit would a-command everything to its right. Hence a straight a-command-ranking emerges if elements are simply numbered from left to right, such that the higher number of an element indicates its dependence on more complex functors with lower numbers. To

illustrate the point, consider the SF of *show* in (19), which is turned into
(23a), using INST instead of the colon (see fn. 15) for the sake of clarity.
The a-command relation between the relevant variables is indicated in
(23b) with the ranking abbreviated in (23c):

(23)   a.   [[INST [[[CAUSE [BECOME [[SEE x] y]]]] [ACT z]]] s]
                  1   2   3   4 5 6   7 8   9
       b.   x a-commands y, z, s; y a-commands z, s; z a-commands s.
       c.   x < y < z < s

The ranking of variables thus derived provides a simple and obvious
account of the second aspect of the Intrinsic View, according to which the
ranking of variables in SF determines the hierarchy of Theta-Roles in AS.
More formally, we have the following condition:

(24)   Theta-Ranking:
       If x a-commands y in SF, then λx precedes λy in the AS prefixed to
       SF.

The effect of (24) has in fact been assumed for empirical reasons in the
examples discussed so far.[20] Now, the crucial point to be noted is this:
Although the lambda-calculus, on which the construal of Theta-Roles as
abstractors rests, does by no means imply the ordering assumed in (24), it
still need not be stipulated. It rather follows, if one adopts the more general
principle (25):

(25)   Close structural correspondence is the default case for the relation
       between semantic and syntactic structure.

The notion of close structural correspondence can be made precise in
various ways that need not concern us here. The basic idea is simply that
the hierarchy of SF is projected into the underlying syntactic structure, such
that Theta-Roles with variables of lower a-command-position, i.e.
depending on less complex functors, are discharged to closer, i.e. lower
syntactic constituents – given appropriate syntactic configurations. Hence
the Intrinsic View need not stipulate the ranking of Theta-Roles, because it
follows from the more general assumption (25), which has, by the way, at
least implicitly been followed in various syntactic approaches, from Lakoff
(1971) and McCawley (1971) to Hale and Keyser (1993). It can in fact be

observed fairly directly in the parallel ranking of Arguments in corresponding (not necessarily synonymous) cases like (26) or (27):

(26)   a.   *John₃ showed us₂ the figures₁*
       b.   *John₃ let us₂ see the figures₁*

(27)   a.   *John₃ persuaded us₂ of his plan₁*
       b.   *John₃ made us₂ accept his plan₁*

In conclusion, the Intrinsic View – in line with the conditions of Adequacy and Parsimony – accounts for content, s-selection, and ranking of Theta-Roles without stipulations beyond independently motivated assumptions.

Three apparently problematic issues are to be noted at this point. They might be called the visibility problem, the multiplicity problem, and the anomalous ranking problem. I will briefly comment on them in turn.

4.1.1.   The visibility problem

The visibility problem is due to the observation that in a wide variety of cases a variable occurring in SF is not turned into a Theta-Role by lambda abstraction and hence not assigned to a co-constituent. One type of invisibility comes from optional Argument Positions, where a variable in SF is left unspecified, if optional Roles is not realized. In these cases, the value of the variables in question must be supplied according to contextual conditions. In these cases, a variable could be considered as a parameter (v), whose syntactic position is still identifiable, as indicated in (28):

(28)   a.   *He was not in (v) today.*
       b.   *She was reading (v) until he came.*

Thus optional Theta-Roles of Prepositions like *in, above, behind*, pseudo-intransitive Verbs like *read, eat, think*, etc. and various other lexical categories can be dropped, but would still be accessible for regular syntactic realization, delivering also their content and s-selection. The situation is different for expressions with variables that do not appear in AS in the first place, as e.g. *speak*, which (in contrast to *say*) does not admit an object. A more intricate example are verbs for transfer of possession like *buy, sell*, or *rent*, whose AS clearly has a Position for an instigator and an

object of exchange, while the exchange-partner and the monitary equivalent necessary for an act of buying or renting cannot be realized by a syntactic complement, but must be inferred from context or background. They can be made explicit, though, by prepositional Adjuncts, as indicated in (29):

(29)   a. *They eventually bought the house (from an agent).*
       b. *He rented a car (for 60 dollars (per day)).*

The partner and the monitary equivalent (indicated by *from an agent* and *for 60 dollars*) are linked to the Verb as Adjuncts by means of *from* and *for*; and they take up variables that appear in the SF, but not in the AS of *buy* and *sell*. This brings up the non-trivial problem of Theta-Roles of Adjuncts and their assignment to the head they modify, a question that cannot be adequately pursued here.[21] Yet another type of invisible arguments is shown by so-called resultative constructions. Cases like (30a) obviously rest on ordinary transitive constructions like (30b), and the inner argument of DRINK, which is realized by *the wine* in (30b), must clearly be present in (30a), but it must be removed from the AS of the verb *drink*. It cannot surface as a regular complement:

(30)   a. *Max drank the bar empty.*
       b. *Max drank the wine.*

A solution to this problem is proposed in Wunderlich (1997a). Adopting the Intrinsic View, Wunderlich suggests that under well defined structural conditions a variable of SF is systematically excluded from appearing as a Theta-Role in AS.[22] I will bypass further types of syntactically invisible variables, turning instead to the next problem.

4.1.2.   The multiplicity problem

The multiplicity problem arises if the same variable shows up more than once in a given SF. These occurrences have necessarily different rankings, and the question arises which of them determines the rank of a possible Theta-Role?[23] The situation is illustrated in (31a) and (b). The first case, a so-called weak resultative construction, resembles (30a), except that the object of the verb *paint* is identical with the individual introduced by the target state *(be) green* and hence occurs twice.

(31)   a.   *Max painted the wall green.*
       b.   *Max stellte die Vase auf den Tisch.*   (Max put the vase <upright>
                                                      on the table.)

Now, if in strong resultatives like (30a) the variable with the lower rank wins the race for a place in AS (see f. 22), then one might plausibly assume a similar effect for weak resultatives. Hence in (31a) the argument of *green* rather than the object of *paint* decides the rank of the Theta-Role that binds both occurrences of the relevant variable in the verbal complex *paint green*. Similar considerations apply to cases like (31b), where the causative verb *stellen* imposes two conditions on the resulting state, viz. a position of the object and its location. The latter condition is specified by the PP *auf den Tisch*, which is not an Adjunct, but a proper complement of the Verb.[24] The point to be noted is that again the occurrence of the variable with the lower a-command ranking is responsible for the place in AS. This effect follows, by the way, from condition (24) without any ado[25].

4.1.3.   The anomalous ranking problem

The anomalous ranking problem clearly differs from the previous cases, as it has to do with the content of Theta-Roles, and it raises difficulties not only for the Intrinsic View, as we will see shortly. The issue is illustrated by examples like (32)–(33), where the (a)- and the (b)-cases are more or less synonymous, but differ nevertheless with respect to c-selection as well as the ranking in AS for essentially the same (or at least very similar) semantic relations:

(32)   a.   *Mary liked the book.*
       b.   *The book pleased Mary.*

(33)   a.   *Mary owns the book.*
       b.   *The book belongs to Mary.*

(34)   a.   *Maria besitzt das Buch.*   (Mary owns the book.)
       b.   *Das Buch gehört Maria.*   (The book belongs to Mary.)

Within the Intrinsic View, two approaches to the problem seem to be possible: Either one item of the pairs in question must be assumed to have an AS-hierarchy that exhibits an idiosyncratic, lexically marked violation

of (24) with subsequent idiosyncrasies for the features of c-selection, or the pairs are analyzed as not really synonymous, differing in their SF with corresponding effects for their AS. It would be the stronger, more systematic account, if the latter approach could be justified as the appropriate option. Consider the contrast in (33) and (34). While *A besitzt/owns B* indicates a (fairly abstract) right of disposal, *B gehört/belongs to A* refers to a more concrete pertinence relation. Hence, in (33b) and (34b) a particular token, a concrete copy is at issue, while in the (a)-cases an arbitrary instance of a given title would do. A number of different consequences corroborate this observation. Thus, different consequences show up if the definite DP *the book* is replaced by its indefinite counterpart. Suppose now that the elements OWN (for right of disposal) and PERTAIN-TO (for pertinence) identify the respective relations. We would then get the entries in (35) and (36), respectively, with no violation of (24).

(35) /besitzen/ [+V] $\lambda x\ \lambda y\ \lambda s$ [s: [y [OWN x]]]

(36) /gehören/ [+V] $\lambda y\ \lambda x\ \lambda s$ [s: [x [PERTAIN-TO y]]]
                         [Dat]

This is of course by no means the whole story about apparently anomalous rankings, but merely a hint at one option for the Intrinsic View to cope with the issue.

These problems are more or less well known and certainly in need of further clarification. I want to emphasize, however, that they arise in much the same way for all approaches, including especially the Extrinsic View, creating in fact even more serious difficulties, as we will see shortly.

4.2.   Extrinsic View

According to this conception, Theta-Roles do not emerge from the semantic representation of lexical items, but must rather be construed as self-contained organizing elements by means of which situations are made accessible for linguistic representation.[26] Like the Intrinsic View, this approach deals with content and ranking of Theta-Roles, although in a rather different way, namely by two independent stipulations, added to the theory of linguistic structure. As to the content, a fixed, presumably universal, albeit fairly controversial, set of Roles such as Agent, Place,

Goal, Experiencer, Theme, etc. is stipulated. With respect to the hierarchy, an explicit ordering within this set is assumed. Usually, these two aspects are presented as just one ordered set of roles. Bresnan (2001) is a representative example, with Agent as the highest and Place the lowest position:

(37)   Agent > Recipient > Experiencer/Goal > Instrument > Patient/Theme
       > Place

The basic idea is, of course, that Theta-Roles define relations by which participants are involved in an event or situation. A widespread version to implement this view, misleadingly called the Neo-Davidsonean view[27], has been proposed by Parsons (1990) and is adopted by Krifka (1992), Dölling (2003) and many others. It construes Theta-Roles as two-place predicates Agent (of), Experiencer (of), Theme (of), etc. which relate a variable x to a given situation or event s, with the properties of s being specified by a one-place predicate indicating the characteristic content of the lexical item in question. According to this view, the entry (19) would have to be replaced by (38), other things being equal:

(38)   /show/ [+V] $\lambda x\ \lambda y\ \lambda z\ \lambda s$ [SHOW (s) & Agent (z, s) &
                                    Exp (y, s) & Th (x, s)]

Four comments are indicted at this point. First of all, the situation-predicate – SHOW in the case of (38) – must be considered as a true basic element of SF, but not as an abbreviation for a more complex structure along the lines of (19), since any decomposition of SHOW would make components like Agent(z, s), Exp(y, s) redundant and would thus totally spoil the gist of the Extrinsic View. Hence SHOW does not conceal any inherent, linguistically relevant, formal relation to SEE, CAUSE, ACT or any other semantic primes.[28]

Second, in order to carry Theta-Roles in this sense, a linguistic expression must provide a situation s to which the roles in question can relate. Hence either Nouns, Adjectives, Prepositions cannot be supplied with Theta-Roles, violating the principle of Adequacy, or they must all be provided with a situation variable and with a predicate specifying its characteristics. In fact, a proper Neo-Davidsonean entry for a Preposition like *under* would look like (39). But such an entry doesn't make sense, as the Relatum x cannot sensibly be said to have a Place-relation to the bare UNDER-situation s.

(39)   /under/ [–V, –N] λx λy [UNDER (s) & Th(y, s) & Place (x, s)]

Similar difficulties would arise with adjectives like *tall*, *narrow*, or nouns like *brother*, *friend*, *president*, etc. In general, I don't see how the Neo-Davidsonean approach could meet the principle of Adequacy.[29]

Third, the hierarchy in AS is assumed to be defined by the ranking among the semantic relations: Agent dominates Experiencer, which dominates Theme, etc. Beyond this stipulation, there is no hierarchy within SF, since the conjunction & is not assumed to impose any ranking among the semantic components.[30] As a matter of fact, semantic representations on this view turn out to be compositional in a rather incomplete and arbitrary way, because Thematic Relations are separated from each other and from the rest of the situation to which they relate.

Fourth, according to a widely held additional assumption within the Extrinsic View, AS is constituted by a choice from the hierarchy (37), subject to certain constraints. Two of these conditions, which would impose interesting restrictions on possible ASs, are given in (40):

(40)   a.   A Thematic relation of (37) can be realized at most once by a given entry.
       b.   A semantic variable can participate in only one relation.

Even if Theta-Roles were – contrary to fact – restricted to verbs, there are further problems with the choice from (37), as constrained by (40). Thus, to exclude repeated occurrence of a Role chosen from (37) by (40a) is presumably a problematic move in view of verbs like *feed*, which need an Agent that causes the activity of another Agent.[31] More obviously still, condition (40b) is at variance with cases where more than one Role is to be assigned to the same argument. To give just one example: Verbs of motion like *walk*, *run*, *swim*, *crawl* etc. would require their subject to be Agent of an activity, but also Theme of motion in cases like *John walked to the bank and crawled across the river*. We will see immediately that this issue is related to the multiplicity problem noted above.

As already noted, just like the Intrinsic View, the Extrinsic View has to deal with the problem of visibility, of multiplicity, and of anomalous ranking, and it encounters greater difficulties in this respect.

4.2.1.   The visibility problem

At first glance, the visibility problem seems to disappear for trivial reasons: As the major predicate of a verb is always a one-place functor that cannot introduce invisible variables, there are just as many variables as the entry provides Theta-Roles. Thus pseudo-intransitives like *read, eat,* etc. just don't introduce a Theme in cases like *he was reading all day.* However, why should a verb like *read* not have, besides Ag(x,s), a component Th(y,x) in its SF, bound by an optional operator in its AS? Notice that this would not even violate condition (40), even in its more restrictive interpretation. But if this option is admitted, the visibility problem arises in much the same way as in the Intrinsic View. Moreover, the standard way to account for optional Complements in the Extrinsic View, namely by just omitting them from SF, raises serious problems of a different type, as we will see below.

4.2.2.   The multiplicity problem

The multiplicity problem, as already noted, would arise e.g. with many verbs of motion, but also with verbs of position like *sit* or *stand,* where the Theme needs to be related both to the type of position (sitting, standing, hanging, etc.) and the location. In these cases, we get an empirically necessary blend of Roles with respect to their content, clearly violating (40) in its strong interpretation. But there is no difficulty in ranking, though, if the highest Role according to (37) determines the position in AS.

4.2.3.   The anomalous ranking problem

As already mentioned, the anomalous ranking problem causes serious problems to the Extrinsic View. Looking at cases like (32)/(33), there doesn't seem to be a possibility to come up with a different choice from (37) for *own* and *belong to*: They both have a Theme and a Recipient or Place (or whatever the appropriate choice for the role of the owner might be, an issue to which we have to return), with no chance to derive a different ranking in AS, – except by the assumption that one of them, say *belong to,* idiosyncratically violates the ranking of (37). Notice that an analysis along the lines suggested in (35)/(36) with different basic predicates for the two verbs would not be of any help, unless (again by

stipulation) a difference in Theta-Roles is created. The reason for this impasse is, among others, the fact that the extrinsic hierarchy (37) provides a by far coarser classification than the elements of SF on which the Intrinsic View relies.

In conclusion, the Extrinsic View, and in particular the Neo-Davidsonean Approach, does have difficulties with the principle of Adequacy as well as the principle of Parsimony.

5.   Comparative Assessment

The two views on Theta-Roles are concerned with largely the same phenomena and share a number of important features: In both views, Theta-Roles can be construed as lambda-abstractors annotated with formal features, thus providing an interface between semantic and morpho-syntactic aspects of linguistic expressions. The semantic background of the abstractors provides the s-selection, and the formal features, subject to universal, language particular, and idiosyncratic conditions, determine the c-selection associated with Theta-Roles. Finally, the semantic background of the lambda-abstractors provides the ranking of Theta-Roles, which – together with their formal features – determines the syntactic realization or saturation of the Argument Positions.

On the other hand, the two views exhibit important differences. Most importantly, the semantic basis is construed in very different ways, which has important consequences for the possible assignment of Thematic Roles. Under the Extrinsic View, only verbs and de-verbal nouns, namely units with primary reference to eventualities, can naturally be assigned Thematic Roles, although in fact expressions of all major syntactic categories do exhibit characteristic Argument Theta-Roles. The root of this restriction is the separation of thematic information from the rest of SF, which in turn is considered as an un-analyzable one-place predicate. This separation is directly related to the main tenet of the Extrinsic View, viz. the existence of a set of universal set of thematic relations and a ranking among them, although both the content and ranking of this set turn out to be controversial in crucial cases.

One might be inclined at this point to argue that the Intrinsic View simply shifts the stipulations to a different place, assuming a perhaps even more controversial, and in any case much larger system of semantic primes, from which SF-representations are made up. This argument misses a

decisive point, however. Notice that the Extrinsic View does not get rid of the information expressed by the basic elements of a de-compositional semantics, it rather needs a (presumably even larger) set of elements to represent for each verb the main predicate identifying its specific event or situation.[32] Hence the additional stipulation coming with the Extrinsic View must be assessed relative to the information needed independently under both views. In any case, the issue must not be misconstrued as simply a matter of counting primes. We will see shortly that further important problems are relevant to this point.

To summarize the relation between the two views, one might consider the way in which the schemata of verbal entries under the two views correspond to each other. This correspondence can be indicated as follows:

(41) $\lambda z \dots \lambda x \, \lambda s \, [\, s : [\, [\, [\, P \, z \,] \dots] \, x \,] \iff$
    $\lambda z \dots \lambda x \, \lambda s \, [\, P'(s) \, \& \, R^1(x, s) \, \& \dots R^n(z, s) \,]$
    where P is a possibly complex configuration of primes with no straight and simple correspondence to P'.

With this provisional correspondence in mind, I will finally discuss four points where the Extrinsic View, and particularly its Neo-Davidsonan version, fails in empirical and theoretical respect.

1. It has frequently been noticed that the set of Thematic Roles raises various problems as to the number, the precise content, and ranking candidates. Looking at the set in (37), one might ask whether its distinctions are necessary and sufficient. For verbs like *resemble*, *differ*, or *equal* it is difficult to see which Role should be assigned to the subject. If the subject is the Theme, then a conflict arises with respect to the rank of the other argument, for it can hardly be the Place, and there is no other role below Theme. If however Theme is taken to be the role of the object of *resemble* or *equal*, then difficulties arise with respect to the subject, as none of the higher roles can be taken as even remotely appropriate. To take another example, consider verbs like *impress* or *frighten*. The (a)-cases in (42)/(43) seem to comply with the standard ranking of Agent (*the kids*), Experiencer (*us*), and Instrument (*answer/noise*). But then the (b)-cases would violate the ranking in (37), as now the Instrument is subject and thus higher than the Experiencer.[33]

(42)   a. *The kids impressed us with their answer.*
    b. *Their answer impressed us.*

(43)   a. *The kids frightened us with terrible noise.*
     b. *The terrible noise frightened us.*

A different problem is connected to verbs like *drive*: In (44a) the subject of *drive* is Agent, its object is Theme (or Patient), while in (44b), contrary to condition (40b), the subject must be both Agent and Theme:

(44)   a. *He drove the car to San Francisco.*
     b. *He drove to San Francisco.*

(45)   a. *John met his friends in London.*
     b. *John and his friends met in London.*

Yet another type of difficulties arises with verbs like *meet, marry, divorce*, where two Roles can be collapsed, as shown in (45): The Roles assigned to subject and object in (45a) are both realized by one plural-subject in (45b).[34] Further problems could easily be added. What is more important, though, is the fact, that similar difficulties would arise with all proposals to adjust the hierarchy of (37) in one way or the other.

For obvious reasons, the Intrinsic View does not encounter the problems arising from (37) (or its variants). The less trivial observation is the fact already noted: The Intrinsic View does not need comparable stipulations somewhere else. It simply accounts for the properties in question in a different way. Under this perspective, the Roles indicated in (37) are just a convenient, but provisional way of referring to some descriptive generaliations about semantic aspects of Argument Positions. There are good reasons to believe that it is essentially for this reason that the Extrinsic View is fairly attractive for certain heuristic purposes.

2. A rather different problem for the Extrinsic View arises from the fact that the number and content of Theta-Roles to be assigned to a given lexical item for purely descriptive reasons is not just an arbitrary lexical property. For instance, that *carry, kill, encounter,* or *resemble* all require two proper, lexical Argument Positions (in addition to the situation variable), that *sleep, jump,* and *run* have only one such Position, while *meet, marry,* or *divorce* need two Arguments, unless they have a plural subject, all these are not arbitrary facts, based on lexical idiosyncrasy. Similarly, that *carry* and *kill*, but not *resemble* or *own* would require an Agent and a Theme/Patient is not open to arbitrary alternations. Furthermore, the inclusion of arbitrary Roles, such as Theme or Recipient for *sleep*

or *jump*, or Instrument and/or Goal for *resemble* or *marry*, etc. must be blocked. In short, anomalous combinations like (46) must be excluded on principled grounds:

(46)   a.   **Eve encountered into the garden.*
       b.   **John slept him a project.*
       c.   **Harry expected.*

The only way I can see to accomplish these requirements is to set up a system of meaning postulates that specifies the necessary and admissible Theta-Roles for all (groups of) main verbal predicates. Notice that (37) and (40) cannot accomplish this task. They would only constrain the postulates in certain respects.

There are two major objections to this way out. The first comes from the enormous, completely artificial, and in fact avoidable complexity such a system of postulates would have, if all actually inadmissible combinations that (37) would allow for are to be correctly excluded. Roughly speaking, for each main predicate P(s) there would have to be a postulate that determines the necessary, and one that excludes the inadmissible Roles from (37), schematically:

(47)   a. $\forall(s) [P_i(s) \rightarrow \exists(x_1, ..., x_m) [R^1 (x_1, s) \& ... \& R^m (x_m, s)]]$
       b. $\forall(s) [P_i(s) \rightarrow \neg\exists(x_{m+1}, ..., x_n) [R^{m+1} (x_{m+1}, s) \& ... \& R^n(x_n, s)]]$
       where R^i is a relation from the hierarchy (37) for $1 \leq i \leq n$.

Elements of (37) that do not show up in (47a) or (b) are optional Roles, such as e.g. Place for *work* or Goal for *swim*.

The second objection results from the consideration that, besides the general problems with meaning postulates for natural languages noted by Zimmermann (1999), they are obviously not the right way to state the conditions in question. Just as it would be inadequate to set up postulates by which '¬', being a one-placed propositional functor, requires exactly one propositional argument, or '≤' requires two and only two individual arguments, it is apparently inappropriate to stipulate that *kill* requires a killer and an object of killing, but excludes a Goal (and admits an Instrument). The whole problem arises merely, because the conceptual conditions specified by predicates are inappropriately separated from the arguments to which they apply. It furthermore creates obscure logical problems, as we will see shortly.

For obvious reasons, these problems do not arise for the Intrinsic View.

3. A side issue of these problems is the fact that the Extrinsic View in its Neo-Davidsonean version does not provide a proper treatment of implicit or optional – as opposed to excluded – arguments. Consider the contrast between (a) and (b) in (48)/(49):

(48) a. A: *He was reading for two hours.*
          B: *And what did he read?*
      b. A: *He was sleeping for two hours.*
          B: **And what did he sleep?*

(49) a. A: *I sold my old bike.*
          B: *To whom did you sell it?*
      b. A: *I found my old bike.*
          B: **To whom did you find it?*

The A-sentences are not elliptical, hence they should not have a dangling Position in the AS of the verb, and therefore, according to the Extrinsic View, not in its SF either. The different acceptability of the B-sentences shows, however, that there must be a clear difference in the representation of *read* and *sell* in contrast to *sleep* and *find*: Although *read* and *sell*, like *sleep* and *find* don't need a Theme or Recipient, respectively, they must have the pertinent variable, though, taken up by a wh-pronoun in the B-cases, which is excluded for *sleep* and *find*.

The treatment of invisible variables in the Intrinsic View has already been discussed – it does not create comparable problems.

4. Finally, the Neo-Davidsonean realization of the Extrinsic View assumes a counterintuitive, in fact unacceptable logical structure, since treating the main predicate p and the thematic relations r_i as logical conjuncts p & r_1 & ...& r_n is strongly misleading. While for instance (50a) would – ignoring tense and aspect – be represented as (50b), it does not express three conjoined propositions, each of which following in the same way from the truth of (50a).[35]

(50) a. *Fred helped Mary.*
      b. $\exists(s)$ [HELPING (s) & Agent (Fred, s) & Recipient (Mary, s)]

While the claim that there was some helping-situation might be considered as naturally following from (50a), there are hardly independent inferences to the effect that Fred acts as Agent Mary acts as Recipient of

some situation.[36] This becomes even more obvious under standard negation, where (51a) with the representation (51b) would be equivalent to (51c):

(51)   a. *Fred didn't help Mary.*
       b. $\neg\exists$(s) [HELPING (s) & Agent (Fred, s) & Recipient (Mary, s)]
       c. $\forall$(s) [$\neg$HELPING (s) $\lor$ $\neg$Agent (Fred, s) $\lor$ $\neg$Recipient (Mary, s)]

According to this analysis, (51a) would be true, if for any situation Fred would not be an Agent or Mary not a Recipient. But that is definitely not the interpretation of (51a).

One might try to avoid these deficiencies by means of a different status assigned to the thematic relations, treating them e.g. as some kind of pre-supposition, which is not asserted and hence cannot be negated either, such that (50a) and (51a) are analyzed as (52a) and (b), respectively, the latter being equivalent to (c), with presuppositions included in curly brackets:

(52)   a. $\exists$(s) [{ Agent (Fred, s), Recipient (Mary, s) }   HELPING (s)]
       b. $\neg\exists$(s) [{ Agent (Fred, s), Recipient (Mary, s) }   HELPING (s)]
       c. $\forall$(s) [{ Agent (Fred, s), Recipient (Mary, s) } $\neg$HELPING (s)]

Although (52) escapes some of the objections just noted, it is still not the appropriate analysis of (50a) and (51a): Fred's Agenthood and Mary's Recipiency in s cannot be the presupposition for HELPING(s) to be true or false, if HELPING is nothing but a one-place predicate about s. There is, altogether, apparently no logically acceptable way to rescue the separation of the main predicate from its arguments, as required by the Extrinsic View.

For obvious reasons, the type of logical inappropriateness just discussed cannot arise with respect to the Intrinsic View, because there is no separation of the main predicates from their arguments. There are, nevertheless, nontrivial logical problems, e.g. with respect to the negation of complex predicates as required e.g. for verbs like *kill* indicated in (53):

(53)   /kill/ [+V] λy λz λs [s: [[ACT z] [CAUSE [BECOME $\neg$[ALIVE y]]]]
]
       Ignoring again tense and other details that are irrelevant in the present context, the SF of (54a) would come out as (54b), which should be equivalent to (54c):

(54)   a. *Max didn't kill Fred.*
       b. ¬[∃s [s: [[ACT Max] [CAUSE [BECOME ¬[ALIVE Fred]]]]]]
       c. ∀s [s: [¬[[ACT Max] [CAUSE [BECOME ¬[ALIVE Fred]]]]]]

The task to be faced at this point is the distribution of the negation in accordance with its scope. Intuitively, (54a) should come out as true if Fred didn't die or if he died, but not from an action of Max. The equivalences in (55) would be a first step to accomplish this effect:

(55)   a. ¬[φ [CAUSE ψ]]   ≡   [[φ [CAUSE ψ]] → ¬φ] ∨ ¬ψ
       b. ¬ [BECOME φ]   ≡   [REMAIN ¬φ]

(55a) accounts for the two alternatives making (54) true. (55b), which relates BECOME to its dual operator REMAIN, would then turn ¬ [BECOME ¬ [ALIVE Fred]], the instantiation of ¬ψ in (54c) according to (55a), into [REMAIN ¬¬[ALIVE Fred]], that is [REMAIN [ALIVE Fred]], representing Fred's staying alive, exactly as required by one of the conditions making (54a) true.

Although this is not more than a rough approximation that only hints at a larger program, three important points can still be made. First of all, the general format on which the Intrinsic View is based does not create a conflict between standard logic and the proper intuitions that must be captured. In particular, the foundation of Theta-Roles is fully in line with standard logical requirements. Second, the program indicated by (55), determining the logical relations of basic functors, is necessary in any case for syntactically explicit constructions, such as resultatives like *he didn't wipe the table clean*, causative constructions like *they didn't make him go*, or the equivalence between *he closed the door* and *he didn't leave the door open*, all of which would be subject to equivalences like (55), which are therefore required by the condition of Adequacy. And third, no additional stipulation is necessary for this aspect of the Intrinsic View, thus meeting the condition of Parsimony.

To sum up, there are strong reasons to assume that Theta-Roles are anchored in an independently motivated semantic representation with no additional requirements coming from the separation of Theta-Roles from other conceptual conditions.[37]

6.   Conclusion

Returning finally to the observation that Theta-Roles are subject to universal, language particular and idiosyncratic conditions, the following overall picture seems to emerge from the previous discussion.

(i)   Three aspects of the language faculty characterized by Universal Grammar UG are essential for the organization of Theta-Roles as part of linguistic knowledge. First, UG determines the organization of the interface between the conceptual system CS (representing the internal, propositional representation of experience with the external and internal environment) and the computational structure of linguistic expressions. This interface has been called here Semantic Form SF.[38] It is this interface that provides the basis for the "content" of Theta-Roles. Second, UG determines the representational format of possible linguistic expressions, in particular the hierarchical and sequential organization of their Phonetic Form PF and their morpho-syntactic structure, including the categorization of expressions and their constituents by sets of formal features. Third, UG determines the organization of lexical information, which basically associates structures of PF with morpho-syntactically categorized representations of SF, determining their combinatorial possibilities by the Argument Structure AS, which makes positions in SF accessible for syntactic realization according to presumably universal constraints, determining thereby the s-and c-selection of the positions in question.

(ii)   Two aspects of the organization of particular languages, based on the framework defined by UG, are characteristically involved in Theta-Roles. First, languages may distinguish different syntactic and morphological categories by means of formal features, where the computational content of syntactic features like $\pm$N or $\pm$V determines, among others, the organization of possible ASs, while morphological features for categories like Case, Number, Person etc. are crucially involved in c-selection associated with positions in AS. Second, according to their respective morphological categories, particular languages impose specific c-selectional conditions, determining in particular systematic dependencies among c-selectional conditions associated with particular positions in AS. Thus Case features to be matched by (or assigned to) characteristic complements can largely be predicted by general conditions, which are, however, language particular to the extent to which they depend on language specific morphology. These conditions are likely to be subject to language particular markedness or preference ordering.

(iii)   Among the properties listed in individual <u>lexical items,</u> the place of all idiosyncratic information in a given language, are specific deviations from the general conditions on positions in AS, such as the choice of Oblique Case for the direct object under particular conditions, as in German *helfen* (help) with Dative instead of Accusative, or even more idiosyncratic *bedürfen* (deserve) with Genitive instead of Accusative, or conversely requiring Accusative instead of Dative for the indirect object of *fragen* (ask). Idiosyncracies of this sort are presumably restricted by boundaries, which reflect patterns of UG, preventing e.g. indirect objects from Nominative Case in English or German.

In somewhat more formal terms:

(I)   <u>Universal Conditions,</u> determining the general organization of possible linguistic expressions, provide
   a.   the format of SF, realized as some version of a typed functor-argument structure with lambda abstraction;
   b.   the possibility to distinguish morpho-syntactic categories in terms of formal features as well as the principles of hierarchical and sequential organization of syntactic as well as PF-representations;
   c.   the structure of lexical information, providing entries of the form E = [PF, Cat [AS, SF]], where
      i.   PF determines the phonetic form of E,
      ii.   Cat is a set of formal features, categorizing E,
      iii.   SF is the semantic information of E, and
      iv.   AS is a sequence of Argument Positions or Theta-Roles $\Theta_i = < \lambda x_i, F_i >$ with x_i a variable in SF, which determines the s-selection associated with λx_i, and F_i a set of formal features determining the corresponding c-selection. The ranking in AS is determined by the functor-argument hierarchy in SF, especially the a-command relation among the x_i.

(II)   <u>Language Particular Conditions,</u> controlling the c-selectional conditions, determine
   a.   the particular morphological and syntactic features available for c-selection;
   b.   the features F_i, associated with the individual Roles Θ_i, as far as they are not fixed by universal principles or just idiosyncratic

information. These conditions may be subject to language particu-lar markedness hierarchies or preference-ordering.

(III)   Indiosyncratic Conditions are particular, lexically fixed options essentially with respect to the content of F_i. Idiosyncratic conditions override language particular constraints belonging under (IIb), but they are presumably constrained by the conditions fixed by (I). Hence their range is not arbitrary, but the instances are unpredictable.

According to this general picture, universal aspects of Theta-Roles concern their general place and function in linguistic structure and their semantic underpinning, while language particular as well as idiosyncratic aspects fall in the domain of morphological categories and their regulation. Idiosyncratic peculiarities are moreover restricted to instances of particular lexical items.

In Conclusion: It is not necessary (and hence excluded by the condition of Parsimony) to stipulate an autonomous, hierarchically ordered set of Theta-Roles. Universal, language particular, and idiosyncratic aspects of Theta-Roles, linking semantic arguments to their morpho-syntactic realization, can rather be derived from independently necessary conditions of UG, the respective grammar G, and specific lexical information.

Notes

1. Terminologically, the phenomena under discussion have been dealt with in various ways. The distinction between c-selection and s-selection has been proposed among others in Chomsky (1986). Earlier versions, such as Chomsky (1965), treated phenomena of c-selection as subcategorization, while s-selection was to some extent treated as selectional restriction.
2. The abbreviation Ag(ent), Th(eme), Exp(eriencer), Goal, Rel(atum) are provisional indications of similar semantic relations to be replaced later on.
3. It is not obvious whether the reflexive version *sich biegen* or the simple unergative *zerbrechen* is to be considered as the marked case. The reflexive is by far more frequent, while the simple unergative construction seems to be morphologically simpler. For the time being, it is sufficient to note that at least one of the two options needs idiosyncratic information, even though both are based on systematic possibilities of German.
4. It might be noted that early versions of Generative Grammar treated the facts ascribed to s-selection as strictly syntactic phenomena. The relevant information was therefore represented e.g. in Chomsky (1965) in terms of syntactic

selectional features, which nevertheless had to refer to largely semantic properties of the constituent to be selected, such as [±animate],[±abstract], etc.

5. The initial treatment of c-selection in terms of so-called subcategorization features in Chomsky (1965) has been replaced in the Minimalist Program of Chomsky (1995) by the more general mechanism of feature checking.

6. The type-structure I will assume here has (at least) two basic types, viz. propositions and individuals represented as t and e, respectively (following the notational conventions introduced in Montague (1974)), and functor types for one-place predicates, two-place predicates, propositional connectors etc., indicated by $\langle e,t \rangle$, $\langle e,\langle e,t \rangle \rangle$, $\langle t,\langle t,t \rangle \rangle$, etc., respectively. For details and further discussion see e.g. Bierwisch (1997, 2002).

7. See e.g. Cresswell (1973) for an explicit discussion of this point. In a somewhat different guise, the same point is made in Jackendoff (1990, 1997).

8. This includes approaches as different as e.g. Katz (1972), Montague (1974), Dowty (1979), Jackendoff (1990), or Kamp and Reyle (1993), to mention just a few. Here is not the place to discuss the different ways in which this assumption is realized.

9. Due to the type structure assumed in condition (d), the type of the variable of a given Theta-Role completely determines the type of the resulting operator. To illustrate the point, suppose that a Preposition like *at* has two Theta Roles, say a Theme and a Relatum or Place, both based on individual variables of type e, the type of the Preposition is $\langle e,\langle e,t \rangle \rangle$, i.e. a two-place predicate or binary relation. The same holds for transitive Verbs, due to their two Complements. (But see below for further comments on the Argument Structure of Verbs.)

10. This is just a rough sketch, merely indicating the role of Functional Categories. As a matter of fact, the appropriate account of Determiners, Quantifiers, and related elements is the topic of a large literature and fairly different proposals, including Montague (1974), Barwise and Cooper (1981), Hornstein (1984), Kamp and Reyle (1993).

11. The characterization of syntactic categories by the features [±V, ±N] has been proposed in Chomsky (1970). Alternatives are discussed in Jackendoff (1977). More recently, a somewhat different choice of features is discussed in Wunderlich (1996). Loosely speaking, the feature [+N] (which Wunderlich proposes to replace with [-art], where 'art' suggests 'articulate AS') can be interpreted as "weak (or optional) government of complements".

12. A more detailed discussion of regular as opposed to idiosyncratic aspects of *fragen* and *sagen* is found in Bierwisch (1996).

13. See e.g. Grimshaw (1990), Kiparsky (1992, 2001), Wunderlich (1997, 1997a), Bierwisch (1997), Stiebels (2002).

14. There is perhaps no sharp boundary between regular and idiosyncratic features, but rather a difference in the degree of Markedness or Irregularity. Stiebels (2002) is an instructive study showing that constraint ranking in the

sense of Optimality Theory might be appropriate to capture these degrees of Markedness. As I cannot go here into these matters here, I'll just leave it at that.

15. The variable s of type e corresponds essentially to variable Davidson (1967) proposed as an additional argument of the semantic structure of action-verbs, in order to capture their reference to events. The present proposal relies – like e.g. Kamp and Reyle (1993) – on the colon as an operator of type $\langle t,\langle e,t\rangle\rangle$, which takes a proposition and an event-variable to form a proposition. It is, in fact, a notational variant of the operator INST, introduced in Bierwisch (1988). For further refinement see e.g. Maienborn (2002). A different version of event reference will be discussed below.

16. The basic ideas of lexical decomposition have been pursued in a number of different ways, which are not always compatible with each other. Examples are Katz (1972), McCawley (1971), Lakoff (1971), Dowty (1979), Jackendoff (1990), Bierwisch (1988), Wunderlich (1991), Hale and Keyser (1993) and many others. What is relevant here is not the assumption of a fixed and finite repertoire of basic elements, let alone a particular choice of it, but merely the fact that natural languages exhibit an internal organization of lexical items that is relevant for their grammatical behavior.

17. I would like to stress that the Intrinsic View is not bound to lexical decomposition. Thus instead of (19) one might – in line with Davidson (1967) – assume (i) as the entry of *show* with the four-place predicate SHOW, which assigns the same properties to x, y, z, and e as the complex structure in (19).

(i)/show/ [+V] $\lambda x\,\lambda y\,\lambda z\,\lambda s$ [[[[SHOW$_{\langle e,\langle e,\langle e,\langle e,t\rangle\rangle\rangle\rangle}$ x]$_{\langle e,\langle e,\langle e,t\rangle\rangle\rangle}$ y] $_{\langle e,\langle e,t\rangle\rangle}$ z]$_{\langle e,t\rangle}$ e] $_t$

The crucial difference is merely the less systematic nature of representations like (i), which could not, for example rely on the relatedness between *show* and *see* just mentioned.

18. Notice that due to the type structure adopted here, the argument of a given functor is uniquely determined, because a functor always applies to just one argument. Hence a two-place relation like SEE in (19) is of type $\langle e,\langle e,t\rangle\rangle$ and combines with the argument x to form a functor [SEE x] of type $\langle e,t\rangle$, which then combines with the argument y to form a constituent of type t.

19. Notice that this is a strictly equivalent notational option, since left-to-right ordering is not a structural property of SF at all. Thus e.g. [y [SEE x]], [y [x SEE]], and [[x SEE] y] are all equivalent notational variants for the same structure with the Polish notation [[SEE x] y].

20. It might be noted that the definition of a-command extends immediately to the lambda-operators in AS, which are formally functors taking their scope as argument. This assigns a hierarchy in terms of a-command to the operators in AS, as illustrated in (i), which adds heavy parentheses indicating the scope of Theta-Roles to the representation given in (19):

(i)/show/   [+V] $\lambda x\,(\,\lambda y\,(\,\lambda z\,(\,\lambda s\,(\,[\,[\,\text{INST}\,[\,[\,[\,\text{CAUSE}\,[\,\text{BECOME}\,[\,[\text{SEE}\,x\,]\,y\,$
$]\,]\,]\,]\,[\,\text{ACT}\,z]\,]\,]\,s\,])\,)\,)\,)$

This observation allows for an even more direct formulation of (24), given in (ii):

(ii)   If x a-commands y in SF, then λx a-commands λy in AS.

21. For some discussion of these matters see Bierwisch (2003). A particular problem in this connection is the integration of what are sometimes called argument adjuncts, as e.g. the PP in *he bought it for ten dollars*. Adjuncts of this sort pick up variables in the SF that do not appear in the head's AS.

22. In somewhat simplified terms, the essence of this proposal is the claim that a lower ranking variable, which according to (24) supports a narrower Argument Position, preempts the place of a higher ranking competitor. Hence, assuming a verbal complex *drink empty* as the core of the Resultative construction (30a), one would get a representation like (ii) if (i) abbreviates the entry of the verb *drink*:

(i)/drink/   [+V] λx λy λs   [s: [y [DRINK x]]]

(ii)/drink empty /   [+ V]
    z λy λs   [s: [[y [DRINK x]] [CAUSE [BECOME [$\neg\exists$ v [v LOC [IN z]]]]]]]]

The crucial point is that x loses its position in AS in favor of the lower variable z coming from *empty*.

23. The question does not arise with respect to content and s-selection of the Theta-Role, as under the Intrinsic View a variable may well bear (possibly indirect) relations to several functors. If for example x is the inner argument of LOC, thereby qualified as a place, it will become a goal, if LOC is argument of BECOME.

24. To be more concrete, I will assume something like (i) as the entry for *stellen*, where VERT-POS abbreviates the condition that the main axis of x is in vertical position:

(i)/stell/ [+V] λP λx λy λs   [s: [[ACT y] [CAUSE [BECOME [VERT-POS x] [&
                    [P x]]]]]]

There are two conditions on x, which are connected by &, which can be seen as an asymmetrical conjunction. Of these conditions, the location [P x] is the lowest ranking proposition in terms of a-command. Hence the Theta-Role λP, providing the directional Complement of *stellen*, has the lowest rank in its AS, the occurrence of x to which it applies defines the rank of λx.

25. Notice, by the way, that the effect is relevant only if the occurrences x^1 and x^2 of a variable x are separated by another variable y in terms of a-command, i.e. if $x^1 < y < x^2$ in SF. Although the examples under discussion are not of this type, this configuration does in fact occur, confirming the assumptions made here. A case in point is the contrast between *he put the coat on* and *he put her the coat on*. To spell out the fairly complex details would exceed the present limits, though.

26. An early proposal along these lines is the Case-Theory proposed by Fillmore (1968), focusing however on the conditions controlling the syntactic

realization of the Roles in question. A very different approach is Jackendoff's (1990) proposal to enrich semantic representations by a separate "Action-Tear" which takes care of independent thematic information – a not very promising compromise between the Extrinsic and the Intrinsic View, which I cannot discuss here in more detail.

27. Reference to Davidson (1967) alludes to the event-variable, as noted in fn. 15 and 17, but it is quite misleading with respect to the actual intention pursued by Davidson, who wanted to account for the logical properties of adverbial adjuncts, rather than for the status of the proper complements of a verb. See also fn. 35.

28. One might, of course, set up meaning postulates to capture the relation among the primes of different lexical items. Such postulates, however, would not only come as additional stipulations, they would also turn out to be remarkably complex, because they would have to cope not only with event-predicates like SHOW and SEE, but at the same time with participants related to the event-arguments by Thematic Relations. I will return to these problems in section 4.

29. It must be noted that mere proliferation of event-variables, as is sometimes proposed for rather different reasons, would not do. To provide a preposition with an event variable by turning e.g. (18) into (i) or simply (ii) still does not yield the basis for "Neo-Davidsonean" Roles relating x and y to s.

(i) / auf / [–N, –V, –Dir] $\lambda x \lambda y \lambda s$ [s : [y LOCATED-AT [SURFACE x]]]

(ii) / auf / [–N, –V, –Dir] $\lambda x \lambda y \lambda s$ [s : [y ON x]]

30. Notice that if & is treated as an asymmetrical connective, as mentioned in fn. 24, one could impose a hierarchy of the following sort:

(i) /show/   [+V] $\lambda x \lambda y \lambda z \lambda s$ [[[SHOW (s) & Th (x, s)] & Exp (y, s)] & Ag (z, s)]

This would connect the ranking in SF and AS according to the principle (24). But it still does not allow to dispense with the stipulation in (37). In this connection, Dowty's (1991) proposal should be mentioned, which motivates the ranking primarily by syntactic conditions of their assignment, semantic aspects being accommodated by bundles of conditions called Thematic Proto-Roles. See also fn.33.

31. Whether in fact verbs like *feed* or *tränken* (make drink) violate (40a), because their Patient-Role must be involved as an Agent of the caused activity, might be a matter of debate. The object *feed* is in any case not a patient in the same way as the object of e.g. *hit, kill*, or *break*.

32. Yet another type of complexity would have to be taken into account, because the conceptual or truth-conditional relation between primes like SHOW, SEE, PULL, SWITCH, DO, CAUSE, OWN etc. needed under this view must probably be made explicit by meaning postulates. See fn. 28.

33. As a way out of these difficulties, Dowty (1991) proposed the notion of Thematic Proto-Roles, which are construed as bundles of conditions, defining

the actual Roles and their ranking in accordance with their syntactic assignment by means of features like animacy, dominance, control, etc. This would allow to retreat to different roles for *the answer* in (42a) and (b), dependeing on syntactic boundary conditions. It must be noted, though, that this is a crucial departure away from the Extrinsic View and its basic contention, as now the actual Roles reconcile a kind of semantic component with syntactic boundary conditions. See also fn.30 on Dowty's proposal.

34. A more general problem already noted is the fact that the Extrinsic View deals only with verbs (and perhaps de-verbal or verb-related nouns and adjectives like *walk, ride, discovery, interesting, well-known*, etc.) but not with other nouns, prepositions, or adjectives in general. It is worth noticing in this respect that extending (37) e.g. to prepositions would lead to further complications: Suppose that locative prepositions like *under* would (somehow) assign *kids* and *roof* in (i) to Theme and Place, respectively. But then the directional *under* in (ii) would require a Theme and a Goal – with inverse ranking according to (37) for practically the same arguments:

(i) The kids were sitting under the roof

(ii) The kids ran under the roof

35. It should be noted that this conception is essentially different from the original Davidsonean analysis based on event-variables. Davidson (1967) proposed to account for locative and other adverbials like the one in (i) by predications on event-variables as indicated in (ii) according to which both Fred's buttering a toast and the localization of an event in the bathroom follow from (i) by standard conjunction reduction:

(i) Fred buttered a toast in the bathroom

(ii) $\exists s \exists x$ [BUTTERING(s, Fred, x) & TOAST(x) & IN(s, bathroom)

A similar treatment would be indicated for locative or directional complements, as sketched e.g. for *stellen* in fn. 24.

36. This must not be confused with claims concerning the identity of Fred or Mary. They might result from contrastive stress, as in *Fred helped MARY*, where the identity of Mary as opposed to some other potential recipient is focused, but not the proposition that Mary is Recipient, rather than say Agent or Theme of the helping situation.

37. Assumptions about Theta-Roles, are, like many other theoretical issues, usually clusters of partially independent ingredients. Thus the Extrinsic View is mostly, but not necessarily, combined with the assumption of an extrinsic thematic hierarchy, while the Intrinsic View is often, but not necessarily, combined with the assumption that decomposition is based on a universal set of primitives. There are, furthermore, approaches borrowing Neo-Davidsonean notation in contexts not committed to this view in other respects. Hence the above discussion rests on canonical versions of the two views compared, not denying the existence of less canonical variants.

38. The main point distinguishing SF from the more widely used notion LF (for Logical Form) in Chomsky (1981, 1986, 1995, and elsewhere) is that SF systematically takes care of the grammatically relevant internal structure of lexical items. See Bierwisch (1997) for some discussion.

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Experiencer constructions in Daghestanian languages[1]

Bernard Comrie and Helma van den Berg

1. Introduction

Daghestanian languages are traditionally described as having a distinct experiencer, or affective, construction used with experiencer verbs, with the experiencer in an oblique case (dative, locative, affective, etc.) and the stimulus in the absolutive. This paper explores the basic morphological and syntactic features of this experiencer construction in a broad sample of these languages.

Daghestanian languages belong to the East Caucasian, or Nakh-Daghestanian language family, which shows the following subgrouping (Nikolayev and Starostin 1994):

(1) *Nakh-Daghestanian:*
                Nakh (Chechen, Ingush, Tsova Tush)
                Avar-Andic (Avar, Andi, Godoberi, Bagvalal, Chamalal,
                   Tindi, Botlikh, Akhvakh, Karata)
                Tsezic (Hunzib, Bezhta, Hinuq, Tsez, Khvarshi)
                Lak
                Dargi (dialects: Akusha, Urakhi, Tsudakhar, Kaytag,
                   Kubachi, Chirag)
                Lezgic (Lezgian, Tabasaran, Agul, Rutul, Tsakhur, Kryz,
                   Budukh, Archi, Udi)
                Khinalug

"Daghestanian" comprises all sub-groups other than Nakh. Daghestanian languages basically have SOV word order; they have an elaborate case-marking system, particularly in the local cases. Most Daghestanian languages have gender agreement, varying from 2 to 5 genders, which is employed to indicate cross-referencing of arguments on the verb.

In order to understand the properties of experiencer constructions in Daghestanian languages better, it will be useful to mention here the other two widespread clause type constructions in these languages, namely the intransitive and transitive constructions, as a basis of comparison and in order to introduce some relevant terminology. The intransitive construction has a single core argument, which appears in the absolutive case (identical to the citation form of the noun); this single core argument will be abbreviated S. The transitive construction has two core arguments, one more agent-like (abbreviated A), the other more patient-like (abbreviated P); the P stands in the absolutive case (like the S of an intransitive construction), while the A stands in a distinct case, the ergative. For illustration and further discussion, see Tsez examples (8a–b) below.

2.   Inventory of experiencer verbs

Daghestanian languages differ as to which verbs are coded with the experiencer construction. Unfortunately, our knowledge in this respect is restricted by the small number of comprehensive descriptions of these languages. Four groups of experiencer verbs can be distinguished which appear in the experiencer construction in all or most Daghestanian languages:

> verbs of emotion/volition (want/love, usually expressed by one and
>   the same verb)
> verbs of perception (see, hear, listen)
> verbs of mental state (know, understand)
> verbs of non-intentional activity (forget, find, lose)[2]

For the languages of our sample, we have comparable data for nine verbs, which can be organised as in semantic map 1. Such semantic maps are diagrammatic representations of hypothesised semantic or cognitive links between lexical items. Only items joined by a line are linked in this way. Lexicons of individual Daghestanian languages show of evidence for the links in that the concepts covered by a single lexical item are joined by lines. Maps 2–7 are all well-formed relative to map 2 in this sense. A map uniting 'want' and 'understand' but not 'see, know, hear' would not be.[3]
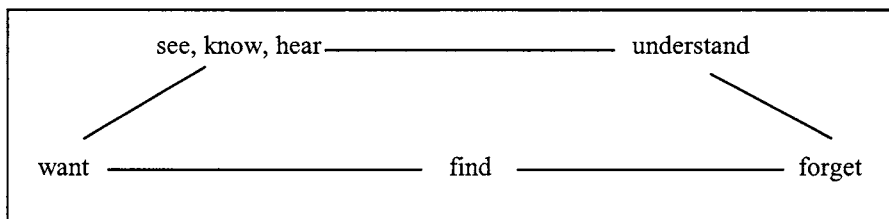
Map 1.   Semantic map of the Daghestanian Experiencer Construction

The most commonly found set of experiencer verbs — characterizing Avar, Andic, Dargi (most dialects), Lak, Kryz, Archi and Bezhta is given in map 2.
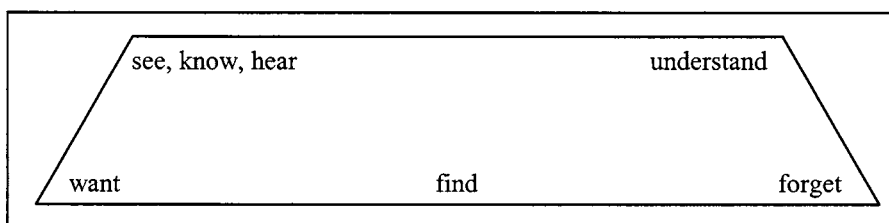
Map 2.   Experiencer Constructions in Avar, Andic, Dargi, Lak, Archi, Kryz and Bezhta

The Tsezic language Hunzib has the largest inventory of experiencer verbs from this set (map 3). Since we do not have enough cross-linguistic evidence to ascertain the links of 'listen' and 'lose' to the other items in map 1, we have simply added these items to map 3 without specifying links. Our own work on the Tsezic languages has shown that some additional verbs of mental state and non-intentional activity occur in some languages, e.g.: get to know, notice, think, be bored, prick.

Map 3. Experiencer Constructions in Hunzib

Examples with experiencer verbs in Hunzib are given in (2a–d):

(2) a. *iyu-u*   *ože*   *Ø-at'.*   **Hunzib**
         mother-DAT   boy.ABS   I-love.PRS
         'Mother loves (her) son.'

     b. *ož.di-i*   *kid*   *y-aⁿc'ə-r.*
         boy-DAT   girl.ABS II-see-PST
         'The boy saw the girl.'

     c. *diʔi*   *r-iq'-at'.*
         me.DAT   V-know-PRS.NEG
         'I don't know.'

     d. *ož.di-i*   *riga*   *r-əʔə-r.*
         boy-DAT   key.ABS   V-lose-PST
         'The boy lost the key.'

Smaller sets of experiencer verbs also occur in the Lezgic languages and Tsez, see maps 4–6.

Map 4.   Experiencer Constructions in Tabasaran, Tsakhur, Rutul and Tsez
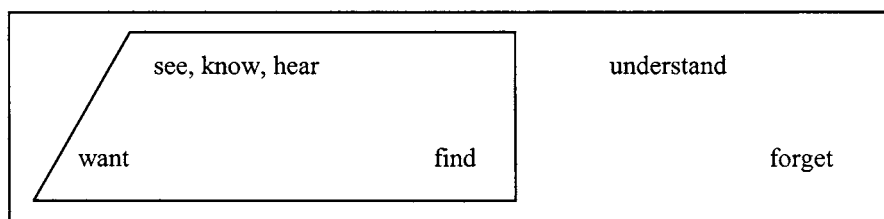
Map 5.   Experiencer Constructions in Lezgian and Azul
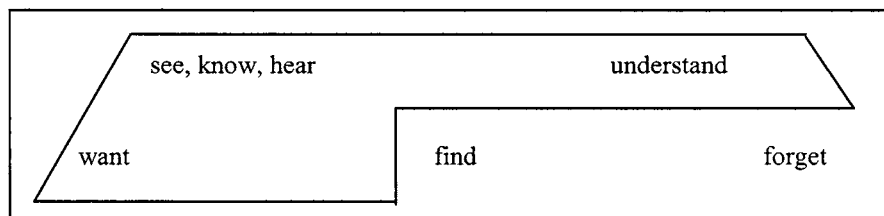
Map 6.   Experiencer Constructions in Budukh

Udi (map 7) has at least 4 experiencer verbs, which show two sets of case-marking at the same time. Depending on the level of control exerted by the experiencer, it is coded either with the ergative (as with transitive verbs), or with the dative (Schulze 2001–2002, section 4.4.3).

Map 7.   Experiencer Constructions in Udi
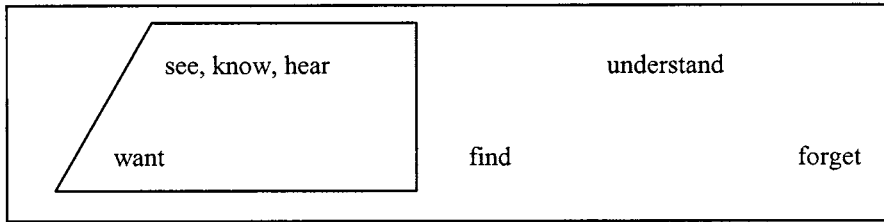
Although most Dargi dialects comply with map 2, Akusha Dargi, on which the written standard is based, has just one verb with a dative marked experiencer, 'want/love'. All other verbs have become regular transitive verbs, with the experiencer in the ergative; see example (3).

(3)   a. *nab*   *udzi*   *dig-ul-ra.*   **Akusha Dargi**
        me.DAT   brother.ABS   love-CVB-1
        'I love my brother.'

      b. *nu-ni*   *dars*   *b-ah-ur-ra.*
        me-ERG   lesson.ABS   N-know-PST-1
        'I knew the lesson.'

While determining the experiencer verbs in Daghestanian languages, the experiencer verbs (with typically a dative/absolutive encoding) should not be confused with intransitive and transitive verbs with an extra argument in adjunct position, which may have an absolutive/dative encoding. Beside word-order there are usually other syntactic arguments, usually language specific, for distinguishing these two distinct group of verbs, see sections 4 and 5 below.

While map 1 succeeds in showing which of the lexical concepts are closer to one another, one can go a step further by establishing a partial hierarchy among these items with respect to their occurrence in the experiencer construction. The items 'want' and 'see, know, hear' are found in all languages (and are the only items in Udi) and seem to constitute the core of the phenomenon. The next stage is for a language to add either 'find' (Lezgian, Agul) or 'understand' (Budukh). If 'find' is present, the next item to be added is 'forget' (Tabasaran, Tsakhur, Rutul, Tsez). If all of the preceding are present, 'understand' can be added (Avar, Andic, Dargi, Lak, Archi, Kryz and Bezhta). Finally, only Hunzib adds 'listen, lose' to this set. In section 3, we will see that the morphological encoding of the

experiencer permits finer differentiation with respect to the hierarchical relations among these lexical concepts.

3. Morphological features

Throughout the Daghestanian languages, the experiencer role can be marked by a variety of cases, the dative, one of the local cases, or, as in Andic languages and Tsakhur, by the so-called "affective" case. The existence of this affective case, only used to mark the experiencer, is one of the reasons to postulate a separate experiencer construction for Daghestanian languages. The various possibilities for experiencer marking in each language (group) will be discussed in detail below.

Within the Andic languages, Andi marks the experiencer with the affective case for all verbs, Karata uses the dative case throughout. Some Andic languages, Bagvalal and Tindi, have a split between 'want/love' with a dative experiencer, whereas the experiencer with other experiencer verbs is marked with the affective, see example (4) (Daniel′ 2001: 372).[4]

(4) a. *he-b-o*   <u>*du-ha*</u>   *q'oča-m-o*   *ek^{′w}a?*   **Bagvalal**
        what-N-Q   you-DAT   want-N-CVB   be
        'What do you want?'

   b. <u>*ʕali-ba*</u>   *bac'a*   *hā̃ⁿ.*
        Ali-AFF   wolf.ABS   see.PST
        'Ali saw a wolf.'

A similar split occurs in Avar, with the experiencer of 'want/love' marked with the dative, the other experiencers with a local case, see example (5) (Charachidzé 1981: 160–161) and map 8.

(5) a. <u>*di-ye*</u>   *yas*   *y-oλ'-ula.*   **Avar**
        me-DAT   girl.ABS   F-love-PRS
        'I love the girl.'

   b. <u>*di-da*</u>   *goħ*   *b-ih-ul-e-b*   *b-ugo.*
        me-SUP   mountain.ABS   N-see-PRS-PART-N   N-COP
        'I see the mountain.'

c. *ł:ik'-łi*   *k'oč-el-ar-in*   *di-da.*
   good-ABSTR.ABS   forget-FUT-NEG-CERT   me-SUP
   'I won't forget your goodness.'
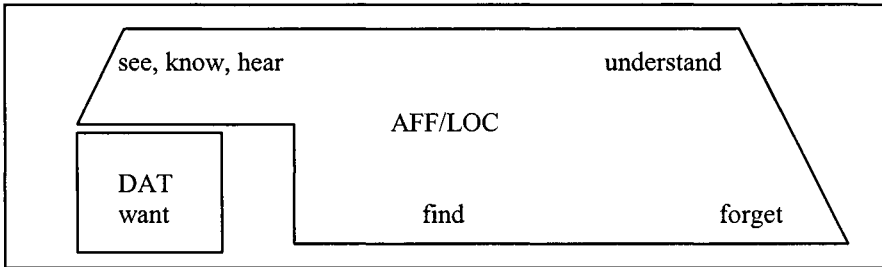
Map 8.   Experiencer Case Marking in Bagvalal, Tindi (affective) and Avar
          (local)

Chamalal has a somewhat different split, in which the verb 'find' groups with 'want/love' with a dative experiencer, rather than with the other verbs, which stand in the affective (Gigatli dialect) or a local case (Gakvari dialect); see map 9.
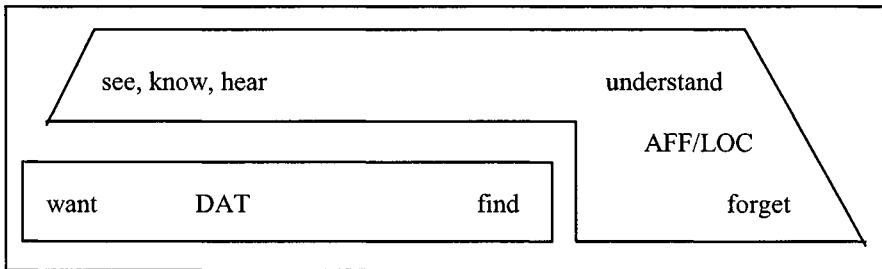
Map 9.   Experiencer Case Marking in Chamalal (affective in Gigatli dialect,
          local in Gakvari dialect)

Godoberi has a three-way distinction between experiencer marking with the dative ('want/love', 'find'), the affective ('see, know, hear'), a local case ('understand'), and either the affective or a local case with 'forget', see example (6) and map 10. Note that the affective case unites 'see, know, hear' and 'forget', although there is no such link shown in map 1. Given that this is just one link in one language, one might be inclined to treat it as idiosyncratic and leave map 1 unchanged. Alternatively, a "diagonal" link could be drawn in map 1 from 'see, know, hear' to 'forget'.

(6) a. *waš.u-łi* *idal-ida* *yaši.*   **Godoberi**
  boy-DAT love-HAB girl.ABS
  'The boy loves the girl.' (Kibrik (ed.) 1996: 79)

 b. *ʕalik'ya-ra* *garam* *daⁿy* *ha ʔ-at-a*
  Alikya-AFF no.one thing.ABS see-PRS-CVB
  bu-k'-ič'-a-da.
  N-be.PST-NEG-CVB-COP
  '...Alikya saw nothing.' (Kibrik (ed.) 1996:79)

 c. *di-č'u* *ʕali* *w-uč:a.*
  me-CONT Ali.ABS M-understand.PST
  'I understood Ali.' (Kibrik (ed.) 1996: 84)
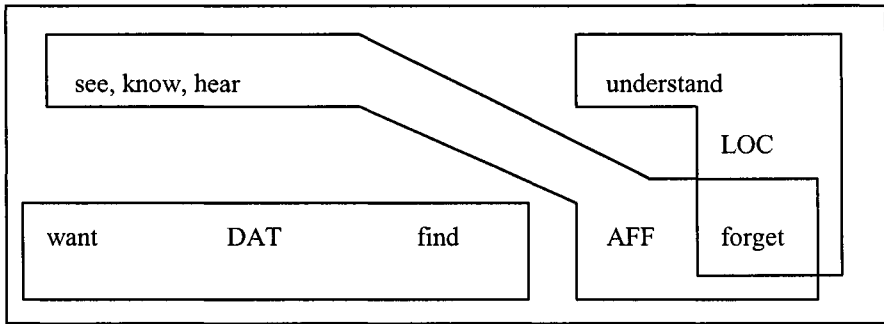
Map 10. Experiencer Case Marking in Godoberi

The Lezgic language Tsakhur resembles some of the Andic languages in that it has a special affective case, and displays a split between 'want/love' with the experiencer in the dative, 'see, hear, know' with the affective, and 'forget, find' with a local case, see example (7) and map 11.

(7)   **Tsakhur**
 a. *girgini* *gade-biše-s* *ïk:an* *hiwa:gʷ-as futbol.*
  all boy-PL-DAT IV.like.IPF IV.play-POT football.ABS
  'All boys like to play football.' (Tatevosov 1999: 749)

 b. *wa-k'le* *yišda* *miz* *w-ac'a-na* *diš-de.*
  you-AFF our language.ABS III-know-CVB not.be-Q
  'Don't you know our language?' (Kibrik 1999: 351)

c. *iči-s:e*   *k'eli<t>χïn-in*   *gïney*   *qedž-e*
   girl-ADEL   forget.PF:IV-CVB   bread.ABS   IV.bake-IPF
   iwho-y.
   tell.PF-MASD
   'The girl forgot that they told her to bake bread.' (Ljutikova and
   Bonč-Osmolovskaja 1999: 490)
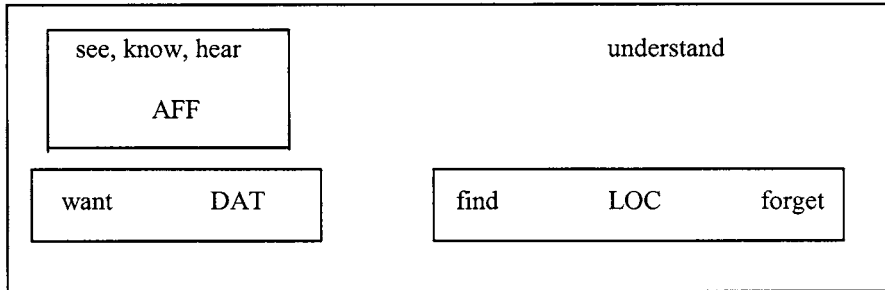
Map 11.   Experiencer Case Marking in Tsakhur

As was done at the end of section 2, we can ask whether the distribution
of cases marking the experiencer provides evidence of hierarchical
relations among the lexical concepts expressed by verbs in experiencer
constructions. With respect to the dative case, the core item is 'want' —
only this item takes the dative in Avar, Bagvalal, Tindi and Tsakhur. The
next to be added is 'find', in Chamalal and Godoberi. Case marking
provides no evidence for hierarchical relations among the other items, since
the other languages that use the dative to encode experiencers use this case
for all verbs taking the experiencer construction. The core of use of the
affective case is 'see, know, hear', the only verb taking this case in
Tsakhur, followed in strict linear order by 'forget' (Godoberi),
'understand' (Gigatli dialect of Chamalal) and 'find' (Bagvalal, Tindi). The
core of local case seems to be 'forget', since although no language restricts
this case to just this one item, languages with two items include 'forget'
and either 'find' (Tsakhur) or 'understand' (Godoberi). If all the preceding
are present, the local case can be extended further to 'see, know, hear'
(Gakvari dialect of Chamalal), and then to 'find' (Avar).

4. Cross-referencing of arguments

All Daghestanian languages except Udi have gender agreement to mark cross-referencing of arguments on the verb. The Tsez example in (8) shows that gender agreement is controlled by the S/P, the intransitive subject or the patient-like argument of transitive verbs, and the stimulus of experiencer verbs (in the example, controller and target have the same underlining):

(8) a. *<u>is</u>*　　　*<u>b</u>-exu-s.*　　　　　　　　　　　　　　　**Tsez**
　　　　bull.ABS　III-die-PSTWIT
　　　　'The bull died.'

　　b. *žek'-ā*　　　*<u>bišʷa</u>*　　　*<u>r</u>-ac'-xo.*
　　　　man-ERG　　food.ABS　　IV-eat-PRS
　　　　'The man eats the food.'

　　c. *aho-r*　　　　*<u>meši</u>*　　　*<u>b</u>-ikʷay-si.*
　　　　shepherd-DAT　calf.ABS　III-see-PSTWIT
　　　　'The shepherd saw the calf.'

Only a few Daghestanian languages have person agreement, and here there are two strategies with regard to the control of this type of agreement. In Dargi, person agreement is partly controlled by animacy: in clauses with 1st or 2nd person plus 3rd person, the speech act participant will be coded independent of its semantic role (for further details, see van den Berg 2001). Dargi experiencer verbs behave like transitive verbs (gender agreement double underlined, person agreement single underlined — in (9a) both agreement markers cross-reference *nu* 'me')):

(9) a. *<u>nu</u>*　　　*<u>r</u>-ak'-il-<u>ra.</u>*　　　　　　　　　　**Akusha Dargi**
　　　　me.ABS　F-come-CVB-1
　　　　'I (female) came.'

　　b. *<u>nu-ni</u>*　　*<u>udzi</u>*　　　　*<u>w</u>-it-il-<u>ra.</u>*
　　　　me-ERG　brother.ABS　　M-hit-CVB-1
　　　　'I hit (my) brother'

    c. <u>*nab*</u>   *udzi*   *dig-ul-<u>ra.</u>*
       me:DAT brother.ABS   love-CVB-1
       'I love my brother'

Other datives (e.g. adjuncts, recipients) do not trigger such agreement.

    Tabasaran also has person agreement with the verb, but here the experiencer controller has its own person marker, which is distinct from the intransitive and transitive person marker, as in (10) — note that this is another idiosyncratic property of an experiencer construction (in addition to the affective case in some languages) not found in any other construction.[5]

(10) a. <u>*uzu*</u>   *t'irxura-<u>za.</u>*   **Southern Tabasaran**
       me   fly-1
       'I fly' (Magometov 1965: 198)

     b. <u>*uzu*</u>   *<u>b</u>-isura-<u>za</u>*   <u>*baž.*</u>
       me   HUM-catch-1   boy.ABS
       'I catch the boy' (Magometov 1965: 199)

     c. <u>*uzu-z*</u>   *uwu* *k:undža-<u>zuz.</u>*
       me-DAT you   love-1
       'I love you' (Magometov 1965: 209)

5. Syntactic behaviour of experiencer arguments

Turning now to behavioural syntactic properties of experiencer arguments, the basic question will be whether it is the experiencer or the stimulus argument that behaves syntactically like the S of an intransitive construction. Section 5 examines a number of tests that can be used in Daghestanian languages. Unfortunately, relatively few Daghestanian languages have been analysed in sufficient depth and breadth and with sufficient accuracy to provide reliable data for questions of this kind. We have therefore restricted our attention to two languages from different branches of the family that have been well described in recent publications, namely Bagvalal (Kibrik et al. 2001) and Tsakhur (Kibrik and Testelec 1999), supplemented by our own work (some in collaboration with Maria Polinsky) on Tsezic languages.

5.1. Reflexivisation

One of the standard tests used in syntactic argumentation to test for similarities and differences across different clause types (such as intransitive, transitive, and experiencer in Daghestanian languages) is reflexivisation, in particular the relation between the controller and target of reflexivisation, and more specifically the identity of the controller. In the English example (11), the target of reflexivisation is the reflexive pronoun *himself*, while the controller is the coreferential antecedent, i.e. *John*. In all examples of reflexivisation in section 5.1, we identify the controller by means of single underlining, the target by means of double underlining.

(11)   <u>*John*</u> hit <u><u>*himself.*</u></u>

In the English example (11), the controller is the A of the transitive construction, while the target is the P. It is not possible to invert the controller–target relation to give **himself hit John*.

In Tsakhur, robust judgments on controller–target relations in reflexive constructions are reported in Toldova (1999: 632–644) and illustrated in (12)–(14). In the intransitive construction, as in (12), only the S (in the absolutive case) can control reflexivisation. In the transitive construction, as in (13), only the A (in the ergative case) can control reflexivisation. And in the experiencer construction, as in (14), only the experiencer (in the dative case) can control reflexivisation. The controller–target relations in Tsakhur are thus the same as they would be in the English translations, despite the fact that Tsakhur morphology makes a different set of distinctions, with P of the transitive construction and the stimulus of the experiencer construction standing in the same case as the S of the intransitive construction.[6]

(12)   **Tsakhur**
 <u>*rasul*</u> <u><u>*wudž*</u></u> *džu-kʷa*   *yišon-a ʔ-a-wo-r.*
 Rasul.ABS REFL.1.ABS REFL.1.OBL-COMIT talk-1.do-IPF-be-1
 'Rasul is talking to himself.'

(13)   <u>*rasulʲ-ē*</u> <u><u>*wudž- ē*</u></u> *wudž* *yaralamiš-a ʔ-u.*
 Rasul-ERG REFL.1-ERG REFL.1.ABS wound-1.do-PF
 'Rasul wounded himself.'

(14)   *rasul-u-s*   *džu-s*   *wudž*   *ïkkan.*
       Rasul-OBL-DAT   REFL.1.OBL-DAT   REFL.1.ABS   1.love.IPF
       'Rasul loves himself.'

A more differentiated picture is provided by Bagvalal, as described in
Ljutikova (2001: 621–631) and illustrated in (15)–(17) for intran-sitive,
transitive, and experiencer constructions respectively. The details are
intricate, and changing other features of the sentences, such as the precise
choice of lexical verb, can slightly shift absolute judgments, but as we will
see there is a consistent overall pattern. In the intransitive construction as in
(15), the S can always be controller, irrespective of the order of the major
constituents of the clause, so that the S controller can precede the target as
in (15a) or follow it as in (15c). In addition, it is possible for the S to be
target rather than controller provided it is preceded by the controller, as in
(15b). What is absolutely excluded is for the S to be the target but to
precede its controller, as in (15d).

(15) a. *ʕali*   *in-šš͏ʷa-da*   *w-ož-ur-ōw.*   **Bagvalal**
         Ali.ABS   REFL-M.OBL.SUP-REFL   M-believe-IPF-PART.M

      b. *ʕali-la*   *e-w-da*   *w-ož-ur-ōw.*
         Ali.SUP   REFL-M.ABS-REFL   M-believe-IPF-PART.M

      c. *in-šš͏ʷa-da*   *ʕali*   *w-ož-ur-ōw.*
         REFL-M.OBL.SUP-REFL   Ali.ABS   M-believe-IPF-PART.M

      d. **e-w-da*   *ʕali-la*   *w-ož-ur-ōw.*
         REFL-M.ABS-REFL   Ali.SUP   M-believe-IPF-PART.M
         'Ali believes himself.'

With the transitive construction illustrated in (16), the resulting sentence
is judged perfect if the A is both controller and precedes the P target, as in
(16a). Changing the constituent order, as in (16c) lowers the acceptability
of the sentence somewhat. The same is achieved, as in (16b), if the P is the
controller but precedes its A target. Having P as the controller but
following its A target, as in (16d), results in a substantial lowering of the
acceptability judgment.

(16) a. *ima-ššu-r*   *e-w-da*   *ašti-w-o*   *w-uk'a.*
     father-M.OBL-ERG REFL-M.ABS-REFL listen-M-CVB M-be

   b. *?ima*   *in-ššu-r-da*   *ašti-w-o*   *w-uk'a.*
     father.ABS   REFL-M.OBL-ERG-REFL listen-M-CVB M-be

   c. *?e-w-da*   *ima-ššu-r*   *ašti-w-o*   *w-uk'a.*
     REFL-M.ABS-REFL father-M.OBL-ERG listen-M-CVB M-be

   d. *???in-ššu-r-da*   *ima*   *ašti-w-o*   *w-uk'a.*
     REFL-M.OBL-ERG-REFL father.ABS listen-M-CVB M-be
     'Father was listening to himself.'

Turning to experiencer constructions, as in (17), we find that a perfect sentence is produced by having the experiencer as controller and preceding its stimulus target, as in (17a). Much as with the intransitive construction as in (15), a sentence judged perfect is also produced by changing the order of experiencer and stimulus, but retaining the controller-target relation, as in (17c). It is also possible to have the stimulus as controller and the experiencer as target, provided the stimulus precedes the experiencer in linear order, as in (17b). It is, however, absolutely impossible to have the stimulus as controller and the experiencer as target if the experiencer precedes the stimulus, as in (17d).

(17) a. *ʕali-ba* *e-w-da*   *mat'uy-ɬi*   *hāⁿ.*
     Ali-AFF REFL-M.ABS-REFL mirror-INTER see

   b. *ʕali*   *in-ššu-ba-da*   *mat'uy-ɬi*   *hāⁿ.*
     Ali.ABS REFL-M.OBL-AFF-REFL mirror-INTER see

   c. *e-w-da*   *ʕali-ba* *mat'uy-ɬi*   *hāⁿ.*
     REFL-M.ABS-REFL Ali-AFF mirror-INTER see

   d. **in-ššu-ba-da*   *ʕali*   *mat'uy-ɬi*   *hāⁿ.*
     REFL-M.OBL-AFF-REFL Ali.ABS mirror-INTER see
     'Ali saw himself in the mirror.'

While the difference between absolute judgments in (15) and (17) versus relative judgments in (16) does complicate the picture somewhat, the following overall pattern emerges. It is preferred for the controller to be A rather than P of a transitive construction, and to be the experiencer rather than the stimulus of an experiencer construction. This fits in well with a long tradition of work on the hierarchy of semantic roles, with agent outranking patient and experiencer outranking stimulus. It is preferred for the controller to precede the target in linear order, again fitting in with a widespread cross-linguistic preferences for the controller of reflexivisation to precede its target. Violating both of these principles leads to the worst sentences. Consistency with both of these principles leads to full acceptability. Consistency with one principle accompanied by violation of the other may lead to intermediate judgments. (Note that in Bagvalal, only the hierarchy of semantic roles seems to be relevant.)

Tsez shows an interesting variation on the pattern of the other two languages. Examples (18)–(20) would seem to follow Tsakhur, with the controller being the S of the intransitive construction, the A of the transitive construction, or the experiencer of the experiencer construction.[7]

(18) *pat'i*   *neł-ā   neło-λ*   *qoqoλi-x.*   **Tsez**
      Fatima.ABS   she-ERG   she-SUBESS   laugh-PRS
      'Fatima is laughing at herself.'

(19) *ʕal-ā   nes-ā   že*   *žek'-si.*
      Ali-ERG he-ERG   he.ABS   hit-PSTWIT
      'Ali beat himself.'

(20) *ʕali-r   nes-ā   nesi-de* *puho*   *t'aqˤ*   *r-ikʷay-si.*
      Ali-DAT he-ERG   he-APUD beside   knife.ABS   IV-see-PSTWIT
      'Ali saw a knife beside him.'

But the experiencer construction turns out to be more differentiated. In (20), while the controller is the experiencer, the target is not the stimulus, and where we have coreferential experiencer and non-stimulus, as in (20), it is indeed the experiencer that serves as controller. If, however, we have coreferential experiencer and stimulus, as in (21), the structure shifts abruptly, and the only possibility is for the stimulus (in the absolute case) to be controller and the experiencer (in the dative) to be target. Sentence

(21) thus provides a unique pattern of controller–target relationship in the experiencer construction that is not found in the other clause types.

(21) *pat'i*   *neɬ-ā   neɬo-r*   *y-eti-x.*
      Fatima.ABS she-ERG she-DAT II-love-PRS
      'Fatima loves herself.'

(For further discussion of reflexivisation in Tsez, see Polinsky and Comrie (2003). In particular, several details not directly relevant to the main issue in the present article have been omitted.)

5.2.   Coreferential noun phrase omission

Another kind of construction that provides evidence in a number of languages for the grouping of A or P in transitive constructions, of experiencer or stimulus in experiencer constructions, with the S of the intransitive construction, is omission of coreferential noun phrases. In an English example like (22), for instance, the missing S of the *while* clause (the target) can only be interpreted as coreferential with the A (the controller), not with the P of the transitive clause — my brother had to be walking along the main street, while my father might, for instance, have been standing in a shop — i.e. A is grouped syntactically together with S rather than with P.

(22) *[While walking along the main street],* my brother *saw our father.*

(In the examples in section 5.2, the controller is identified by means of underlining, while the subordinate clause is set off by square brackets.)

In at least many Daghestanian languages, the interpretation of missing arguments in examples like (22) is determined not by syntactic, but rather by pragmatic principles, according to which interpretation makes more sense, and this is noted explicitly for Tsakhur by Testelec (1999: 678). While pragmatic factors also play an important role in Tsez, there seems nonetheless to be one syntactic constraint, namely that under certain circumstances a coreferential noun phrase *must* be omitted. The relevant combinations are illustrated in (23)–(25) for intransitive, transitive, and experiencer constructions. In these examples, it is not possible to express overtly the understood coreferential noun phrase of the subordinate clause.

The relevant condition is that the omission is obligatory if the antecedent in the main clause is either S (as in (23)), or A (as in (24)), or experiencer (as in (25)); a P in a transitive clause or a stimulus in an experiencer construction does not require obligatory omission (although they allow optional omission).

(23) *[k'eč'   q ˤaλi-x]*   <u>*kid*</u>   *iduɣor*   *y-ik'i-x.*   **Tsez**
      song.ABS   sing-PRSCVB   girl.ABS   home   II-go-PSTWIT
      'Singing songs, the girl went home.'

(24) *[is   žek'-no]*
      bull.ABS   beat-PSTCVB
      <u>*ɬomoy-ā*</u>   *neɬo-r*   *sis ʕaq'lub-oy-no.*
      donkey-ERG   it-DATone   advice.ABS III-do-PSTUNW
      'Having beaten up the bull, the donkey gave it a piece of advice.'

(25) <u>*ʕali-r*</u>   *aħo*   *[guz   p ˤoλi-r-λ'orey]*   *Ø-*
      esu-s.
      Ali-DAT   shepherd.ABS   rock.ABS explode-CAUS-DURCVB   I find-
      PSTWIT
      'While blowing up the rock, Ali found a shepherd.'

The pattern illustrated in (23)–(25) is thus that S, A, and experiencer behave alike, in contrast to P and stimulus, thus once again evincing a syntactic pattern that goes against the morphology, where all of S, P, and stimulus share absolutive case, contrasting with the ergative case of A and the dative case of the experiencer.

5.3.   Imperative formation and agentivity / volitionality

A particularly close interaction of syntax with semantics is found in one property of the experiencer construction in the Tsezic languages, namely whether or not the experiencer can, like the A of a transitive predicate or at least many S's of intransitive predicates, serve as the addressee of an imperative construction.

In Bezhta, there is no difficulty in providing literal translations of English sentences like *love your enemies!*, despite the fact that the addressee instructed to realise the situation is an experiencer, and might

therefore be considered low in agentivity / volitionality. This is illustrated in example (26).

(26) *mizo-s*   *tušmal-la*   *b-āt'*   **Bezhta**
       you.PL-GEN1   enemy-PL.ABS IPL-love.PL.IPR
       'Love your enemies!'

In Tsez and Hunzib, such literal translations are impossible. In Tsez, if one wishes to form an imperative from a sentence like (26), it is necessary first of all to explicitly mark the agentivity / volitionality of the experiencer by presenting it as the agent (causer) of a causative construction. This can be seen by comparing examples (27)–(29). Sentence (27) illustrates the experiencer construction, and does not imply any agentivity / volitionality of the shepherd, who may simply have accidentally come across the calf in question without even knowing that it was missing. It is not possible to form an imperative directly from (27).

(27) *aḥo-r*   *meši* *b-esu-s*   **Tsez**
       shepherd-DAT   calf.ABS III-find-PSTWIT
       'The shepherd (perhaps accidentally) found (came across) the calf.'

Sentence (28) is a causative construction similar to (27), and might be translated more literally as 'the shepherd caused the calf to be found'; it clearly implies that the shepherd was looking for the calf and found the calf. The internal structure of (28) is that of a transitive construction, with the A in the ergative and the P in the absolutive.

(28) *aḥ-ā*   *meši* *b-esu-r-si*
       shepherd-ERG   calf.ABS III-find-CAUS-PSTWIT
       'The shepherd (sought and) found the calf.'

Like any other transitive construction, (28) has an imperative counterpart in (29).

(29) *meši*   *b-esu-r*
       calf.ABS III-find-CAUS[IPR]
       'Find the calf!'

Hunzib behaves in this respect like Tsez, so that while there is no possibility of forming an imperative directly from an experiencer

construction, the imperative of the corresponding causative is possible, as in (30) (van den Berg 1995: 88).

(30)   *Ø-aⁿc'-k'(-o)*   **Hunzib**
       I-see-CAUS-IPR
       'See [him]!'

Constructions of this kind are discussed in greater detail in Comrie (2001). The difference between Bezhta on the one hand and Tsez (and Hunzib) on the other seems to be one instance of a more general tendency to require agentivity / volitionality for a number of constructions in Tsez – in Tsez, for instance, more agent-like S's of intransitive verbs allow imperative formation (e.g. 'go!'), while more patient-like S's of intransitive verbs do not (e.g. 'melt!') – while Bezhta seems to lack such a requirement. Comparative data on a wide range of Daghestanian languages are, unfortunately, not available, although a broader comparison would offer further insight into the extent to which experiencers can be assimilated to more typical, agent-like arguments of two-argument constructions despite their departure from the prototypical semantics of such an agent-like argument.

It will be useful to add a few summarising remarks on behavioural syntactic properties of experiencers in Daghestanian languages. There is a strong tendency for the experiencer, rather than the stimulus, to share "subject properties" with the S of the intransitive clause (and with the A, rather than the P, of the transitive clause), thus suggesting a syntactic grouping of S, A, and experiencer that goes against the morphological grouping (absolutive case) of S, P, and stimulus. This property of experiencers does not extend to other noun phrases that stand in the same morphological case, such as recipients of ditransitive verbs. However, other factors can intervene to mitigate or even override this tendency, for instance linear order of constituents and pragmatic factors, in addition to occasional apparently purely syntactic departures from the general tendency as in reflexivisation involving coreferential experiencer and stimulus in Tsez.

6. Conclusions and prospects

At first sight, Daghestanian languages seem to present a canonical case of experiencer constructions in which the experiencer appears in an oblique case but nonetheless behaves syntactically like the absolutive S of an intransitive construction. More detailed examination, however, points to a much more nuanced picture. The range of verbal concepts that participate in the experiencer construction varies from one Daghestanian language to another, although certain general principles can be represented by means of semantic maps and hierarchies. While some Daghestanian languages have a single oblique case for all experiencers, others have two or three different cases that are used with different verbs. Despite the morphological grouping of the stimulus of the experiencer construction with S of an intransitive construction, in terms of syntactic properties it is rather the experiencer that behaves like the intransitive S, though with numerous hedges and even an occasional outright exception. Many of the properties of experiencer constructions can be explained through the utilisation of forms and behaviours that are available elsewhere in the language in question. But perhaps the most surprising result of our research is that experiencer constructions in some Daghestanian languages show unique properties, for instance a case (the affective) that is found only in experiencer constructions, an affix on verbs that is used exclusively for cross-referencing experiencers (see Tabasaran example (10c)) or a unique pattern of controller–target relationship with reflexives (see Tsez example (21)).

   In this area, Daghestanian languages — whether taken together, or often even if looking at a single language — present particularly complex sets of data, especially complex interaction of principles, and this is what ties the detailed discussion of this paper to the more general theoretical issues that inform this volume. In particular, various hierarchies are at play in Daghestanian experiencer constructions, and it is often conflicts among these hierarchies that both permit and constrain the cross-linguistic variation. For instance, in the hierarchy of semantic roles experiencers are high, perhaps outranked only by agents (and other semantic roles closely related to agents, depending on particular theories of semantic roles), and in many instances this is reflected in Daghestanian languages by assigning them syntactic primacy, or "subject properties", even in the experiencer construction where they are marked by means of an oblique case. But in Daghestanian languages experiencers in the experiencer construction are low in terms of the hierarchy of morphological cases, and indeed for some

purposes they are outranked by absolutive noun phrases, as in Tsez examples like (21). Another hierarchy that can intervene is that of linear order, perhaps itself a reflex of topicalisation, such that noun phrases to the left can assume syntactic primacy even when this goes against the hierarchy of semantic roles. What is excluded is syntactic primacy being assigned to a noun phrase that is low on all these hierarchies, and this is what constraints the possible cross-linguistic variation. In general, then, the morphosyntactic properties of the Daghestanian experiencer construction, and in particular the behaviour of the experiencer, can be described in terms of the distribution of already existing properties across noun phrases highest on the various hierarchies. However, the picture is complicated by the unexpected, sporadic, but nonetheless robust phenomenon of property sets of experiencers that are not simply combinations of "subject proper-ties" but involve idiosyncratic properties of experiencers alone; this last point needs to be incorporated more centrally into theories that relate experiencer constructions to other constructions of a language.

The complexities of Daghestanian experiencer constructions are also a promising field for psycholinguistic and neurolinguistic investigation. Hitherto, Daghestanian languages have played essentially no role as objects of such investigation. Yet the slight differences in the experiencer construction between neighbouring closely related languages provide near-perfect control situations for the testing of individual parameters in experiencer constructions of a kind that is rarely found in better studied languages.

Appendix I: Abbreviations

ABS absolutive	DURCVB durative converb
ABSTR abstract	ERG ergative
ADEL adelative	F feminine
AFF affective	FUT future
APUD apudessive	GEN genitive
CAUS causative	HAB habitual
CERT certain	HUM human
COMIT comitative	INTER interessive
CONT contactive	IPF imperfective
COP copula	IPR imperative
CVB converb	itr. intransitive
DAT dative	LOC any local case
diff. any other construction	M masculine

MASD masdar
N   neuter
NEG negative
OBL oblique
PART participle
PF   perfective
PL   plural
POT potential
PRS present
PRSCVB   present converb

PST past
PSTCVB   past converb
PSTUNW   past unwitnessed
PSTWIT   past witnessed
Q   question
REFL reflexive
SUBESS   subessive
SUP superessive
tr.   transitive

Roman numerals indicate genders (noun classes), Arabic numerals grammatical persons.

Appendix II: Experiencer verbs in Daghestanian languages

The following tables give an overview of the experiencer verbs in the Daghestanian languages of our sample. An experiencer construction is indicated with the case marking of the experiencer (either dative, affective or local case); other possible constructions are intransitive (itr.), transitive (tr.) or an entirely different construction, like a compound verb or a paraphrasal construction (diff.). In a few cases, no information is available (indicated with -).

Table 1. Experiencer verbs in Tsezic, Andic, and Avar

	Tsezic			Andic			
	Tsez	Bezhta	Hunzib	Andi	Bagvalal	Chamalal	Godoberi
emotion/volition							
want/love	DAT	DAT	DAT	AFF	DAT	DAT	DAT
perception							
see	DAT	DAT	DAT	AFF	AFF	AFF	AFF
hear	DAT	DAT	DAT	AFF	AFF	AFF	AFF
listen	diff.	diff.	DAT	itr.	tr.	itr.	diff.
mental state							
know	DAT	DAT	DAT	AFF	AFF	AFF	AFF
understand	diff.	diff.	-	AFF	AFF	AFF	LOC
non-intentional activity							
forget	DAT	DAT	DAT	AFF	AFF	AFF	AFF, LOC
find	DAT	DAT	DAT	AFF	AFF	DAT	DAT
lose	tr.	tr.	DAT	tr.	tr.	tr.	tr.

Table 2. Experiencer verbs in Dargi, Lak, and Lezgic

	Dargi		Lak	Lezgic			
	Akusha	Chirag		Lezgian	Tabasaran	Tsakhur	Budu
emotion/volition							
want/love	DAT	DAT	DAT	DAT	DAT	DAT	DAT
perception							
see	tr.	DAT	DAT	DAT	DAT	AFF	DAT
hear	tr.	DAT	DAT	DAT	DAT	AFF	DAT
listen	itr.	itr.	diff.	diff.	itr.	diff.	diff.
mental state							
know	tr.	DAT	DAT	DAT	DAT	AFF	DAT
understand	tr.	DAT	DAT	-	diff.	diff.	diff.
non-intentional activity							
forget	tr.	DAT	DAT	itr.	DAT	LOC	diff.
find	tr.	DAT	DAT	DAT	DAT	LOC	itr.
lose	tr.	tr.	diff.	tr.	itr.	itr.	itr.

Notes

1. Helma van den Berg died tragically on November 11, 2003. The pre-final version of this article had already been submitted, but the referees' reports had not yet been received. Bernard Comrie bears sole responsibility for preparation of the final version taking into account the referees' comments. Thanks are due to the referees, and also to Michael Cysouw for discussion of the semantic maps.
2. The English glosses 'find', 'lose' are particularly approximate, since in some respects a more appropriate English gloss for the basic lexical items might be 'be found, turn up', 'get lost, disappear', though these glosses are also not without their problems. For some relevant discussion see section 5.3 and Comrie (2001).
3. For a detailed description of the structure and function of semantic maps, see Haspelmath (2003).
4. The affective case marker can be considered a shared innovation of some Andic languages: it occurs in five out of eight Andic languages and has cognate forms, e.g.: Andi *-B-o* (with gender marker *B*), Bagvalal and Tindi *-ba*, Chamalal *-ba*, Godoberi *-ra*.
5. In many Daghestanian languages, at least some personal pronouns lack an overt distinction between absolutive and ergative; in Tabasaran example (10a) *uzu* would correspond to an absolutive full noun phrase, in (10b) to an ergative.
6. The Tsakhur reflexive pronoun consists of two parts, the first being the pronoun in the same case as its controller, the second being this pronoun in the case required by the syntactic–semantic function of the reflexive pronoun in its clause.
7. In Tsez the reflexive pronoun consists of two (inseparable) parts, the first being a fossilised ergative form of the ordinary third person pronoun, the second the same pronoun in the case required by the syntactic-semantic function of the reflexive within the clause.

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Clause-level vs. predicate-level linking

Balthasar Bickel

1. Introduction

In response to the discovery of syntactic ergativity and the ensuing general subjecthood debate in the 70s and 80s of the past century, many linguists have adopted the notion of PIVOT originally proposed by Heath (1975), Dixon (1979), and Foley and Van Valin (1984). The pivot is a property of an individual construction, and it is defined as that argument which receives privileged treatment in the construction: e.g. in a control construction, one argument is privileged by being the sole argument whose reference is controlled, and that argument is therefore the pivot; or under conjunction reduction, one argument is privileged by being the sole argument that is deletable under coreference, and that argument is therefore the pivot; in active participle relativization, one argument is privileged by being the sole argument that may be the target of relativization, and that argument is therefore the pivot. Capitalizing on this notion of privileged treatment, Van Valin and LaPolla (1997) suggest to replace the term pivot by the more transparent term PRIVILEGED SYNTACTIC ARGUMENT ("PSA"). This innovation has another advantage: a number of constructions not only impose a pivot, but also a controller. Switch-reference markers, for example, typically involve both the specification of a controller (the argument in the clause marked by the switch-reference morphology) and of a pivot (the argument monitored by this morphology in another clause). Controllers satisfy the same definition as pivots, and both together are PSAs: the controller in a switch-reference construction is privileged by being the sole argument that is able to determine what counts as the same or a different pivot in the other clause.

PSAs are well-known to vary across languages and across constructions by selecting – or being linked to – different subsets of arguments, e.g. only actors, or only transitive actors ("A") and the sole argument of intransitives ("S"), or only transitive undergoers ("O") and S, etc. But what does it mean to say that PSAs select or link to "arguments"? Arguments are specified on

two levels of representation, once in the lexical representation of a specific predicate (in terms of semantic roles or of positions in decompositional semantic structure), and once in the form of NPs (or DPs) as they appear in a specific clause, fully specified for case and agreement morphology, phrase-structural position, projection level (bare N, NP, DP, KP), focus markers and whatever other syntactic structures the language may have. Are PSAs selected from among arguments on the PREDICATE LEVEL, or from among arguments on the CLAUSE LEVEL? I suggest that this question defines a typological variable, the PSA-LEVEL VARIABLE: constructions differ in whether their PSA is selected on the predicate level or on the clause level. While the values of the variable are defined specifically for each construction that involves a PSA, languages, and to some degree even entire language families, tend to chose the same value for their constructions, resisting change through language contact to a remarkable degree (Bickel 1999a, 2004b). Moreover, there is evidence that the PSA-level variable accounts for systematic variation in discourse style (Bickel 2003b), and thus has far-reaching typological implications.

In this paper I want to further establish the variable empirically, and then determine how it can be modeled in current monostratal theories of syntax.[1] In Section 2 I first address in more detail the general difference between argument specification on the predicate vs. on the clause level, and briefly survey how this difference is expressed in some current theories. Section 3 surveys the empirical evidence that justifies positing the PSA level variable. In Section 4 I address ways of modeling the variable in syntactic theories, and Section 5 summarizes the paper.

2.   Predicate-level vs. clause-level argument role specification

The perhaps earliest proposal to distinguish argument role specification on the predicate vs. on the clause level was made in Valence Theory (in particular by Helbig 1971, 1982). In this theory, predicate level argument structure is analyzed as logical (numerical) and semantic valence: the LOGICAL VALENCE of *hit* is 2, the SEMANTIC VALENCE is <agent, patient>. Clause level argument structure is analyzed as SYNTACTIC VALENCE; the syntactic valence of *hit* is <NP-NOM, NP-OBJ> (or some such, including more phrase structure information). Similar (but of course not identical) distinctions emerge in most current monostratal theories of syntax.

In Lexical Functional Grammar (LFG), for example, the difference is captured by the distinction between argument structure (a-structure) and

functional structure (f-structure): a-structure specifies semantic roles in lexical predicates; f-structure specifies grammatical functions like subject or object that map arguments into equivalence classes of expressions in clause structure, where arguments have morphological and phrase structural properties (Bresnan 2001).

In Role and Reference Grammar (RRG), the distinction between predicate and clause level role is captured by the difference between Logical Structure (LS), where semantic roles are defined by positions in lexical decomposition, and annotations of these by what is called macroroles (MR). LS positions and their hierarchical ranking corresponds to what I call here the predicate level. MR annotations correspond to the clause level and govern morphosyntactic role marking in terms of case or agreement (e.g. Van Valin and LaPolla 1997).[2]

Early Head-Driven Phrase Structure Grammar (HPSG) did not distinguish between predicate and clause level role specifications (all being subsumed under SUBCAT), but such a distinction was introduced by Manning and Sag (1998): under this proposal ARG-ST (argument structure) specifies roles at the predicate level (in a fashion similar to LFG's a-structure), whereas VAL-ST (valence structure) differentiates grammatical relations like subject and complement, specifies case marking,[3] and drives the construction of phrase structure trees.

The kinds of motivation for these theoretical distinctions are mostly formal: for Valence Theory, the difference was primarily motivated by the fact that one and the same semantic role can have different case exponents (e.g. German *unterstützen* 'support' takes an accusative whereas *helfen* 'help' takes a dative). For, LFG, HPSG, and RRG, one core motivation is the observation that some syntactic principles apply to argument structure (especially, control and binding phenomena) whereas others are best stated in terms of clause level structures (e.g. extraction constraints). For RRG, an additional, explicitly acknowledged motivation is that case marking, agreement and other aspects of morphosyntax are sometimes crucially sensitive to clause-level MR-annotations as opposed to predicate-level valence in Logical Structure (Van Valin and LaPolla 1997: 147–54, 352–76).

Construction Grammar (CG) makes a similar distinction between predicate and clause level role specification in terms of PARTICIPANT ROLES VS. ARGUMENT ROLES (Goldberg 1995; also Seiler and Premper 1991), but in this theory the motivation is also a semantic one: as Goldberg argues, predicate-level participant roles and clause-level argument roles can each have their own semantic specification. In feature-based versions of CG (e.g. Fillmore and Kay 1997; Kay 1997; Kay and Fillmore 1999),

this is captured by the fact that both types of roles are represented by attribute-value matrices (AVMs) that include frame-semantic (*sem*) attributes: clause-level argument roles are specified in the valence AVMs (*val*) of argument structure constructions, and there they are not only specified for phrase-structural category, morphology and grammatical function, but they are also indexed to *sem*-AVMs. These *sem*-AVMs are independent (to variable degrees, and in specific ways) of the *sem*-AVMs that define the participant roles of the lexical predicates inserted in these argument structure constructions. Clause-level and predicate-role semantics have been shown to part from each other in at least two classes of phenomena: (i) Goldberg (1995) has demonstrated that clause-level role specifications can override predicate level specifications, as when, e.g. a one-participant verb like *to sneeze* is used in a clause that invokes a transitive caused-motion semantics (*she sneezed the napkin off the table*). (ii) Bickel (2000) has argued that clause-level role markers like case can have different semantic values than the range of semantic roles possible for core arguments of lexical predicates, as when, e.g. the Belhare ergative case covers transitive agents, causes, and instruments, whereas the actor role in lexical predicate semantics is generally limited to animate arguments and excludes inanimate causes and instruments.

If predicate and clause level argument role specification are not only different levels of representation, but proprietory domains of both formal and semantic specification, the question arises among which of these domains arguments are selected for PSA-hood. In order to find out, we need to look at constructions and lexical material where argument specifications on the predicate and clause level are formally distinct. This is what the following section is devoted to. I will return in Section 4 to the theoretical issue of how PSAs relate to the distinctions between predicate and clause level role specification drawn in the various monostratal theories.

3.   Typological variation

In order to establish whether PSA selection operates on predicate-level or on clause-level argument notions, I examine in this section two sets of phenomena that show a systematic mismatch between these notions. The first set involves what I call DOWNGRADED EXPERIENCERS, and is discussed in Section 3.1, the second set involves what I call DOWNGRADED UNDERGOERS, and is the topic of Section 3.2. In both sets of phenomena

we will observe arguments that are eligible for PSA-hood depending on whether PSA selection refers to properties of these arguments on the predicate level or on the clause level, or both.

3.1. Downgraded experiencers

Virtually all theories of semantic role hierarchies agree that experiencer arguments rank higher than stimuli (e.g. Givón 2001; Bresnan 2001; Jackendoff 1987; Van Valin and LaPolla 1997; Primus 1999; among many others), i.e. that in terms of predicate-semantic macro- or protoroles, they are ACTORS rather than UNDERGOERS. But it is also clear that experiencers occupy an intermediate position on the hierarchy, removed from the extreme endpoints of volitional agents on the one side and inanimate patients on the other. In response to this intermediate status, a sizeable number of languages codes subsets of experiencers by morphosyntactic coding means on the clause level (case marking, agreement forms, canonical positions) that are in conflict with their hierarchical prominence because the coding means also cover arguments that rank lower on the hierarchy, especially devices that are generally used for patient or goal arguments (for recent surveys, see Verma and Mohanan 1990, Bossong 1998, Bhaskararao and Subbarao 2004). I refer to this use of coding devices for lower-ranking on higher-ranking arguments as morphosyntactic DOWNGRADING (Bickel 2004b).[4] The following examples illustrate experiencer downgrading in German and Belhare, respectively:[5]

(1) German
  a. *Mir   schmeck-t   diese-s   Bier.*
     1SG.DAT taste-3SG.NPST DEM-N.SG.NOM beer[-SG.NOM]
     'I like this beer.'
  b. *Mich   frier-t.*
     1SG.ACC be.cold-3SG.NPST
     'I'm cold.'

(2) Belhare (Kiranti, Sino-Tibetan; Nepal[6])
  a. *ŋka   ina   iŋa   lim-yu.*
     1SG[-ABS] DEM   beer[-ABS] [3SG.S-]taste-NPST
     'I like this beer.'

b. *ŋka   cuŋ-ŋa   mai-tar-he.*
1SG[-ABS]   cold/fever-ERG 1SG.O-[3A-]bring-PST
'I've got fever.' (lit., 'the cold brought [fever] to me'[7])

In the German examples, the experiencer appears in the dative or accusative. If there is also a stimulus argument (like *Bier* in (1a)), the verb agrees with it (so that we would get the plural *schmecken* if *Bier* were in the plural); if not, the verb defaults to third person singular. Belhare has an ergatively aligned case system, whence the object case used for experiencers is the absolutive. Downgraded experiencers come in two variants in Belhare: with intransitive morphology as in   (2a), or with transitive morphology, as in as in   (2b). In both cases, the verb agrees with the stimulus (if there is one, as is the case in these examples). If the morphology is transitive, as in   (2b), the verb shows additional object (O) agreement with the experiencer (*mai-* '1SG.O' in agreement with *ŋka* 'me').

In all of these examples, the clause-level coding of experiencers is that of objects; but their predicate-level semantics is that of high ranking, actor-like arguments. This contrast between levels makes different predictions for PSA selection: if PSA selection operates on clause-level valence, the experiencer arguments are formally objects, and as such, they cannot be mapped into an S/A-PSA (a 'subject'); the only option would be an S/O-PSA (an ergatively aligned pivot or controller) if the language has one. If PSA selection operates on the predicate level, by contrast, theories of semantic role hierarchy would predict that the experiencer argument is mapped into an S/A-PSA, and would not qualify for an S/O-PSA.

The level at which PSAs are selected can be tested by using these downgraded experiencers in constructions requiring an S/A-PSA. Relativization by active participles is a case in point, and both German and Belhare have this construction. Consider first the following examples from German.

(3) German
   a. *Die   Student-en   mög-en   das*
      ART.PL.NOM   student-PL.NOM   like-3PL.NPST   ART.N.SG.ACC
      Bier.
      beer[-SG.ACC]
      'The students like the beer.'

a'. *die   das   Bier*
ART.PL.NOM ART.N.SG.ACC   beer[-SG.ACC]
mög-end-en   Student-en
like-ACT.PTCP-PL.NOM   student-PL.NOM
'the students who like the beer'

a''. **das   die   Student-en*
ART.N.SG.NOM ART.PLNOM student-PL.NOM
mög-end-e   Bier.
like-ACT.PTCP-PL.NOM   beer[-SG.NOM]
Intended: 'the beer that the students like'

b. *Den   Student-en   schmeck-t   das*
ART.M.PL.DAT student.PL.DAT taste-3SG.NPST ART.SG.NOM
Bier.
beer[-SG.NOM]
'The students like the beer.'

b'. **die   das   Bier*
ART.PL.NOM ART.SG.NOM beer[-SG.NOM]
schmeck-end-en   Student-en
taste-ACT.PTCP-PL.NOM   student.PL.NOM
Intended: 'The students who like the beer.'

Example   (3a') shows that with active participles it is possible to relativize on experiencers bearing the canonical marking of A arguments (subjects) (3a). (3a'') shows that this is ungrammatical with canonical O arguments (objects), and this fact establishes that the construction is indeed constrained to an S/A-PSA. The test case is example   (3b'), which shows that it is impossible to relativize on experiencers that are marked on the clause level by dative case, as in   (3b). This suggests that in these constructions, PSA selection is sensitive to argument information specified on the clause level: experiencers can be PSAs only as long as they bear nominative, or at least non-dative case.

Before accepting this analysis, however, we first need to rule out an obvious alternative: could it be that dative experiencers are not only marked as O arguments, but that they are in fact regular undergoer arguments in predicate-level semantics and that they are mapped into the syntactic O function because of this? That this is not the case is shown by passivization: dative-marked undergoers as in   (4a) allow impersonal passivization   (4a'); dative-marked experiencers   (4b) do not allow this (4b').[8]

(4) German
   a. *Die   Leute   halfen   mir.*
      ART.PL.NOM people.PL.NOM help.3PL.PST 1SG.DAT
      'They helped me.'
   a'. *Mir   wurde   (von   den   Leuten)*
      1SG.DAT AUX.PASS.3SG.PST by   ART.PL.DAT people.PL.DAT
      geholfen.
      help.PASS.PTCP
      'I was helped (by them).'
   b. *Die   Äpfel   schmeck-ten   mir.*
      ART.PL.NOM apple.PL.NOM taste-3PL.PST 1SG.DAT
      'I liked them.'
   b'. **Mir   wurde   (von   den   Äpfeln)*
      1SG.DAT AUX.PASS.3SG.PST by   ART.DAT.PL apple.PL.DAT
      geschmeckt.
      taste.PASS.PTCP
      Intended: 'I liked them.'

Thus, dative-marked experiencers are not undergoers in predicate-level valence. Therefore, the fact that they fail to be selected as S/A-PSAs in (3) cannot be attributed to their semantic role on the predicate level. Dative-marked experiencers are actor arguments on the predicate level, but they fail to project into S/A-PSAs because they are morphosyntactically coded as O arguments on the clause level. This confirms the conclusion that active participle constructions in German select PSAs on the clause level. Indeed, a survey of PSA-involving constructions in German (Bickel 1999a) shows that O-coding devices on the clause level generally block experiencers from serving as S/A-PSAs in German. The relevance of nominative case is so prominent in this (and related) languages, that Reis (1982) entertains the hypothesis that the notion of subject can effectively be reduced to its coding device.

This is all in minimal and striking contrast to active participle and other constructions in Belhare (Bickel 2003a, 2004a, 2004b):

(5) Belhare
   a. *pitcha-chi-ŋa   kubaŋ-chi*
      child-NSG-ERG   rhesus.monkey-NSG[-ABS]
      ŋ-kitt-he-chi.
      3NSG.A-fear-PST[-3O]-NSG.O
      'The children were afraid of the monkeys.'

  a′. *kubaŋ-chi*   *ka-kit-pa*   *pitcha-chi*
      rhesus.monkey-NSG[-ABS]   ACT.PTCP-fear-M   child-NSG[-ABS]
      'the children who are afraid of the monkeys'
  a″.**pitcha-chi-ŋa* *ka-kit-pa*   *kubaŋ-chi*
      child-NSG-ERG   ACT.PTCP-fear-M   rhesus.monkey-NSG[-ABS]
      Intended: 'the monkeys who the children are afraid of'
  b. *ma ʔi*   *iŋa*   *lim-yu.*
      person[-SG.ABS]   beer[-SG.ABS]   [3SG.S-]be.delicious-NPST
      'The man/woman likes the beer.'
  b′. *iŋa*   *ka-lim-ba*   *ma ʔi*
      beer[-SG.ABS]   ACT.PTCP-delicious-M person[-SG.ABS]
      'the person who likes the beer'
      (cf. German **der das Bier schmeckende Mann*)
  c. *ma ʔi*   *cuŋ-ŋa*   *tar-he.*
      person[-SG.ABS]   cold/fever-ERG   [3A-]bring-PST[-3SG.O]
      'The person got fever.'
  c′. *cuŋ-ŋa*   *ka-tat-pa*   *ma ʔi*
      cold/fever-ERG   ACT.PTCP-bring-M   person[-SG.ABS]
      'the person who has got fever.'

Example (5a) establishes the S/A-PSA for this construction: relativiza-
tion is possible on A-arguments, as in (5a′), but not on O-arguments, as
shown by the ungrammaticality of (5a″). But in contrast to German,
downgraded experiencers, as in (5b) and (5c) can be straightforwardly
projected into the S/A-PSA. This suggests that in Belhare, PSAs are
selected from among arguments on the predicate level: on that level,
experiencers are the most actor-like arguments and can therefore be
mapped into the A function that is critical for the PSA. This is so
regardless of whether the experiencer appears in the canonical A case, the
ergative as in (5a), or in the canonical O case, the absolutive, as in (5b)
and (5c).

Before accepting the conclusion that Belhare PSAs are selected on the
predicate level, however, we need to rule out an obvious alternative: could
it be that Belhare allows downgraded experiencers to function as S/A-PSAs
not because they are actor-like on the predicate level but because they are
in the absolutive on the clause level, which is the unmarked case of the
language (just like the nominative is the unmarked case in German), and as
such might be expected to be privileged by PSAs? This alternative analysis
is contradicted by the following observation: apart from the downgrading-

to-object constructions in (5b) and (5c), Belhare experiencers also occur in constructions in which they are downgraded to possessors. In these constructions, the experiencer appears as the possessor of an experience, or of the domain in which an experience is located (for a detailed study of this, see Bickel 1997). Consider the following examples, where possessive-marked experiencers occur in active participle constructions:

(6) Belhare
    a. *ciya*   *a-niũa*   *ti-yu.*
        tea[-ABS]   1SG.POSS-mind [3SG.S-]be.easy-NPST
        'I like tea.'
    a'. *ciya*   *niũa* *ka-ti-ba*   *ma ʔi*
        tea[-ABS] mind ACT.PTCP-be.easy-M person[-SG.ABS]
        'a/the man who likes tea'
    b. *u-ris*   *kar-he*
        3SG.POSS-anger [3SG.S-]come.up-PST
        'S/he got angry'
    b'. *ris* *ka-kat-pa*   *ma ʔi*
        anger ACT.PTCP-come.up-M person[-SG.ABS]
        'an/the angry person'

The experiencers in the examples are not in the absolutive, but they have full-fledged access to the S/A-PSA in active participle relativization. (6a) illustrates a possessive experiencer in a bivalent scenario. The experiencer is realized here by the prefix *a-* '1SG.POSS'. (6b) instantiates a possessive experiencer in a monovalent setting, realized here by *u-* '3SG.POSS'.[9] (6a') and (6b') show that these possessors can be relativized on by active participle constructions. While this may suggest an analysis in terms of possessor raising, it would have to be possessor raising limited to experiencers since other possessors cannot be relativized on by active participles. Example (7a) is structurally parallel to (6b), but the posssessive prefix does not denote an experiencer. Because of this, (7b) is ungrammatical, unlike its structural equivalent in (6b'):

(7) a. *u-tak*   *kar-he.*
        3SG.POSS-friend [3SG.S-]come.up-PST
        'His/her friend came up.'

b′. **tak   ka-kat-pa*
      friend   ACT.PTCP-come.up-M
      Intended: 'the person whose friend came up'

Thus, any analysis of the participle constructions in (6) as based on raising would have to be limited to experiencer. But this would be equivalent to simply saying that possessive experiencers, unlike ordinary possessors, have access to PSA status, and the advantage of this analysis is that it captures the generalization that experiencers can be selected as PSA regardless of their case.

Indeed, a detailed survey of PSAs in Belhare (Bickel 2004a) has unearthed no single instance of constructional S/A-PSAs ever being sensitive to clause-level information like case or position. The only apparent exception is the observation that absolutive and some possessive experiencers fail to trigger S/A-agreement in verbs (cf. examples in (2) and (6)). But agreement morphology is arguably not evidence for constructional PSAs on a par with the PSAs involved in relativization, raising, and the like, but rather itself a clause-level coding device, like case. Moreover, even if agreement were analyzed as involving PSAs (as it is in Bickel 2004b), the case-sensitivity is more apparent than real: the fact that absolutive and possessive experiencers do not trigger agreement in examples like (2) and (6) is an idiosyncrasy of these constructions. There is no general ban against absolutives or possessive experiencers triggering agreement: absolutives triggering S/A-agreement is the norm with intransitively inflected verbs; and possessive S/A-agreement is an option with possessive experiencers. This is shown by the following examples.

(8) Belhare
      a. *unchik   mi-ŋ-kii ʔ-ni.*
         3NSG[-ABS] 3NSG.S-NEG-fear[-NPST]-NEG
         'They aren't afraid.'
      b. *ciya   a-niũa   tiu-t-u-ŋ.*
         tea[-ABS]   1[SG]POSS-mind   be.easy-NPST-3[SG]O-1SGA
         'I like [this specific kind of] tea.'

In (8a) the experiencer is realized by an absolutive 3rd person nonsingular pronoun triggering 3rd person nonsingular agreement on the verb (*mi-* '3NSG.S'). (8b) is a transitive version of (6a) and is used for stimulus arguments with specific reference. The experiencer appears as a possessor (here realized by *a-* '1SG.POSS'), but this coding does not prevent

it from triggering regular verb agreement (*-ŋ* '1SG.A'). This is in striking contrast to German (and indeed virtually all other Indo-European langua- ges: Bickel 2004b), where only nominatives (and ergatives in some languages) ever trigger S/A-agreement on verbs.

This confirms the conclusion that constructional PSAs in Belhare (including or excluding agreement controllers) are selected at the predicate level and are therefore not sensitive to clause-level information like case, while PSAs in German are selected at the clause level and are therefore sensitive to case.

3.2.   Downgraded undergoers

A number of languages, Belhare among them, have morphosyntactic means of downgrading undergoers. Consider the following pairs of examples, with regular   (9a,b) vs. downgraded   (9a′,b′) undergoers:

(9)   Belhare
   a. *ina-ŋa*   *wa*   *khui ʔ-t-u.*
      DEM[-SG]-ERG   chicken[-SG.ABS]   [3SGA-]steal-NPST-3[SG]O
      'That one steals / will steal the chicken.'
   a′. *ina*   *wa*   *khu ʔ-yu.*
      DEM[-SG.ABS]   chicken[-SG.ABS]   [3SGS-]steal-NPST
      'That one will steal chicken.' ('S/he is a chicken-stealer')
   b. *un-na   cece   cai-t-u.*
      3SG-ERG   meat[-ABS]   [3SG.A-]eat-NPST-3O
      'S/he eats / will eat the meat.'
   b′. *un   cece   ca-yu.*
      3SG[-ABS]   meat[-ABS]   [3SG.S-]eat-NPST
      'S/he will eat meat.' ('S/he is not a vegetarian.')

Undergoer downgrading is achieved by detransitivizing the morpho- syntax of the clause: the actor argument in   (9a′) and   (9b′) appears in the absolutive case instead of the canonical ergative. The undergoer is also in the absolutive, but unlike regular transitive undergoers, it does not trigger O-agreement. Moreoever, the undergoer is downgraded in its phrase- structural projection level: it is reduced to bare N status, a constraint that is elsewhere found in the language only in compound nouns. The result of

this is that downgraded undergoers cannot be modified by any kind of constituent:

(10) Belhare

    a. *[NP khaĩ-kha*   *cece]*   *n-cai-t-u.*
        [3SG.S-]good[-NPST]-NMLZ meat[-ABS] 3NSG.A-eat-NPST-3O
        'They eat good meat.'

    a′. **[N khaĩ-kha*   *cece]*   *n-ca-yu.*
        [3SG.S-]good[-NPST]-NMLZ meat[-ABS] 3NSG.S-eat-NPST
        Intended: 'They eat good meat.'

    b. *[NP ina*   *phak]*   *sei ʔ-t-u-ŋ.*
        DEM pig[-SG.ABS] kill-NPST-3[SG]O-1SG.A
        'I'll kill this pig.'

    b′. **[N ina*   *phak]*   *sei ʔ-ŋa.*
        DEM pig[-SG.ABS] kill[-NPST]-1[SG]S
        Intended: 'I'll kill this pig.'

As is shown by (10a′,b′), the undergoer in these constructions cannot head any constituent more complex than N^0, i.e. the undergoer constituent cannot be expanded in any way. Regular, freely expandable NPs occur only in regular argument (and adjunct) positions, as in (10a,b). The phrase-structural downgrading also has a semantic concomitant: as suggested by the translations of   (9a′,b′), downgraded undergoers can only refer to KINDS, not to INDIVIDUALS. As a result of this, they are not countable:

(11) Belhare

    a. *wa-chi*   *khui ʔ-t-u-chi.*
        chicken-NSG[-ABS]   [3SG.S-]steal-NPST-3O-NSG.O
        'S/he steals / will steal the chicken.'

    a′. **wa-chi*   *khu ʔ-yu.*
        chicken-NGS[-ABS]   [3SG.S-]steal-NPST
        Intended: 'S/he steals chicken.'

    b. *sik-kira*   *ŋatlabu*   *cai-t-u-chi.*
        two-INANIM banana[-ABS]   [3SG.A-]eat-NPST-3O-NSG.O
        'S/he eats / will eat two bananas.'

    b′. **sik-kira*   *ŋatlabu*   *ca-yu.*
        two-INANIM banana[-ABS]   [3SG.S-]eat-NPST
        Intended: 'S/he eats two bananas.'

Examples (11a') and (11b') demonstrate that undergoers marked by nonsingular number or modified by a numeral are incompatible with downgraded undergoer constructions; for this, plain transitive constructions as in (11a) and (11b) are mandatory.

From the phrase-structural reduction and the semantics, one might want to analyze undergoer downgrading as incorporation (an analysis indeed adopted for a neighboring language by Angdembe 1998). Such an analysis is immediately contradicted, however, by the fact that downgraded undergoers need not occur adjacent to the verb (Bickel 2004a):

(12)   Belhare
     wa   *nakha*   *ŋ-khuʔ-yu.*
     chicken[-SG.ABS]   DEM.NSG[-ABS]   3NSG.S-steal-NPST
     'Chicken that one steals.'

Thus, if analyzed as incoporation, one would have to posit two distinct notions of grammatical words: one based on phrase structure levels, in which undergoer downgrading defines a single (incorporated) word; and one based on ordering rules, in which undergoer downgrading defines two independent grammatical words. An alternative analysis of the construction is in terms of antipassivization, but then it would have to be a very special, unusual kind of antipassivization because it entails phrase-structural rather than morphological demotion of the undergoer.

Regardless of which analysis one prefers, undergoer downgrading entails a mismatch between predicate level and clause level structure: on the predicate level, downgraded undergoer constructions are bivalent and involve both a regular actor and a regular undergoer. On the clause level, the morphosyntax is intransitive, and only the actor is a full-fledged argument that projects a regular NP constituent and that triggers regular (S) agreement on the verb. The question that arises is which level PSA selection operates on: if on the predicate level, we would expect both actor and undergoer to be eligible for PSA-hood; if PSA selection operates on the clause level, only the actor would qualify, and would so qualify as an intransitive S argument.

The critical evidence bearing on this question comes from constructions with ergative syntax, and it also these constructions that undergoer downgrading is mostly used for in Belhare. A case in point is internally-headed relative constructions, which allow relativization on S or O only (Bickel 1995, 1999b):

(13) Belhare
    a. *maʔi*   *khiuʔ-kha*
       person[-SG.ABS]   [3SG.S-]quarrel[-NPST]-NMLZ
       misen niu-t-u-ga   *i?*
       know-NPST-3[SG]O-2[SG.A] Q
       'Do you know the person who is quarreling?'
    b. *tombhira-ŋa*   *wa*
       lynx[-SG]-ERG   chicken[-SG.ABS]
       seiʔ-s-u-ha   *chitt-he-m.*
       [3SG.A-]kill-TR.PRF-3[SG]O-NMLZ   find-PST[-3SG.O]-1PL.A
       'We found the chicken that the lynx had killed.'
       Impossible: 'We found the lynx that had killed the chicken.'

(13a) illustrates relativization on S, which is possible with all kinds of semantic roles; (13b) shows that with transitive clauses, (internally-headed) relativization is possible only with O-arguments (here *wa* 'chicken'), and not with A arguments. Note that the PSA is not case-defined, by allowing relativization on all and only absolutives (as Primus, this volume, would predict on theoretical grounds): as argued in Bickel (1995), those absolutive-marked arguments that are not undergoers are not mapped into the O role and therefore have no access to PSA-hood. This is so, for example, with absolutive-marked goal arguments of motion verbs. Because they are not undergoers, they do not trigger O-agreement, nor indeed any kind of transitive verb morphology. This is illustrated by (14a). Example (14b) demonstrates that absolutive goal arguments have no access to the S/O-PSA in internally-headed relativization; relativization is possible here only with pre-nominal constructions, as in (14b'):

(14) Belhare
    a. *khim*   *khai-ŋa-ŋŋ-ha.*
       house[-ABS] go-INTR.PRF-1[SG]S-PRF
       'I went home.' *or* 'I went to the/a house.'
    b. **asenle khim*   *khai-ŋa-ŋŋ-ha*
       earlier house[-ABS]   go- INTR.PRF-1[SG]S-NMLZ
       tunn-har-e.
       [3SG.S-]burn-TELIC-PST
       Intended: 'The house that I went to recently burnt down.'

b′. *asenle   khai-ŋa-ŋŋ-ha   khim*
earlier   go- INTR.PRF-1[SG]S-NMLZ   house[-ABS]
tunn-har-e.
[3SG.S-]burn-TELIC-PST
'The house that I went to recently burnt down.'

Returning to downgraded undergoer constructions, relativization is found on both actor and undergoer arguments:

(15) Belhare
      tombhira   wa   sei ʔ-sa-ha
      lynx-[SG.ABS]   chicken[-SG.ABS]   [3sg.S-]kill-TR.PRF-NMLZ
      chitt-he-m.
      find-PST[-3SG.O]-1PL.A
      'We found the lynx that had killed chicken.'
      Or: 'We found [the kind of] chicken that a lynx would have killed.'

The first reading relies on relativization on the actor; the second on relativization on the undergoer. This ambiguity suggests that in these constructions, PSA selection has access to both the predicate level, where undergoers are regular arguments, and to the clause level, where actors satisfy the S/O-PSA constraint of relativization by being promoted to S status.

This is all in striking contrast to regular antipassives or regular incorporation where PSA selection is limited to the clause level: once it is antipassivized or incorporated, the undergoer is no longer eligible for PSA-hood, only the actor is eligible by virtue of being promoted to the S function. I illustrate this with examples from Hakha Lai (Kuki-Chin, Sino-Tibetan, Burma, Kathol and Van-Bik 1999; Peterson and Van-Bik 2001; Peterson 2003; among others) because the antipassive in this language involves the same morphological structure as Belhare (and like Belhare, lacks overt diathesis markers). In the following example, (16a) is the regular transitive version, 16b) is the downgraded undergoer version. Like in Belhare (cf. examples (9a′,b′) above), verb morphology is intransitive (as evidenced by intransitive stem finals), and both actor and undergoer appear in the (unmarked) absolutive case:[10]

(16) Hakha Lai (Peterson and Van-Bik 2001)
    a. *law.thlaw.paa.-niʔ*   *ka-zaal*
       farmer-ERG   1[SG]POSS-bag[-ABS]
       a-baʔ.
       3[SG]A-[3SG.O-]hang.TR
       'The farmer hung up my bag.'
    b. *law.thlaw.paa* *ka-zaal*   *a-bat.*
       farmer-[ABS]   1[SG]POSS-bag[-ABS] 3[SG]S-hang.INTR
       'The farmer hung up my bag.'

    Unlike in Belhare, however, morphosyntactic downgrading here entails that the undergoer is no longer accessible as an argument and no longer available as an S/O-PSA. S/O-PSAs are found in a subtype of internally-headed relative clause constructions, similar to Belhare. Compare the following examples:

(17) Hakha Lai (Peterson and Van-Bik 2001)
    a. *law.thlaw.paa.-niʔ* *a-baʔ.-mii*   *zaal*
       farmer-ERG   3[SG]A-[3sg.O-]hang.TR-REL bag[-ABS]
       'the bag that the farmer hung up'
    b. *zaal   *a-baʔ.-mii*   *law.thlaw.paa*
       bag[-ABS] 3[SG]A-[3SG.O-]hang.TR-REL farmer[-ABS]
       Intended: 'the farmer who hung up the bag'
    b′. *zaal*   *a-bat.-mii*   *law.thlaw.paa*
       bag[-ABS] 3[SG]S-hang.INTR-REL farmer[-ABS]
       'the farmer who hung up the bag'
    c. **law.thlaw.paa* *a-bat.-mii*   *zaal*
       farmer[-ABS]   3[sg]S-hang.INTR-REL bag[-ABS]
       Intended: 'The bag that the farmer hung up.'

    Example (17a) shows relativization on an O argument; (17b) demonstrates that, as predicted by the S/O alignment of the PSA, the same relativization strategy is incompatible with transitive actor (A) arguments. Undergoer downgrading, as in (17b′), detransitivizes the clause, and maps actors into the S function, which is a regular component of the required S/O-PSA. This shows that PSA selection operates on the clause level. But unlike in Belhare, PSA selection does not also have access to the predicate level in Lai: (17c) is ungrammatical because undergoers have argument status only on the predicate level; on the clause level that is relevant for

Lai, undergoers are downgraded and have no argument status that would make them eligible for PSA-hood. The only argument available on the clause level is the actor mapped to the intransitive S function, as in (17b′).

3.3.   Summary

In the preceding sections I discussed two kinds of morphosyntactic argument downgrading in which arguments receive non-canonical coding on the clause level. By looking at constructions involving S/A and S/O PSAs (active participle and internally-headed relativization, respectively) differences emerged between languages and constructions in whether the clause level morphosyntax (case and agreement morphology, phrase-structural projection level) affected by downgrading is relevant or not for PSA selection. The results are summarized in Table 1. In German active participle constructions, argument selection for PSAs operates on the clause level: only those arguments that are in the nominative case and that trigger agreement ('AGR' in Table 1) are eligible as PSAs. In Belhare active participle constructions, PSA selection operates on the predicate level, and the morphosyntactic coding of arguments is irrelevant: any argument that is actor ('ACT' in Table 1) is mapped into the S or A role that is definitional for S/A-PSAs. For the S/O-PSAs of internally-headed relative construc-tions, any argument that is an undergoer ('UND') in a bivalent predicate is mapped into the O role critical for this PSA, regardless of its morpho-syntactic status (hence even if it is a downgraded object limited to a N^0 projection level). But in Belhare internally-headed relativization, PSA selection has also access to the clause level status of arguments and this makes transitive actor arguments also eligible for PSA-hood, because on the clause level they are S arguments, a role covered by the PSA. In Lai, the clause level is the only one accessible to PSA selection, hence undergoers can be PSAs only if they have the morphosyntactic treatment of regular O (primary object) arguments.

Table 1.   Crosslinguistic differences in PSA linking levels (bold face highlights the arguments selected as PSA) of two constructions

	S/A-PSA (in participle relativization) selection on:	S/O-PSA (in internally-headed relativization) selection on:
German	clause: <exp:DAT; stim:NOM,**AGR**>	n/a
Belhare	predicate: <exp:**ACT**; stim:UND>	predicate: <agt:ACT, pat:**UND**>
		clause: <agt:ABS,AGR,NP; pat:ABS,N^0>
Lai	n/a	clause: <agt:ABS,AGR,NP; pat:**ABS,NP**>

Most of the data surveyed here allow for alternative *prima facie* analyses, but all of them fail for one reason or the other: the constraint against dative experiencers as PSAs in German cannot be explained by analyzing these arguments as objects because, unlike true objects, these experiencers do not passivize. The fact that Belhare downgraded experiencers can function as PSAs cannot be explained by their status as absolutives because also non-absolutive experiencers in the possessive (genitive) or the ergative case can be PSAs. Possessive experiencers as PSAs could perhaps be explained by possessor raising but since this would have to be limited to experiencers, it would simply re-state the fact that possessive experiencers can be PSAs, and would miss the generalization that all experiencers can be PSAs regardless of case. Further, an analysis in terms of raising would not carry over to the fact that downgraded undergoers in Belhare have access to the S/O-PSA, while the case-free analysis does. The only alternative explanation other than positing PSA selection on the predicate level would involve positing PSA-accessible LOGICAL OBJECTS, as suggested by Mohanan (1994). But this would miss the generalization that PSA access to downgraded undergoers follows the same principle of case-free PSAs as the access to downgraded experiencers. For these reasons, I submit that the analysis in terms of predicate vs. clause level linking is descriptively more adequate and captures the cross-linguistic difference in a more simple and straightforward way than alternative analyses that suggest themselves.[11]

This establishes the linking level of PSAs as a typological variable differentiating the behavior of PSAs in specific constructions. Companion studies on more constructions in more languages (Bickel 1999a, 2004b) have shown that the variable is not only widely applicable but that languages – and to some degree even language families – tend to favor one level over the other:[12] Indo-European languages strongly favor clause-level linking. The only exceptions noted in the companion studies are found at the geographical extremes of the family: Icelandic in the west, Shina in the

east. Sino-Tibetan languages, if there are any PSA-involving constructions at all, strongly favor predicate-level linking; the only exceptions noted sofar are the internally-headed relative constructions discussed above.

There is also some evidence that the PSA-level variable might have direct bearings on processing. With regard to language production, the variable successfully predicts cross-linguistic differences in the use of NPs in discourse: processing languages with many constructions involving clause-level linking frequently activates NP-related processing procedures, and this seems to prime speakers into an overly frequent use of overt NPs, even if the language is pro-drop (Bickel 2003). With regard to compre-hension, it seems that the strong preference for clause-level linking is the reason why in German, case and position (as clause-level argument properties) are always taken by the processor as cues to the PSA of agreement constructions even though they are not always taken as cues to semantic roles: Bornkessel 2002, Bornkessel et al. 2003, Bornkessel and Schlesewsky, this volume). One would not expect this for languages prefering predicate-level linking. Here, neither position nor case should privilege PSA-status.

These observations and testable hypotheses make the PSA level variable typologically interesting and relevant: the variable not only successfully captures differences in PSA selection in individual constructions, but it has fairly consistent distributions and makes typological predictions beyond grammar. In the following section I want to explore how the variable can be modeled in theories of syntax.

4. Theoretical modeling

Across theories and traditions, the term grammatical relation has been used in two senses:

– grammatical relations are properties of equivalence classes of expressions (in Bresnan's 2001 sense) that select specific arguments as privileged for these classes (cf. Keenan's 1976 'coding properties' of subjects generalized to all arguments);

– grammatical relations are properties of constructions that select specific arguments as privileged for these constructions (cf. Keenan's 1976 'behavioral properties' of subjects generalized to all arguments)

For terminological convenience, I will use the term 'grammatical function' or GF for the first sense (as is standard practice in LFG), and the term PSA

for the second (as is standard practice in RRG). Most theories (and also most descriptive traditions) conflate the two, and seek to state PSA properties in terms of GFs, capturing behavioral properties of arguments by subject and object properties. The only theories that make the distinction are constructional theories like RRG or CG, and it is in these theories that the PSA level variable receives the most straightforward interpretation. I will show this in Section 4.1; in Section 4.2 I will discuss how the variable could be handled by (monostratal) theories that reduce PSAs to GFs, taking LFG as an example.

4.1. Constructional theories

As noted in Section 2, RRG identifies arguments of predicates by their position in semantic representation (Logical Structure or LS). The arguments in LS are ranked by the principles of the Actor-Undergoer hierarchy, reproduced in 18).

(18)   The Actor-Undergoer Hierarchy (Van Valin and LaPolla 1997: 146)

ACTOR   UNDERGOER

————————————————————————————>

                          <————————————————————————————————

Arg of   1st arg of   1st arg of   2nd arg of   Arg of state
DO   **do´** (x,...**pred´** (x,y) **pred´** (x,y)   **pred´** (x)

   [——>' = increasing markedness of realization of argument as macrorole]
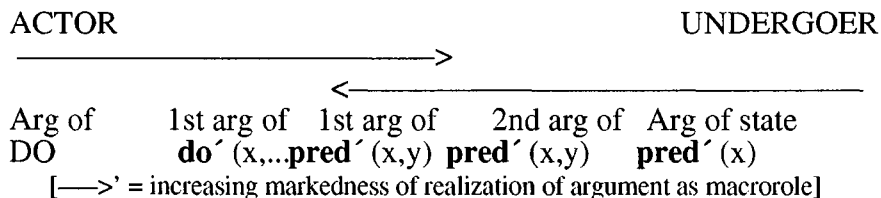
Downgraded experiencer verbs like German *schmecken* and Belhare *limma* are assigned the LS **like.the.taste.of´**(x,y), where the first argument (x) ranks higher than the second (y).

   A core feature of RRG is that LS-arguments are annotated for macrorole (MR) status, following the principles in (19):

(19)   Default Macrorole Assignment Principles (Van Valin and LaPolla
         1997: 152f)
         a. Number: the number of MRs a verb takes (its macrorole transiti-
            vity) is less than or equal to the number of arguments in its LS
            1. If a verb has two or more arguments in its LS, it will take two
                MRs.
            2. If a verb has one argument in its LS, it will take one MR.

   b. Nature: for predicates which have one MR,
      1. If the verb LS contains an activity predicate, the MR is actor.
      2. If the predicate has no activity predicate in its LS, it is under-
         goer.

In many languages, MR transitivity is subject to considerable lexical idiosyncrasy, and downgraded experiencers are a frequent example of this. On this level, German *schmecken* and its Belhare equivalent *limma* are lexically annotated as MR-intransitive, and only one LS-argument qualifies as an MR. Because there are no activity predicates, this MR will be an undergoer ('UND'), following (19b2). The other LS-argument is relegated to non-macrorole direct core status (NMA). The result of this is the annotation **like.the.taste.of′**(x:NMA,y:UND) in both languages.

These MR-annotated structures are the RRG equivalent of grammatical functions and they determine case marking, agreement, and other aspects of clause structure. Case and agreement follows universal defaults that are potentially overridden by language-specific and/or constructions-specific rules. The default is for sole MRs to be in the nominative/absolutive and for NMAs to be in the dative. This is exactly what we find in German, where the experiencer is in the dative and the stimulus (undergoer) in the nominative. Belhare has no dative case, and instead of the expected <DAT, ABS> case frame, we find <ABS, ABS>.[13] Belhare possessive experiencer verbs would override these default solutions and replace the default NMA case (the dative) by the genitive (or a corresponding possessive agreement affix), resulting in <GEN, ABS>.[14] Agreement rules follow the same principles, and in both languages only MRs trigger agreement by default. Since the structures are MR-intransitive, agreement is intransitive (i.e. S-agreement).[15]

Regular bivalent agent-patient verbs in Lai and Belhare have a basic LS with a higher **do′**-predicate, i.e. **do′**(x, [**pred′**(x,y)...]), plus a resultative BECOME-element in the case of active accomplishments. If the undergoer is downgraded lexically, or via antipassivization or incorporation, the LS is treated as MR-intransitive. Because they contain an activity predicate, the LS of these verbs is MR-annotated by the principle in (19b1) as **do′**(x:ACT, [**pred′**(x,y:NMA)]). Like before, NMAs are assigned absolutives (for the lack of dative morphology), and not being MRs, they fail to trigger agreement. The fact that they are limited to bare Ns is treated as a special (constructional) property of undergoer downgrading.

PSAs in RRG are theoretical entities independent of both LS and MR-annotations. PSAs are properties of language-specific constructions,

specified in constructional templates. Figure 1 illustrates such a (simplified, generic) template for the kind of active participle discussed earlier (ø indicates a lexically empty element). Crucial to the linking mechanism in active participle constructions is that the ø$_i$ element (the argument of the relative clause that is coindexed with the head noun) must be an accusatively aligned PSA.[16]

In the past, all RRG analyses have assumed that PSAs are linked to MR-annotated structures, but there is no axiomatic reason why PSAs could not also select arguments from among plain LS representation: MR annotation does not in any way discard or replace the LS of a predicate, and so both MRs and the underlying arguments of LS are representationaly available in parallel. Given that that PSAs are theoretical entities independent of both, one would expect that languages are free to have PSAs selecting from either representation: from MR annotations or from plain LS representations. This choice is precisely what models the typological PSA level variable. In languages like German, PSA selection operates on MR-annotations. Because German PSAs are restricted to (highest-ranking) MRs (Van Valin and LaPolla 1997: 360), the x (experiencer) argument of *schmecken* 'to like the taste of' is not a possible PSA:

Syntax:	Juncture:	NP		
	Nexus:	Subordination		
	Layering Units:	matrix	<default>	
		clause	[$_{CORE-N}$]$\leftarrow$[$_{PERIPH-N}$ [$_{CLAUSE}$]]	
	PSA:	(see text)		
	Linking:	(see text)		
Morphology:	Participle			
Semantics:	be'(x$_i$,			
	[pred'(...ø$_i$...)])			
Pragmatics:	...			

Figure 1. Active participle constructions

(20) German
    a. **be'**(x$_i$,[**like.the.taste.of'**(x:NMA,ø$_i$:UND)])
    b. ***be'**(x$_i$,[**like.the.taste.of'**(ø$_i$:NMA,y:UND)])

In (20), only the y argument of **like.the.taste.of'**(x:NMA,y:UND) has MR status (as an undergoer) and because PSA selection is sensitive to this, only the y argument can function as the coindexed ø-argument in active participle constructions. This is so in (20a), but not in (20b).

In Belhare, PSA selection operates on plain LS representations, selecting whatever is the highest ranking argument according to (18). Therefore, the x (experiencer) argument is the only possible choice as PSA in this language, as is the case in (21b), but not in (21a). MR-status plays no role:

(22) Belhare
      a. *be′(x$_i$,[**like.the.taste.of**′(x:NMA,ø$_i$:UND)])
      b. **be**′(x$_i$,[**like.the.taste.of**′(ø$_i$:NMA,y:UND)])

Turning to downgraded undergoer constructions, the constructional PSA is ergatively aligned and links therefore to the lowest ranking argument. If PSAs are selected on plain LS representations, the y argument (the patient) is selected, e.g. **do**′(x:ACT, [**pred**′(x,y:NMA)]). This is what we found as one option in Belhare (see example (15)). If PSAs are selected on MR-annotations, the only argument available as PSA is the macrorole x, the actor; the y argument is not a macrorole (NMA). Belhare has this as an option. In regular antipassive constructions like the one discussed for Lai, selection on MR-annotations structures is, as we saw in (17), the only option.

Thus, the existence of the PSA-level variable follows directly and explicitly from the architectural design of RRG which differentiates axiomatically between PSAs as constructional properties and between Logical Structure and its MR annotations. The other major constructional theory of syntax, Construction Grammar (CG), does not make the same distinction on explicit grounds, but this distinction, and by the same token, the PSA level variable, is implicitly given by the general architecture of the theory.

The foundational idea of CG is that higher-level constructions like sentences, or complex constructions like relative clauses, have the same general feature geometry as lexical items. They all have features (technically, attribute-value matrices or AVMs) specifying form (phonology, morphology, syntax) and content (frame semantics, also including conventionalized conversational implicatures and focus structure). A general feature geometry for all kinds of constructions is given in Figure 2.[17] Valence structures list AVMs of any type needed, but most typically they involve syn[tactic] and/or sem[antic] AVMs. The syn-AVMs, as detailed in Figure 2b, specify rel[ational] information like gf (grammatical functions, with associated semantics) and/or int[rinsic] information like case or phrase-structural category information. When occurring inside val-AVMs, syn-information typically involves rel-AVMs detailing the relational pro-

perties of each argument (valent) of the valence-bearing element; when occurring outside valence specifications, syn-information is usually limited to int-AVMs (and often to just category information like 'verb', 'noun' etc.).

$$
\text{a.} \begin{bmatrix} \text{ph/mph} & [\ ] \\ \text{syn} & [\ ] \\ \text{val} & \{\ \} \\ \text{sem} & \begin{bmatrix} \text{frame} & [\ ] \\ \text{args} & [\ ] \end{bmatrix} \end{bmatrix}
\qquad
\text{b.} \begin{bmatrix} \text{syn} & \begin{bmatrix} \text{rel} & \begin{bmatrix} \text{gf} & [\ ] \\ \text{sem} & [\ ] \end{bmatrix} \\ \text{int} & \begin{bmatrix} \text{cat} & [\ ] \\ \text{mph} & [\ ] \end{bmatrix} \end{bmatrix} \end{bmatrix}
$$
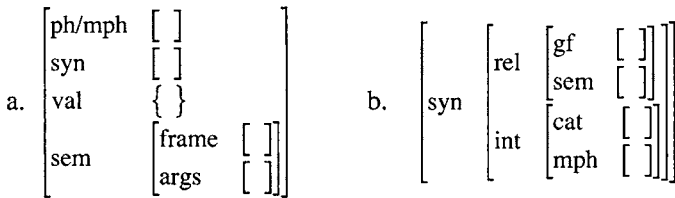
Figure 2. General CG feature geometry

Kay and Fillmore (1997) also utilize a 'role' AVM that specifies what role the construction plays in a large construction (e.g. a verb plays the role of head in a clause, an NP plays the role of complement in a verb-headed clause etc.). However, maximizing the similarity between lexical predicate construction and higher-level construction (and thus being closer, as I believe, to the foundational idea of CG), I assume here that such combinatorial possibilities are not explicated by a special role-filler mechanism, but by the same val-AVMs that are needed for lexical predicates. (In the Kay and Fillmore version, only lexical predicates contain val-AVMs.). That is, the kinds of elements that, say, an active participle construction can combine with, will be specified by its val-requirements (such as a kind of verb, or word order constraints if there are any, etc.).

Under these feature-geometrical assumptions, PSAs will be represented as rel-AVMs of the higher-level construction; GFs (in the cross-theoretical sense adopted above) will be represented as rel-AVMs of the predicate that is embedded in the val-AVM of the construction. The difference between clause-level linking and predicate-level linking will then fall out as the difference between unifying some element of the higher rel-AVM either with a rel-AVM embedded in the val-AVM of the lexical predicate used in the construction, or directly with an argument in the sem(antic) structure of that predicate.

$$
\begin{bmatrix}
\text{mph} & \text{'active participle'} \\[4pt]
\text{syn} & \begin{bmatrix}
\text{rel} & [\ ] \\[4pt]
\text{int} & \begin{bmatrix}
\text{cat} & \text{adjective} \\
\text{mph} & [\ ]
\end{bmatrix}
\end{bmatrix} \\[16pt]
\text{val} & \left\{ \begin{bmatrix}
\text{mph/ph} & [\ ] \\
\text{syn} & [\text{int}\ [\text{cat}\ \text{verb}]] \\
\text{val} & \{\ \} \\
\text{sem} & \#1
\end{bmatrix} \right\} \\[20pt]
\text{sem} & \begin{bmatrix}
\text{frame} & \text{INVOLVED} \\
\text{args} & \{\#\alpha,\ [\text{sem}\ \ \#1]\}
\end{bmatrix}
\end{bmatrix}
$$
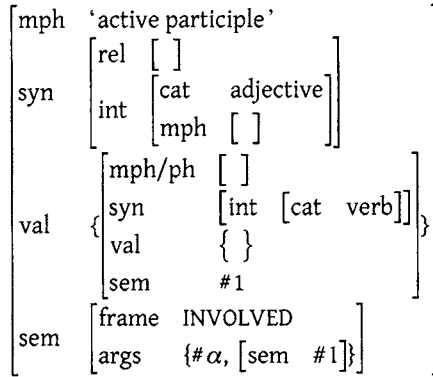
Figure 3. Active Participle constructions (generic, simplified)

Figure 3 is a generic and simplified AVM for active participle constructions. Internally-headed constructions will have different features values, but the over-all AVM architecture is the same, and I concentrate here on the participial relatives. Only the most important AVMs are spelled out, and those that are spelled out may not be specific to the construction because they may be inherited from other constructions (as is the case here with inheritance from general attributive constructions).[18] The val-AVM in Figure 3 requires that the adjective-producing morphology (*-end* in German, *ka-* in Belhare) combines with a lexical verb. '#' marks unificational indices. #1 has the effect that the semantics of the construction will be something like 'argument α is involved with [whatever the semantics of the input verb is]'; #α unifies with that argument in the relevant verb semantics that is relativized by the construction. Crucial for our current purposes is the rel-specification in Figure 3. It is there that PSA specifications are found.

If the language (like German) has clause-level linking, the value of this rel-attribute will unify with a rel-value in the val-AVM of the embedded verb. Here, arguments are specified for case, and the unificational index can be tagged to the correct argument that bears nominative case, i.e. the stimulus (the *u*-argument). This is shown by the index '#1' in Figure 4. If the language (like Belhare) has predicate-level linking, the value of rel will be specified as a gf linked directly to an argument in the frame semantics of the embedded verb (technically: as a gf whose semantic co-attribute unifies with a semantic argument of the verb). On this level, no case information is available, and the linking is subject only to the principles of accusative

alignment (as specified by gf = S/A), selecting the experiencer (the *a*-argument). This is shown in Figure 5. For gf values I adopt here Dixonian representations, so that standard subjects are notated as 'S/A'. In Figure 4, I assume that the dative bears an oblique argument function; that it is not an object (either direct or indirect) is shown by its failure to passivize (see the data in   (4) above). Belhare clause-level morphology shows tripartite align-ment and distinguishes primary objects (triggering agreement) from secon-dary objects (SO, not triggering agreement) (Bickel 2003a), and I therefore posit S, A, PO, and SO as distinct grammatical functions in Figure 5. Note that because Belhare has predicate-level linking, the gf on the construc-tional level is not only independent of the gfs indexed by case and agree-ment, but that it can have a totally different alignment pattern. Note that this representational mechanism allows for a natural way of capturing the common fact that ergative morphology (i.e., with gfs A vs. S/O indexed in verb valence) combines with acusatively aligned constructional PSAs (i.e., with a gf = S/A in the constructional rel-AVMs, exactly like in Figure 5.
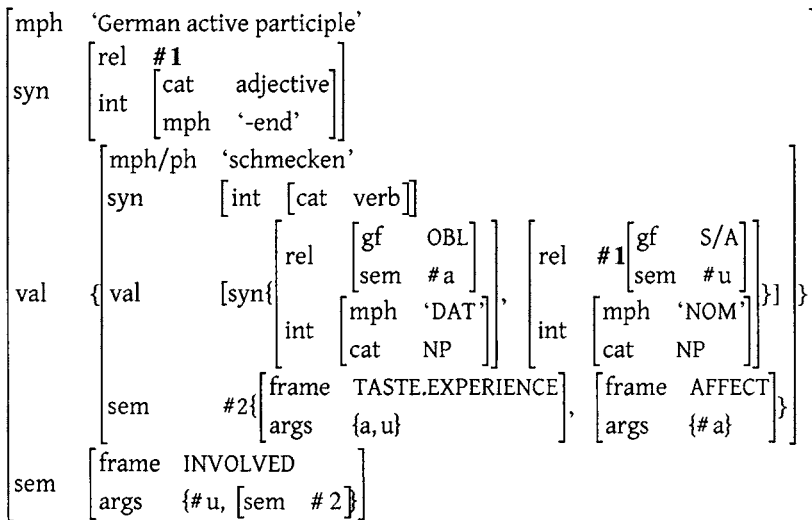
Figure 4.   Unification of an active participle construction with a verb in German

$$
\begin{bmatrix}
\text{mph} & \text{'Belhare active participle'} \\[4pt]
\text{syn} & \begin{bmatrix}
\text{rel} & \begin{bmatrix}\mathbf{gf} & \mathbf{S/A} \\ \mathbf{sem} & \mathbf{\#a}\end{bmatrix} \\[6pt]
\text{int} & \begin{bmatrix}\text{cat} & \text{adjective} \\ \text{mph} & \text{'ka-'}\end{bmatrix}
\end{bmatrix} \\[10pt]
\text{val} & \left\{ \text{val} \begin{bmatrix}
\text{mph/ph} & \text{'limma'} \\
\text{syn} & [\text{int}\ [\text{cat}\ \text{verb}]] \\[4pt]
\text{val} & [\text{syn}\{ \begin{bmatrix}\text{rel} & \begin{bmatrix}\text{gf} & \text{SO} \\ \text{sem} & \#a\end{bmatrix} \\ \text{int} & \begin{bmatrix}\text{mph} & \text{'ABS'} \\ \text{cat} & \text{NP}\end{bmatrix}\end{bmatrix}, \begin{bmatrix}\text{rel} & \begin{bmatrix}\text{gf} & \text{S} \\ \text{sem} & \#u\end{bmatrix} \\ \text{int} & \begin{bmatrix}\text{mph} & \text{'ABS'} \\ \text{cat} & \text{NP}\end{bmatrix}\end{bmatrix}\}] \\[4pt]
\text{sem} & \#2\{\begin{bmatrix}\text{frame} & \text{TASTE.EXPERIENCE} \\ \text{args} & \{a,u\}\end{bmatrix}, \begin{bmatrix}\text{frame} & \text{AFFECT} \\ \text{args} & \{\#a\}\end{bmatrix}\}
\end{bmatrix} \right\} \\[10pt]
\text{sem} & \begin{bmatrix}\text{frame} & \text{INVOLVED} \\ \text{args} & \{\#a, [\text{sem}\ \#2]\}\end{bmatrix}
\end{bmatrix}
$$

Figure 5. Unification of an active participle construction with a verb in Belhare

The advantage of the CG approach is that it allows for rich frame semantic characterization of the experiencer construction: there is a straightforward way to capture the insight that the dative (or in Belhare absolutive) coding of the experiencer argument structure constructions suggests a general sense of affectedness, or 'befalling' (Croft 1993; Fried 1998, among others). This is represented in Figures 3 and 4 by additional semantic frames that blend with basic lexical experiencer frame through shared arguments ('#a'). The frames are inherited (in a way not shown in the figures here; cf. note 18) from a general AVM detailing EXPERIENCER-AS-GOAL constructions.

The disadvantage of the CG approach is that one needs to stipulate which argument is selected as the constructional gf. In the RRG approach this choice was derived by the MR-transitivity theory so that, once we know the MR-transitivity of a predicate, and know whether the language has predicate- or clause-level PSAs, we can predict which argument will be selected as PSA. MR-transitivity in turn is independently motivated by case and agreement effects.

4.2.   Nonconstructional theories

Nonconstructional theories like LFG seek to state all construction-specific PSA properties in terms of GF properties in the verb's valence frame (f-structure). Without stipulating additional machinery,[19] it is not possible in these theories to capture the PSA level variable by differentiating between PSAs selecting GFs vs. PSAs selecting predicate arguments because PSAs are the same as GFs. The traditional way such theories deal with facts like the ones covered by the PSA-level variable is to take clause-level linking to be the only theoretical option and to analyze all evidence for predicate-level linking as instances of an extended notion of QUIRKY CASE, i.e. as explicitly listed nonstandard morphological case assignment to standard GFs. Under this proposal, downgraded experiencers and undergoers in Belhare would be available for syntactic processes like relativization because the rules would list all case and phrase structure options available: the Belhare subject function would list 'ERG, ABS, GEN' as possible case values, and the difference to German would be that the list in German is limited to nominative. The ergative syntax of Belhare internally-headed relativization would be captured by 'intransitive subjects or objects triggering agreement or objects limited to N^0'.[20] There are various ways of simplifying this, e.g. by taking the subject-nominative association to be a universal default so that only the Belhare subject coding rule would have to list cases. Ergative syntax could be captured by inverse mapping of arguments so that undergoers instead of actors are mapped into subjects (Manning 1996). If so, the Belhare rule would specify intransitive subjects or objects limited to N^0.

The advantage of this proposal is that all linking mechanisms would be universally the same, the cross-linguistic differences being relegated to language-specific quirks. But there is a price to pay for this: the cases listed for the Belhare subject definition exhaust the list of grammatical cases the language has, and a better generalization is therefore to say that case simply does not matter. But that is equivalent to saying that one core piece of clause-level information, viz. case, is simply irrelevant for the linking mechanism, as one would in constructional approaches. Further, a quirky-case approach would make it difficult to capture any typological generalizations, such as the trend in Belhare (and even in the entire Sino-Tibetan family) against case-sensitive PSAs across different constructions. Finally, the seeming advantage of a quirky-case approach is that cross-linguistic differences are not in the linking principles but in the lists of items involved. But this would work fine only if the list items were all

morphemes (here, case affixes), but it is difficult to see how phrase structural projection levels could be language-specific quirks on a par with morphemes. Most theories would want to analyze the architectural principles of phrase structure as universal. LFG at least offers a solution for this particular problem: since downgraded undergoer constructions are a kind of diathesis, the undergoer on the predicate level has what Mohanan (1994) calls LOGICAL OBJECT status. The fact that it is still available for relativization could therefore be captured by saying that relativization is possible on intransitive syntactic subjects, and on all kinds of objects, both syntactic and logical objects.

5.   Conclusions

The survey of theories in Section 4 suggests that both constructional and nonconstructional approaches can handle all facts covered by the PSA level variable. But it is only in constructional theories like RRG and CG that the variable directly falls out from the architecture of the theory and emerges as a single parameter of typological variation. In nonconstructional theories the facts are best captured by quirky case effects stated specifically for each language and by the option that some languages have for syntactic processes operating on logical (rather than syntactic) objects.

I have argued elsewhere that the PSA level variable is a typological interesting variable, with robust correlations in discourse and considerable genealogical stability (Bickel 2003b, 2004b). If one evaluates theories not only in terms of descriptive and explanatory adequacy, but also adopts Dik's (1989) criterion of typological adequacy, then constructional approaches prove to be more adequate approaches than nonconstructional ones: constructional theories predict the existence of the variable, whereas in nonconstructional theories the variable cannot be naturally subsumed under one single parameter of variation. This would suggest in turn that the findings presented here support a general distinction between three domains of argument role specification: (i) roles based on semantic and pragmatic prominence in argument structure, (ii) roles based on syntactic valence specifications (grammatical functions or m-transitivity), and (iii) roles as pivots and controllers selected by specific constructions (PSAs).

Acknowledgments

Notes

1. I do not wish to claim that derivational theories in the Chomskyan tradition cannot model this variable. I simply refrain from discussing these theories for lack of time and space. I choose here monostratal rather than derivational theories (i) because the issues I want to address in this paper connect most straightforwardly to monostratal architectures and (ii) because the ergative and nonconfigurational syntaxes discussed here are relatively well researched in such theories.
2. Unlike in LFG and HPSG, there is no direct mapping in RRG between these aspects of syntax and phrase structure; cf. Van Valin and LaPolla (1997) and Bornkessel and Schlesewsky (this volume) for discussion.
3. Not so under Przepiórkowski's (1998) proposal, however, where case is assigned in ARG-ST.
4. Such downgrading may correlate with a different role semantics (cf. the contributions by Primus, Wunderlich, and Bierwisch in this volume). I will come back to this issue shortly, and again in Section 4.1. For current purposes, I am interested in the formal effects of the case choice.
5. Interlinear glossing follows the Leipzig Rules (http://www.eva.mpg.de/lingua/files/morpheme.html).
6. The data on Belhare were collected between 1991 and 1999. All examples were elicited from my principal consultant, Lekhbahādur Rāī, but all were double-checked with at least two other speakers, and wherever possible matched with natural discourse specimens.
7. Belhare agreement morphology shows primary object alignment. See Bickel (2003a).
8. As a reviewer points out, dative undergoers and dative experiencers behave alike in not allowing the *bekommen/kriegen*-passive, unlike dative recipients of ditransitive verbs. This fact does not establish that the datives in   (4) share

a semantic or syntactic property; it only shows that they both happen to lack a crucial property required by the *bekommen/kriegen*-passive, viz. the transfer semantics of ditransitives.

9. In both cases, the possessive agreement trigger could be spelled out by free pronouns in the genitive (*ŋkaha aniũa, unnaha uris,* both with contrastive focus on the pronoun).

10. Periods in Lai transcripts indicate phonological word boundaries inside grammatical words.

11. Whether the analysis is also more adequate from the point of view syntactic theory, will be discussed in Section 4.

12. As I hope to have made clear at the outset in the introduction, the PSA level variable has specific values for specific constructions. Like with other variables of grammatical relations typology, languages can have quite diverse values for different constructions (cf. Van Valin and LaPolla 1997; Bisang, this volume; Bornkessel and Schlesewsky, this volume). If values cluster in languages or families, this is an interesting probabilistic finding, but not a necessity of the human language faculty (cf. Bickel 2005 on the difference between typological variables and parameters that are defined as part of the human language faculty or Universal Grammar.)

13. Note, however, that speakers sometimes borrow the Nepali dative case suffix on experiencers. Also note that no distinction is made in the theory between nominative and absolutive. They are labels of the unmarked case in different alignment patterns.

14. Interestingly, a number of South Asian languages have free or lexically-driven alternations between datives and genitives in the expression of experiencers: see Bickel (2004b).

15. Possessor agreement in Belhare as in   (8b) would have to be taken as exceptional.

16. I concentrate here on that aspect of linking material to the PSA level variable. There are of course other important aspects of linking, such as how LS arguments map into the layered structure specifications in Table 1. For a detail exposition of the relevant linking algorithms, see Van Valin and LaPolla (1997).

17. This is based on Fillmore and Kay's feature-based version of CG (Fillmore and Kay 1997; Kay and Fillmore 1999; Kay 1997). The main difference is that I capture semantic roles by semantic AVMs of grammatical functions that unify with the frame-semantic arguments of the predicate (assuming semantic hierarchy principles determining the linking). Fillmore and Kay (1997) introduce for this purpose explicit theta-roles as co-AVMs of syntactic category and morphology AVMs. Note that empty brackets do not denote empty sets but are variables for appropriate values. Curly brackets denote lists of AVMs.

18. I am not concerned with the relevant inheritance networks in the following. Also, I am not concerned with morphological or phonological details here,

and abbreviate this information by form labels in single quotes, e.g. 'active participle'.

19. Falk (2000) in fact introduces pivots in LFG f-structures. It remains to be seen whether this is fully consistent with LFG principles. One immediate problem is that f-structures contain functions that map arguments into expressions, but PSAs are not expressions but rather arguments selected for specific purposes in specific constructions; they are reflexes of 'behavioral', not of 'coding properties' of arguments, in Keenan's (1976) terminology.

20. Note that not all elements with an N^0-projection constraint can be PSAs. N^0's in compounds are not eligible.

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From meaning to syntax – semantic roles and beyond

Walter Bisang

1. Introduction

If semantic roles are supposed to be more than a "thinly disguised wild card to meet the exigencies of syntax" (Jackendoff 1987: 371) their identification cannot be based on meaning alone. It is for that reason that Dowty (1991) looks at semantic roles through argument selection, i.e., through the assignment of the two semantic proto-roles of proto-agent and proto-patient to the syntactic categories of subject and object.

If Dowty's (1991) strategy of looking at semantic roles and argument structure through analysing their interaction with syntax is applied cross-linguistically, a number of problems may arise. I shall look at the following problems which will be discussed on the basis of examples from individual languages:

1. On the semantic level, it may turn out that semantic roles and their position within thematic hierarchies do not provide the whole semantic information relevant for assigning participants[1] to syntactic categories.
2. From a syntactic perspective, it may either turn out that syntactic categories are of low profile in a given language and thus can only provide scarce or no semantic-independent syntactic evidence for semantic roles or it may be that syntactic operations are not based on the neutralization of semantic roles.
3. Semantic roles and argumenthood may turn out not to be the main factor that determines the assignment of nominal participants to the syntactic categories of subject and object.

My approach is primarily empirical, i.e., I look at data on individual languages which call in question some tenets of different theories and I try to offer some tentative solutions. Whereas the first problem touches on semantic factors beyond the relevance of thematic hierarchies for argument

assignment, the second problem hints at a scenario in which we do not only give up taking semantic roles for granted in the sense of Dowty (1991) but also look more critically at the status of syntactic categories. The last problem opens a new perspective which is not very often discussed in theoretical literature. As I would like to show, in Tagalog and Kapampangan and maybe in a number of other Austronesian languages the assignment of participants to syntax is based primarily on their referential status.

The first problem of semantic information beyond semantic roles and thematic hierarchies will be presented in section 2. Section 3 will be dedicated to the problem that there may be a systematic lack of semantic-independent syntactic evidence in some languages. The languages to be analysed will be Chinese and Liangshan Nuosu (Tibeto-Burman). The topic of section 4 will be referential status as another primary semantic dimension determining the assignment of participants to syntax in Tagalog and Kapampangan. In my conclusion in section 5, I shall look at some consequences of the data discussed in sections 2 to 4 from the perspective of a number of different theoretical approaches. For that purpose, I would like to finish this section with a very brief sketch of how semantic roles and their interaction with syntax is understood in some linguistic theories.

Most theories dealing with argument selection take the syntactic categories of subject and object for granted. Thus, Dowty (1991) examines how the proto-roles of proto-agent (1a) and proto-patient (1b) are assigned to these categories on the basis of his argument selection principle (2):

(1)   Proto-roles and their properties (Dowty 1991: 572):

     a.   Contributing properties of the Agent Proto-Role:
         - volitional involvement in the event or state
         - sentience (and/or perception)
         - causing an event or change of state in another participant
         - movement (relative to the position of another participant)
         (- exists independently of the event named by the verb)

     b.   Contributing properties of the Patient Proto-Role:
         - Undergoes change of state
         - incremental theme
         - causally affected by another participant
         - stationary relative to movement of another participant
         (- does not exist independently of the event, or not at all)

(2)   Argument selection principle (Dowty 1991: 576):
In predicates with grammatical subject and object, the argument for which the predicate entails the greatest number of Proto-Agent properties will be lexicalized as the subject of the predicate; the argument having the greatest number of Proto-Patient entailments will be lexicalized as the direct object.

In syntactically ergative languages, the argument selection principle works the other way round, that is, the argument with the greatest number of proto-patient entailments will be selected as the subject (pivot) and vice versa. If the argument that does not qualify for the subject/pivot position is supposed to take that position a passive or an antipassive is needed.

Jackendoff's (1990) approach is not based on prototypical properties of proto-arguments but on a thematic hierarchy (3) and on a syntactic hierarchy which are then subject to argument linking.

(3)   Thematic hierarchy (Jackendoff 1990: 258):

a. $[\text{AFF} (X^*, <Y>)]$ (Actor)
b. $[\text{AFF} (<X>, Y^*)]$ (Patient (AFF-) or Beneficiary (AFF+))
c. $[_{\text{Event/State}} \text{F} (X^*, <Y>)]$ (Theme)
d. $[_{\text{Path/Place}} \text{F}(X^*)]$ (Location, Source, Goal)

The A-marked constituents in the verb's lexical conceptual structure (LCS) are ordered according to the thematic hierarchy in (3). The first A-marked constituent is linked with the external argument which is in turn coindexed to the subject if there is one. If there is no subject the external argument has to be satisfied with a bound variable. Obviously, Jackendoff (1990) does not take the subject for granted to the same extent as Dowty (1991) does. Nevertheless, his theory is based on a syntactic asymmetry between subject and object which is also reflected in the roles that can be linked to these different syntactic categories. The set of roles that can become external arguments, that is, the set which is eligible for subjecthood is higher in the thematic hierarchy (actor, patient/beneficiary, theme) than the set that can become first object (from patient/beneficiary down to identificational goal/reference object):

(4) Linking hierarchy (Jackendoff 1990: 268)[2]

Actor

Patient/Beneficiary   External Argument

Theme   1st Object

Source/Goal
Reference Object

Identificational Goal/
Reference Object
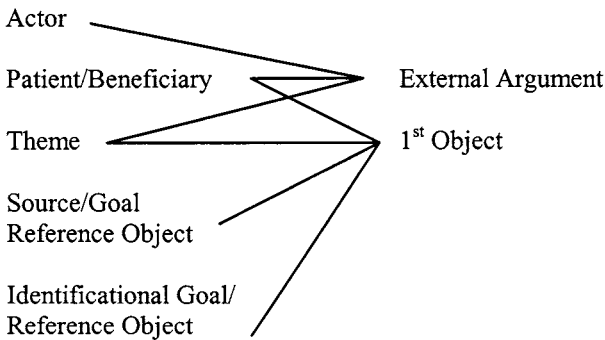
   Problems with this approach arise if there is no such asymmetry, that is, if a language has a flatter syntactic structure. How can then semantic roles be assigned to syntactic structure? The model of Lexical-Functional Grammar (LFG) and its architecture of a(rgument)-structure, f(unctional)-structure and c(onstituent)-structure offers a solution to this problem (Bresnan 2001). The categories of subject (SUBJ) and object (OBJ) belong to f-structure and can be mapped onto constituent structures with different degrees of hierarchical rigour in the c-structure. A-structure in turn is associated to f-structure by another linking mechanism.
   The grammatical categories of subject and object are taken for granted in Lexical-Functional Grammar as well. To my knowledge, there are only a few approaches which do not take syntactic categories for granted. Two of them are represented in this volume (Van Valin [this volume] on Role & Reference Grammar and Wunderlich [this volume]). In Role & Reference Grammar, there is one privileged syntactic argument called pivot which can operate in constructions such as relativization, equi constructions, reflexivization, verbal agreement, etc. Role & Reference Grammar is based on the two macroroles of actor and undergoer and a thematic hierarchy which determines what semantic roles will be assigned to what macrorole. Grammatical relations such as the pivot, also called the privileged syntactic argument (PSA), are defined by restricted neutralization of semantic or pragmatic relations (Van Valin and LaPolla 1997: 274) (cf. § 3.2). Thus, in the pivot (or subject) position of English, the agent A of a transitive verb and the single intransitive argument S are neutralized. Pivots do not occur in every language. Acehnese (Malayo-Polynesian; Durie 1987) is postulated to be a language which directly operates on macroroles without any neutralization taking place.

2.   Semantic information beyond semantic roles and their position within thematic hierarchies

The relevance of semantic information beyond semantic roles for assigning participants to morphosyntax in terms of case marking and maybe in terms of syntactic categories (depending on what can be concluded from the grammatical descriptions available) can be seen from several instances. I shall discuss the limited pervasiveness of semantic roles (§ 2.1), the role of affectedness and the difference between two types of agents, affected and nonaffected agents (§ 2.2), and the fact that the assignment of arguments of two-place predicates to morphosyntax depends on the relationship between both of them (§ 2.3).

2.1.   The limited pervasiveness of semantic roles and thematic hierarchies

The pervasiveness with which proto-roles such as agent and patient are reflected in the assignment systems of individual languages seems to be subject to variability. As it turns out, it is often only the more prototypical instances of participants, i.e., the most agent-like or the most patient-like participants, which get the relevant case marking such as nominative/ accusative vs. ergative/absolutive, while the less prototypical participants are treated differently. In this context, Tsunoda (1985) distinguished six classes of two-place predicates arranged according to the parameter of affectedness from predicates with maximal affectedness in class 1 down to predicates of class 6 (cf. table 1). As it turns out, in Avar (NW Caucasian), case marking is different for almost each class:

Table 1. Case marking in Avar on the basis of Tsunoda (1985: 388)

Class	Avar verb	Case marking for	
		Agent (A)	Patient (B)
1. Direct effect on patient	'kill'	A = Ergative	P = Absolutive
2. Perception	'see'	A = Locative	P = Absolutive
3. Pursuit	'search'	A = Ergative	P = Absolutive
	'wait'	A = Absolutive	P = Apudessive
4. Knowledge	'know'	A = Locative	P = Absolutive
5. Feeling	'love'	A = Dative	P = Absolutive
6. Relationship	'have, own'	A = Genitive	P = Absolutive

2.2.   Affected agents

Different degrees of affectedness not only yield different types of patients
such as maximally affected patients of predicates like 'kill' or 'break (tr.)'
or less affected patients occurring with predicates such as 'see' or 'love'
(cf. Tsunoda's 1985 above semantic classes of verbs), they also have their
impact on agents. As was pointed out by Saksena (1980), in some
languages there is a difference between affected agents and nonaffected
agents. In Hindi, this difference shows up in the case marking of the causee
in morphologically related causatives of agentive verbs. In example (5b)
with the causative form of the verb *khaa* 'eat', the causee can only be
marked by the dative/accusative marker -*koo*, whereas in example (6b) with
the verb *kaaṭ* 'cut' the causee must take the instrumental marker -*see*:

(5)   Hindi (Saksena 1980: 812):
    a.   Agentive verb:
        raam-nee   khaanaa   khaa-yaa.
        Ram-ERG   food:ABS   eat-PFV
        'Rame ate dinner.'

    b.   Causative form:
        mãĩ-nee   raam-koo/-see   khaanaa   khil-aa-yaa.*
        I-ERG   Ram-DA/INSTR   food:ABS   eat-CAUS-PFV
        'I fed Ram.'

(6)   Hindi (Saksena 1980: 813):
    a.   Agentive verb:
        raam-nee   peeṛ   kaaṭ-aa.
        Ram-ERG   tree:ABS   cut-PFV
        'Ram cut the tree.'

    b.   Causative form:
        mãĩ-nee   raam-see/-koo   peeṛ   kaaṭ-aa-yaa.*
        I-ERG   Ram-INSTR   tree:ABS   cut-CAUS-PFV
        'I made Ram cut the tree.'

Case-marking of the causee depends on the verb. There are verbs such
as *deekh* 'see', *pii* 'drink', *bhaag* 'run away', *dauṛ* 'run', *siikh* 'learn', etc.
which require dative/accusative marking and verbs such as *phaaṛ* 'tear',

maanj 'scour', *phiinch* wash', *kar* 'do', etc. with which the causee must take the instrumental. The difference between these two verb classes is based on the degree with which the agent is affected by the action denoted by the verb. The following quotation from Saksena (1980: 821) describes the case of the verbs with an affected agent which takes the dative/accusative marker -*koo* in the function of the causee:

> The agent of such a verb is also the recipient of the verb activity, and constitutes the goal toward which this activity is directed. Thus the activities represented by 'eat' and 'read' are not only directed at their objects ('food' or 'book'), but also toward their agents. These agents undergo a change of state physically (as in the activity expressed by running) or psychologically (as in the activity of studying). In other words, these agents have some of the properties that one typically expects of patients. These agents are not only do-ers (performers of their activities) but also do-ees (recipients of these same activities).
> (Saksena 1980: 821)

There are only a few verbs such as *parh* 'read', *likh* 'write', *cakh* 'taste' and *gaa* 'sing' which allow the causee to occur with both case markers. Thus, if the causee of *cakh-vaa* 'taste-CAUS' in (7) is marked by the dative/ accusative, it is supposed to profit from that action (the tasting is for its benefit). If it is marked by the instrumental, this is not the case, i.e., the causee is not supposed to be affected by the action denoted by the verb (Saksena 1980:816):

(7)   Hindi (Saksena 1980: 816):
   *mãĩ-nee   raam-**koo**/-**see**   masaalaa   cakh-vaa-yaa.*
   I-ERG   Ram-DA/INSTR   spice:ABS   taste-CAUS-PFV
   'I had Ram taste the seasoning.'

From the above data one can see that the mere proto-role of agent is not sufficient to account for how the actor of agentive verbs is treated in the case morphology of Hindi. Thus, the affected vs. nonaffected distinction is more basic in Hindi than the proto-roles of agent and patient.

The facts illustrated with the above data from Hindi falls into a wider pattern which seems to be related to the general complexity of the process of causation. While the causee may still be treated uniformly in many languages, in other languages its treatment depends on a number of semantic parameters. Dixon (2000: 62, 65–67) lists the following three parameters: control (depends on "[w]hether the cause *lacks control* or *has*

control of the activity" [Dixon 2000: 65]), volition (depends on "[w]hether the causee does it *willingly* ('let') or *unwillingly* ('make')" [Dixon 2000: 65]) and affectedness (depends on "[w]hether the causee is only *partially affected or completely affected* by the activity" [Dixon 2000: 67]). The parameter of affected agents in Hindi differs from the parameter of partial/complete affectedness as discussed by Dixon (2000) on the basis of data from Tariana (Aikhenvald 2000). Two-place events with an agent and a patient are not necessarily analysed as one-way processes from an agent onto a patient in the classical sense of transitivity. In some languages, the action of the agent onto the patient reacts upon the physical or psycholigical state of the agent. This semantic dependency of the agent on the patient shows up in the context auf causativity in Hindi. Since it does not occur in Dixon's (2000) list of semantic parameters, it must be seen as a fourth parameter. The following subsection will further elaborate on this topic.

2.3.   Mutual dependence of the arguments

Linking theories based on semantic roles typically look at the semantic roles of each individual argument without considering the option that one argument may have its impact on the other. That the agent and patient argument of two-place predicates are not necessarily mutually independent may even play a role in the case of the affected agent as described above. With a verb like 'learn', the patient argument affects the agent in the sense that the agent somehow integrates it into her/his mental repertoire and thus undergoes a certain change in her/his mind. Consequently, the distinction between affected and nonaffected agents may not only be a matter of verb semantics as suggested by Saksena (1980) but also a matter of the semantics of the patient.

In most instances of mutual dependence between agent and patient, some variety of the animacy hierarchy is involved. Thus, Blake (1994: 121–122; on the basis of McKay 1976) briefly discusses the case of Rembarnga (Australian), in which there is a suffix added to the proclitic of the patient on the verb only if the patient is higher in the animacy hierarchy (which is '1 > 2 > 3 plural > 3 singular' in this language) than the agent. Another language also mentioned briefly by Blake (1994: 123) is Fore (Papua New Guinea) as described by Scott (1978). In this language, basic word order is free in principle and none of the arguments is obligatory. The agent and the patient can both be unmarked. Potential ambiguities are

resolved either by the animacy hierarchy, or, if both arguments take the same position in that hierarchy, by word order (agent before patient). Thus, example (8) means 'The man kills the pig' on the basis of the animacy hierarchy and (9) means 'The man sees the boy' on the basis of word order:

(8)   Fore and the animacy hierarchy (Scott 1978: 116):
      yaga: wá   a-egú-i-e.
      pig   man   3sP-hit -3sA-INDIC
      'The man kills the pig.' [not: 'The pig kills the man.']

(9)   Fore and the impact of word order (Scott 1978: 115):
      mási   wá   á-ga-i-e.
      boy   man   3sP-see-3sA-INDIC
      'The boy sees the man.' [not: 'The man sees the boy.']

If the agent and the patient roles are distributed against the animacy hierarchy, the agent is marked by the ergative suffix *-ma* (when attached to nouns denoting humans)/*-wama* (when attached to nouns denoting nonhumans) which is called 'delineator' by Scott (1978: 100–103). The same suffix is also used if the agent and patient roles are distributed against word order. The former case is illustrated by (10), the latter by (11):

(10) Case marking against the animacy hierarchy in Fore (Scott 1978: 116):
      *yaga:-**wama**   wá   a-egú-i-e.*
      pig-ERG   man   3sP-hit -3sA-INDIC
      'The pig attacks the man.' [not: 'The man attacks the pig.']

(11) Case marking against word order in Fore (Scott 1978: 115):
      *mási   wá-**má**   a-ga-i-e.*
      boy   man-ERG   3sP-see-3sA-INDIC
      'The man sees the boy.' [not: 'The boy sees the man.']

Silverstein (1976) describes the phenomena presented above under the term of "global case-marking systems":

if the split involves a contingency depending on two (or more) NPs of the sentence, referable to the 'global' level of the whole proposition, rather than the local level of one NP, then we must reformulate the rules of agentive and patientive hierarchy. The rules will have to state that the split in case-marking for both agent and patient is sensitive not only to the features of the NP in question, but also to the features of the NP which functions as its opposite member in the proposition. (Silverstein 1976: 125)

Although it is known since quite some time that case marking can depend on constellation patterns between both arguments of a two-place predicate this fact is seldom seriously integrated into linguistic theories.

3.   Reduced semantic-independent syntactic evidence

Semantic-independent syntactic evidence may be insufficient in a language either because the relevant syntactic categories are nonexistent or low-profile in a language or because syntactic categories are not sensitive to semantic roles and thematic hierarchies. The former case will be discussed in section 3.1 on the basis of some constructions which lack subject/object asymmetry in Modern Standard Chinese. The latter case will be illustrated in section 3.2 with data from Liangshan Nuosu (Tibeto-Burman) as presented by Gerner (2002, 2004).

3.1.   Languages with low-profile syntactic categories

In Chinese linguistics, the existence of syntactic categories is discussed controversially. Probably the most rigorous proponent of the irrelevance of subject and object in Chinese is LaPolla (1990, 1993). In my view, LaPolla's position is too extreme. There are constructions in which the subject/object asymmetry is irrelevant, but there are other constructions in which it matters. The constructions in which the asymmetry matters are raising (Li 1990: 118–130), reflexives (Huang Yan 1994) and passives (if we follow Huang C.-T. James forth). Since I have discussed semantic roles, argumenthood and syntax in Chinese more extensively elsewhere (Bisang forth. a), I shall concentrate on cases with no subject/object asymmetry plus two more instances of general interest for the argumentation adopted in this paper.

After a short description of how the semantic roles of agent and patient are linked to syntax in section 3.1.1, I shall briefly look at those instances where the subject/object asymmetry is irrelevant, i.e., at the coordinate-clause construction (equi-NP-deletion) and the topic construction (§ 3.1.2). In the next subsection (§ 3.1.3), I shall discuss headless relative clauses and the relevance of argumenthood as such for syntactic processes. This subsection is linked to the syntactic relevance of argumenthood as described in section 3.2 on Liangshan Nuosu as well as to the role of argumenthood in Tagalog as described in section 4.1. The last subsection (§ 3.1.4) will be dedicated to the extraction out of relative clauses and to the syntactic relevance of animacy and reference. This last subsection is linked to section 4 which presents factors relevant for participant linking beyond semantic roles and thematic hierarchies.

3.1.1. The assignment of semantic roles to basic word order in Chinese

In two-place predicates, the agent is linked to a position in front of the verb and the patient is linked to a position immediately following the verb.

(12)   Two-place predicates:

AGENT   V   PATIENT

(13)   *Wǒ   péngyou hē-le   jiǔ.*
       I   friend   drink-PFV   wine
       'My friend drank wine.'

   In one-place predicates, the argument precedes the verb (14). The argument of ergative verbs can occur preverbally if it is activated or postverbally if it is not activated in the discourse (15):

(14)   Li (1990: 136):
       a. *Kèrén   kū-le.*
          guest   cry-PFV
          '[The] guests cried.'

       b. **Kū-le   kèrén.*
          cry-PFV   guest
          'there cried some guests.'

(15)   Li (1990: 136):
  a. *Kèrén   lái-le.*
     guest   come-PFV
     '[The] guests came.'

  b. *Lái-le   kèrén*
     come-PFV   guest
     'There came [some] guests.'

None of the argument positions needs to be filled by an overt noun phrase. In front of the actor position, there is a number of positions whose functions have to do with information structure. Since the exact function of these positions is of no significance for this paper, I shall not discuss this rather controversial issue.

3.1.2.   Constructions for which the subject/object asymmetry and semantic roles are irrelevant

The coordinate-clause construction (equi-NP-deletion) and the topic construction seem to be governed by pragmatic inferences exclusively, irrespective of semantic roles and syntactic categories.

In coordinate-clause constructions with sequences of two states of affairs, the first represented by a two-place predicate, the second by a one-place predicate with a zero argument, coreference only depends on the pragmatic situation and on semantic compatibility. Thus, the zero-argument of the second predicate can be coreferent with the agent or the patient of the preceding two-place predicate. This can be seen from the following example presented by LaPolla (1993):

(16)   LaPolla (1993):
  a. The zero-element of the second predicate is coreferent with the patient of the first predicate:
     Nèi   ge   rén   bǎ   xīguā$_i$ diào zài
     that   CL   person   COV   watermelon   drop COV:to

     dì-shang Ø$_i$ suì   le.
     ground-on   break.to.pieces   PF
     'That man dropped the watermelon on the ground, (and it) burst.'

b. The zero-element of the second predicate is coreferent with the actor of the first predicate:

[Nèi   ge   rén]ᵢ bǎ   xīguā   diào zài   dì-shang
that CL   man COV watermelon drop COV:to ground-on

Øᵢ huāng   le.
get.flustered PF

'That man dropped the watermelon on the ground, (and he) got flustered.'

Since Chafe (1976) and Li and Thompson (1976), Chinese is famous for its Chinese-style topic. While languages such as English with their English-style topics can only topicalize noun phrases which are syntactically related to the comment, languages with Chinese-style topics go beyond this restriction, i.e., the element in the topic position is not necessarily syntactically related to the comment. Example (17) presents an English-style topic. In (17a), the element in the topic, i.e., *jī* 'chicken', is the patient argument of the verb *chī* 'eat' in the comment. In (17b), the same topic is the agent of the verb in the comment. Thus, example (17) is not only an example of an English-style topic in Chinese, it also shows that the coreference of the topic with the zero-element is pragmatically determined. Example (18) is to illustrate a Chinese-style topic. It is of particular interest, because it shows that the number of topic positions is theoretically infinite. None of these topics is represented by an argument position of the verb in the comment or by a pronominal element in a periphrastic function.

(17) Huang (1994: 168):

a. *Jī   Ø chī-wán-le Øᵢ,   ròu   hái   yǒu.*
   chicken eat-up-PFV   meat   still   have

   'The chicken, (e.g. we) have eaten (it) up; the meat, (e.g. we) still have some.'

b. *Jīᵢ   Øᵢ chī-wán-le Ø, yào   bú   yào   zài*
   chicken   eat-up-PFV   should NEG should again
   wèi   diǎnr shí?
   feed   a.bit feed

   'The chicken, (it) has eaten (e.g. the feed) up. Should (e.g. I) give (it) a bit more feed?'

(18) Huang (1994: 161):
[Yīngguó]~TOP4~ *[dàxué]*~TOP3~ *[Niújīn   Jiānqiáo]*~TOP2~ *[xuésheng]*~TOP1~
England   university Oxford Cambridge   student
zhìliàng gāo.
quality   high
'England, universities, Oxford Cambridge, students, quality is high.'

3.1.3.   The relevance of argumenthood as such for syntax – some evidence from headless relative clauses

Chinese relative clauses are prenominal and they are marked by the attributive particle *de* at their end. Headless relative clauses do not have an overt noun in the head position following the particle *de*. As I tried to show in Bisang (forth a), the zero element in the head position can only be coreferent with arguments of the relativized verb. If we thus take a headless relative clause which just consists of a two-place verb such as *chī* 'eat' in (19), the only possible inter pretations are those in which the zero element in the head position is a patient (19a) or, less likely (and often dispreferred), an actor (19b) in the relative clause:

(19) a. *chī   de   shì   shémme?*
         eat   ATTR   COP   what
         'What is being eaten?'
      b. *chī   de   shì   shéi?*
         eat   ATTR   COP   who
         'Who is the one who eats?'

If there is a wh-element which asks for a nonargument such as *zài nǎr* 'where?' it is not possible to infer locative coreference between the zero head and the relative clause:

(19) c. *chī   de   zài nǎr?*
         eat   ATTR   where
         *'Where is the place for eating?'
         only: 'Where is the thing to be eaten/the food.'

The same test also applies to three-place verbs such as *fá* 'fine' in (20 a.). It is possible to ask for the amount of the fine (20 e.), but it is again impossible to ask in such a way that the zero head is interpreted as a locative (20–21):

(20)   a. Li and Thompson (1981)
        Tā   fá-le   Zhāngsān   sì-shí kuài qián.
        s/he   fine-PFV   Zhangsan   40   Q   dollar
        'S/He fined Zhangsan $40.'

    b. *Fá   de   shì   shéi?*
        fine   ATTR   COP   who
        'Who is the one who fines someone?'/ 'Who is the one who is fined?'

    c. *Fá   Zhāngsān   de   shì   shéi?*
        fine   Zhangsan   ATTR   COP   who
        'Who is the one who fined Zhangsan?'

    d. *Tā   fá   de   shì   shéi?*
        s/he   fine   ATTR   COP   who
        'Who is the one whom s/he fined?'

    e. *Fá   de   duōshao   qián?*
        fine   ATTR   how.much   money
        'How much is the fine?'

    f. *Fá   de   zài nǎr?*
        fine   ATTR   where
        'Who is the one who fined / was fined?'
        but not: *'Where is the place where he was fined?'

In headless relative clauses containing verbs of movement such as *lái* 'come' or *qù* 'go' coreference is limited to the actor even though locatives follow these verbs without any marking (21a):

(21)   a. *Zhāngsān   qù   Běijīng.*
        Zhangsan   go   Beijing
        'Zhangsan goes to Beijing.'

b. *qù   de   shì   shéi?*
   go   ATTR   COP   who
   'Who is the one who left?'

c. **qù   de   zài năr?*
   go   ATTR   where
   *'Where is the place where [s/he] went?'
   but: 'Where is the one who left?'

From a purely pragmatic perspective, coreference of the zero head with a nonargument within the relative clause is unproblematic. It is the *syntax* of Chinese which prevents the acceptability of such a construction, a syntax which looks at argumenthood as a whole without paying attention to an internal hierarchy among different types of arguments.

In headed relative clauses, cases of nonargument coreference are possible but rather rare. The following two examples are from Ning (1993) who claims that this type of relative clauses is limited to four universally available values, i.e., place, time, manner/instrument and reason:

(22) a. Manner coreference (Ning 1993: 95):
        [tā   xiū   chē   de]   fāngfă
        s/he   repair car   ATTR   method
        'the method how s/he repaired a car'
     b. Instrumental coreference:
        [wŏ   xiě   xìn   de]   máobĭ
        I   write letter ATTR   pencil
        'the pencil I write a letter with'

Although Ning's (1993) claim is somewhat too narrow, the restriction to argument coreference as we find it with headless relative clauses also works to a considerable extent with headed relative clauses. However, some pragmatically based inferences of nonargument coreference are possible if the semantics of the head noun allow it.

3.1.4. Syntax and the relevance of animacy and reference – the case of extraction out of relative clauses

The following two examples of topic extraction out of relative clauses from Huang and Li (1996) (also cf. J. C.-T. Huang 1984, 1987, 1991) are well-

known in Chinese linguistics. They are used to prove the relevance of subjacency and thus the relevance of subject/object asymmetry[3]. Examples (23b) and (24b) are ungrammatical because the head noun is in the patient/object position of the matrix verb:

(23)   Huang and Li (1996: 82):
   a. *Zhāngsān$_i$ [[Ø$_i$ chàng   gē   de]   shēngyīn]   hěn*
       Zhangsan   sing   song ATTR   voice   very
       hǎotīng.
       charming
       'Zhangsan, the voice with which [he] sings is charming.'

   b. **Zhāngsān$_i$ wǒ xǐhuan [[Ø$_i$ chàng   gē   de]   shēngyīn].*
       Zhangsan   I   like   sing   song ATTR   voice
       'Zhangsan, I like the voice with which [he] sings.'

(24)   a. *Zhāngsān$_i$ [[pīpíng   Ø$_i$ de]   rén]   hěn   duō.*
       Zhangsan   criticize   ATTR   person   very   many
       'Zhangsan, people who criticized [him] are many.'

   b. **Zhāngsān$_i$ wǒ rènshi   hěn   duō   [[pīpíng Ø$_i$ de]   rén].*
       Zhangsan   I   know   very   many   criticize   ATTR person
       'Zhangsan, I know many people who criticized him.'

The question of the overall relevance of subjacency in Chinese was subject to heated controversies in the eighties and still seems to be unresolved. As was shown by Xu and Langendoen (1985) and Xu (1986) there are counter-examples to (23) and (24). In example (25) below, the topic position is bound by a position in a relative clause modifying a patient:

(25)   Xu and Langendoen (1985: 15):
   a. *Wǒ cónglái méi   yùdào-guo [néng huídá   zhè   ge   wèntí*
       I   never   meet-EXP   can   answer   this   CL   question
       de   rén].
       ATTR   man
       'I have never met a person who can answer this question.'

b. *[Zhè   ge   wèntí]ᵢ   wǒ   cónglái méi   yùdào-guo   [néng huídá Øᵢ*
   this   CL   question   I   never   meet-EXP   can   answer
de   rén].
ATTR   man
'This question, I have never met a person who can answer.'
[literal translation]

Examples like (25) led Xu and Langendoen (1985: 15) to the conclusion that "topics can bind positions in the comment across any number of intervening NP, S, and S' nodes". In spite of this general statement the two authors come up with a constraint in the next paragraph. According to their view, example (26a) is ungrammatical or at least problematical because *zhè běn shū* 'this book' is specific (a specific token of a book with a certain title), whereas it is nonspecific in (26b) (any token of a book with a certain title):

(26) a. *??[Zhè běn   shū]ᵢ   wǒ   xiǎng   [[dú-guo   Øᵢ de]   rén] lái*
         this CL   book   I   think   read-EXP   ATTR   man come
         le.
         PF
         'This book, I think the man who read came.' [literal translation]

   b. *[Zhè   běn   shū]ᵢ   wǒ   rènwéi   [[dú-guo Øᵢ de]   rén] bù*
      this   CL   book   I   think   read-EXP   ATTR   man NEG
      duō.
      many
      'This book, I think there aren't many people who read.' [literal translation]

As is pointed out quite clearly by Huang and Li (1996: 83), examples such as (25) and (26) differ from their own examples presented in (23) and (24) inasmuch as the gap is bound by an animate noun in the former examples whereas in the latter examples the gap is bound by an inanimate noun. My own tests fully confirmed Huang and Li's (1996) findings on subject/object asymmetry in cases where the gap is bound by animate nouns, or to be even more rigid, by nouns denoting humans. The special status of humans in the Chinese system of binding is well established (though not always duly considered in the literature), since the pronoun *tā* 's/he' can only refer to humans. If we look at binding of the gap with

inanimate nouns, our data yield a completely different picture which confirms the findings of Xu and Langendoen (1985: 15) according to whom there does not seem to be any subject/object asymmetry at all. The semantic criteria which determine whether binding is possible seem in some way to depend on the saliency of the antecedent, i.e., on its referential status and on its animacy.[4]

3.2.   Languages whose syntactic categories cannot be defined in terms of restricted neutralization of semantic roles

The data presented in this section are from Gerner (2002, 2004) on Liangshan Nuosu, a Tibeto-Burman language (South East Tibeto-Burman, Burmese-Lolo, Loloish) with some 2.2 million speakers in southern Sichuan province of China. Liangshan Nuosu is a verb-final language. There are three word-order patterns for agent and patient. Clauses with an overt marker of ongoing[5] action have the order agent-patient-verb (cf. example (27) with the continuous marker $n_{\upsilon}d_{\upsilon}\zeta\jmath^{33}$. If there is an overt expression of resultativity[6], the order is patient-agent-verb (cf. example (28) with a second verb V_2 denoting the result of the action expressed by the first verb V_1). Finally, there are clauses with no overt marking of neither ongoing action nor resultativity as in example (29):

(27)   Ongoing action in Liangshan Nuosu (Gerner 2002: 117; 2004: 114):
$m^{33} ka^{55}$ $\underset{.}{s}a^{33} ma^{55} k^y\underset{.}{u}^{33}$ $n_{\upsilon}d_{\upsilon}\zeta\jmath^{33}$.
Muga   Shama   frighten   CON
'Muga [name of a man] is frightening Shama [name of a man].'

(28)   Clause with overt resultative marking in Liangshan Nuosu (Gerner 2002: 121, 2004: 117):
$\eta d\underset{\textit{z}}{z}^{33} m^{33}$ $\eta d\underset{\textit{z}}{z}^{33} z o^{55}$ si^{21} $lo^{55} t\underset{c}{c}i^{33}$ $t\underset{c}{c}i^{33}$ ηa^{33}
wine do   wine wrong   CONJ   finger   CL   1s
$d_{\upsilon}\zeta\jmath^{33} ko^{44}\underset{.}{s}a^{33}$ o^{44}.
V_1:fell V_2:send   DP
'Because of the wine, I have cut off my finger.'

(29)   Free order of agent and patient in Liangshan Nuosu (Gerner 2002: 115, 2004: 113):
$m̩^{33}ka^{55}$ $m̩^{33}ko^{44}$ ndu^{21}.
Muga   Mugo   beat
'Muga beats Mugo.' / 'Mugo beats Muga.'

Another instance of fixed agent-patient vs. patient-agent order has to do with directional verbs such as la^{33} 'come' and bo^{33} 'go'. Since this will be relevant for the discussion of an example below (cf. (33)), it is briefly presented here. If the semantic relation between V_1 and V_2 is that of purpose the directional verb V_2 immediately follows V_1 and word order is agent-patient-V_1-V_2. If the directional verb is used resultatively, the purposive interpretation is blocked by the particle si^{44} which occurs between V_1 and V_2. In this case, word order is patient-agent-V_1-si^{44}-V_2 as is to be expected with resultatives (cf. (28) above). The following example is an illustration of both word-order patterns. The purpose relation between V_1 and the directional verb in the first sentence of that example requires agent-patient-V_1-V_2 order (i.e., $vz̩^{55}vu^{33}$ 'elder brother' [Agent] in front of la^{21} bu^{33} 'ox' [Patient]), the resultative relation in the second sentence is responsible for patient-agent-V_1-si^{44}-V_2 order (i.e., la^{21} bu^{33} 'ox' [Patient] in front of $tsʰ i̩^{33}$ 'he' [Agent]).

(30)   Liangshan Nuosu (Gerner 2002: 122, 2004: 118):
$tsʰ i̩^{21}$ $n̩p̩i^{21}$ $n uɯ^{33}$ $vz̩^{55}$ vu^{33} i^{44} $ʑi^{33}$ $d uɯ^{44}$ la^{21} bu^{33}
one   day   TOP   elder.brother   younger.brother LOC   ox
$h uɯ^{33}$ la^{33} lo^{44} la^{21} bu^{33} $tsʰ i̩^{33}$ $h uɯ^{33}$ si^{44} bo^{33} lo^{44},
borrow   come after   ox   3   borrow   CONJ go   after
$tsʰ i̩^{33}$ si^{21} si^{55} $dz uɯ^{33}$ o^{44}.
3s   COV:take   kill   eat   DP
'One day, the elder brother came to borrow an ox from his brother. After he borrowed the ox[7], he killed it and ate it.'

In the case of free word order as illustrated by (29) there are several strategies for avoiding ambiguity such as a grammatical tone on singular patient pronouns, a grammatical tone on a lexically determined number of monosyllabic verbs (cf. (33) below) and a special patient marker ko^{33}. The following example illustrates the use of ko^{33}:

(31)   Liangshan Nuosu (Gerner 2002: 128, 2004: 122):
   a. $m^{33} ka^{55}$ $ʂa^{33} ma^{55}$ $ti^{55} ɭ^{21}$.
       Muga   Shama   compel
       'Muga compels Shama.' / 'Shama compels Muga.'

   b. $m^{33} ka^{55}$ $ʂa^{33} ma^{55}$ ko^{33} $ti^{55} ɭ^{21}$.
       Muga   Shama   PAT   compel
       'Muga compels Shama.'

From the perspective of the linking from semantics to morphosyntax the above data show that the semantic roles of actor and patient are assigned to different word-order positions depending on the overt marking of the distinction between ongoing and resultative action. Such a system is not extraordinary if one thinks of instances such as Georgian or Hindi, in which case marking depends on the aspect expressed by the predicate. The two differences are that alignment is in terms of word order, not in terms of case marking, and that there is a third option with no aspect marking and no fixed order of agent and patient. This has to do with the fact that there is no obligatory expression of aspect in Liangshan Nuosu.

What seems to be extraordinary about Liangshan Nuosu is that its grammatical relations are strictly based on word order. Thus, in the coordinate-clause construction (equi-NP-deletion) and in the relative-clause construction the privileged syntactic category is always the argument in the first position irrespective of its semantic role. In the coordinate-clause construction, coreferential noun phrases of the state(s) of affairs following the first state of affairs can be omitted if they are in the first syntactic position for arguments. The following example illustrates the juxtaposition of two two-place predicates followed by a one-place predicate. The two-place predicates are characterized by agent-patient-verb order. Because the agent is in the first position in both two-place predicates, the agent-position of the second predicate as well as the argument of the third one-place predicate are empty:

(32) Linangshan Nuosu (Gerner 2002: 143, 2004: 135):

a. $p^h u^{21}$ su^{33} $v\jmath^{55}$ vu^{33} $du^{44}{}_i$ $n\,\mathrm{u\!\!\!\!/}^{33}$ $\underset{\scriptscriptstyle 7}{l}^{33}$ $\upbeta\wp^{33}$ si^{44} ta^{33} $\emptyset_i$
Mister Pu   family   TOP   stone.brick   take/use   STP

i^{21} $k^h o^{33}$ $ts\!\hat{\imath}^{21}$ ta33 $\emptyset_i$ i^{55}.
gate   block   STP   sleep
'Mister Pu's family$_i$ took stone bricks, $\emptyset_i$ blocked the [entrance] gate and then $\emptyset_i$ fell asleep.'

Since the second state of affairs in (32a) is not marked for aspect, its word order is free, i.e., it could be agent-patient as well as patient-agent. Within the juxtaposition of (32a) it is automatically analysed as agent-patient, because this is the word order which is required syntactically and which makes sense semantically. If the second predication is marked by a resultative verb (V_2) which implies patient-agent-verb order, the whole sequence of events becomes ungrammatical:

b. Linangshan Nuosu (Gerner 2002: 143, 2004: 136):

*$p^h u^{21}$ su^{33} $v\jmath^{55}$ vu^{33} $du^{44}{}_i$ $n\,\mathrm{u\!\!\!\!/}^{33}$ $\underset{\scriptscriptstyle 7}{l}^{33}$ $\upbeta\wp^{33}$ si^{44} ta^{33}
Mister Pu   family   TOP   stone.brick   take/use   STP
i^{21} $k^h o^{33}$ $\emptyset_i$ $ts\!\hat{\imath}^{21}$ $\underline{ko^{44}\,\underline{sa^{33}}}$ ta^{33} $\emptyset_i$ i^{55}.
gate V_1:block V_2:send   STP   sleep
'Mister Pu's family$_i$ took stone bricks, $\emptyset_i$ blocked <u>up</u> the [entrance] gate and then $\emptyset_i$ fell asleep.'

In the above example, the semantic roles involved in the syntactically privileged position are the agent A and the single intransitive argument S. In the following example, the semantic roles involved are the agent A and the patient P:

(33) Liangshan Nuosu (Gerner 2002: 146, 2004: 139):

$ts^h o^{33}$ $\upbeta\wp^{55}$ a^{33} $ma^{55}{}_i$ $ts^h\hat{\imath}^{33}$ tsi^{33} si^{44} $\emptyset_i$ ko^{33}
demon-sorceress   3s   cheat   CONJ   P:PRON
$\d{s}\mathrm{u\!\!\!\!/}^{44}$ $bo^{33}\,o^{44}$.
look.for   go   DP
'The sorceress was tricked by him into searching for them [i.e. the objects].'

In this example, the demon-sorceress in its patient function is in the first position of the first state of affairs. In the second state of affairs, the first syntactic position must be the agent because this is a directional-verb construction with a purpose relation between V_1 and V_2 as discussed in example (30) above. In addition, the verb 'to look for' is one of the few verbs which occurs with two tones in Liangshan Nuosu. If it occurs in the form of $ʂuɿ^{44}$ it requires agent-patient-verb order, in the form of $ʂuɿ^{21}$ it requires patient-agent-verb order. Since the demon-sorceress is an agent in the second state of affairs and since the agent argument must be in the first position, it can be omitted because it is coreferent with the argument occurring in the first position of the first state of affairs.

The same position-based strategy is also at work in the relative-clause construction. Relative clauses are head-initial in Liangshan Nuosu, i.-e., the relative clause follows its head and is concluded by the relative marker su^{33}. If the predicate in the relative clause is either ongoing or resultative, i.e., if it occurs in a construction which requires a fixed order of agent and patient, the first position is empty, if it is coreferent with the head noun.[8] In the following example, the predicate in the relative clause is marked by a resultative verb (ko^{44} $ʂa^{33}$ 'send') and thus requires patient-agent-verb order. Since the head noun is coreferent with the patient argument in the relative clause and since the patient argument is in the first position, this position is empty:

(34)   Liangshan Nuosu (Gerner 2002: 149, 2004: 141):
$t^h uɿ^{21} ʐ̩^{33}$ *[Ø$_i$* $m̩^{33} ka^{55}$ ku^{21} $ko^{44} ʂa^{33}$ $(guɿ^{44})$ $su^{33}]$
book   Muka   V$_1$:throw V$_2$:send COLL   REL
$a^{33} ʂə̩^{55}$ $dʑʐ̩^{33}$ $a^{33} ʂə̩^{55}$.
new   very   new
'The books [which Muka threw away] were brand-new.'

If the relative clause is ongoing, we have actor-patient-verb order. This means that relativization with the patient-argument being dropped is not possible, because the coreferent argument within the relative clause is not in the first position. The solution to this problem is that the coreferent patient-argument is present in the relative clause in the form of a pronoun. This is illustrated by the following example:

(35)   Liangshan Nuosu (Gerner 2004: 141):
vi^{55} ga^{33} [a^{44} mo^{33} ko^{44} $ts^h\!i^{33}$ $n_{\!\phi}d_{\!\phi}\!z\!o^{33}$ (gu^{44}) su^{33}] a^{44} $n_{\!\phi}i^{33}$
garment mother 3p   wash CON   COLL REL many
$d_{\!\phi}\!z^{33}$ a^{44} $n_{\!\phi}i^{33}$.
very many
'The clothes [that Mum busily washes] are many.'

The relative marker su^{33} can only occur with relativised arguments. If nonarguments are to be relativised, other markers such as dBu^{33} for instrumentals or du^{33} for locationals must be used (cf. Gerner 2002: 149, 2004: 141). This distinction of argument vs. nonargument in relativization is parallel to Chinese headless relative clauses.

If Gerner's (2002, 2004) analysis is correct, Liangshan Nuosu does not fit into the postulate of Role & Reference Grammar that "grammatical relations exist only where there is *a restricted neutralization* of semantic or pragmatic relations for syntactic purposes" (Van Valin and LaPolla 1997: 274, also cf. the last paragraph of § 1 above). Since the syntactically privileged position (or pivot in terms of Role & Reference Grammar) can either be agent or patient, there clearly is neutralization in Liangshan Nuosu, but this neutralization is not restricted to one proto-role or macrorole (cf. Van Valin and LaPolla 1997: 250–253) and thus is not based on a thematic hierarchy. The factor that determines neutralization is argumenthood, i.e., any argument has the potential for being neutralized under the conditions described above.

The centrality of argumenthood as a whole for syntactic processes in Liangshan Nuosu parallels the case of headless relative clauses in Chinese (cf. § 3.1) and is reflected in particular by the fact that there are different relative markers for arguments and nonarguments in Liangshan Nuosu. Whether this is of some areal or genetic (Sino-Tibetan: Tibeto-Burman) relevance needs a lot more research.

4.   Assignment of nominal participants to syntactic categories – beyond semantic roles

The present section deals with two Austronesian languages of the Philippines. In section 4.1, Tagalog will be discussed as a language in which the assignment of participants to syntax is primarily governed by the referential status of a participant and thus does not depend on a thematic

hierarchy. Kapampangan is another Philippine language and will be presented in section 4.2. This language seems to be typically ergative/absolutive with the absolutive being the syntactically privileged position operating along the lines of a thematic hierarchy. In spite of this, I shall argue that semantic roles are only of secondary importance. It is the referential status of the arguments that sets the course for their morphosyntactic expression.

4.1.   Reference and the assignment of nominal participants to syntactic categories in Tagalog[9]

4.1.1.   Preliminaries about the structure of Tagalog

Tagalog is a verb-first language like many other Austronesian languages. The verb is marked for aspect (perfective, imperfective and contemplated; cf. Schachter and Otanes 1972: 66), kind of action (cf. Ramos 1974a: indicative, distributive, aptative, social, causative) and for the semantic role of the noun phrase marked by *ang* (with common nouns) or *si* (with proper names). Apart from *ang*[10], noun phrases, which follow the verb in more or less free word order, can be marked by the case markers *ng* (*ni* with proper names) and *sa* (*kay* with proper names)[11]. The case marker *ng* occurs with actors, patients and a subset of instrumentals which are not in the *ang* phrase and thus are not marked for semantic role on the verb. The same marker is also used in possessive constructions. The case marker *sa* is associated with the semantic roles of goal, recipient and location. It is used if a noun phrase in one of these roles is not marked by *ang*. The inflectional system of pronouns follows the same pattern, that is, there are three pronominal paradigms which distributionally covary with the three markers *ang*, *ng* and *sa*. There is a considerable number of semantic roles which can be expressed on the verb and refer to the *ang*-marked noun phrase. The following example illustrates the roles of actor (infix *-um-* (36a)), patient (zero suffix (36b)), locative (or dative) (suffix *-(h)an* (36c)), instrumental (prefix *ipang-* (36d)) and benefactive (prefix *i-* (36e)):

(36)   Tagalog (Foley and Van Valin 1984: 135):
   a. *B-um-ili*   *ang*   *lalaki*   *ng*   *isda*   *sa*   *tindahan.*
      PFV:/AT/-buy T   boy   P/A   fish   LOC   store
      'The man bought fish at the store.'

b. *B-in-ili-Ø*   *ng*   *lalaki*   *ang*   *isda*   *sa*   *tindahan.*
   /PFV/-buy-PT P/A man   T   fish   LOC store
   'The man bought the fish at the store.'

c. *B-in-il-han*   *ng*   *lalaki*   *ng*   *isda*   *ang*   *tindahan.*
   /PFV/-buy-LF P/A man   P/A fish   T   store
   'The man bought fish at the store.'

d. *Ip-in-ang-bili* *ng*   *lalaki*   *ng*   *isda*   *ang*   *pera.*
   IT/PFV/-buy P/A man   P/A fish   T   money
   'The man bought fish with the money.'

e. *I-b-in-ili*   *ng*   *lalaki*   *ng*   *isda*   *ang*   *bata.*
   BT-/PFV/-buy P/A man   P/A fish   T   child
       'The man bought fish for the child.'

The *ang*-marked noun phrase is called "trigger" by Schachter (1993). The morphological affixes on the verb associated with the trigger are termed "X-trigger affix" with X denoting the semantic role. In earlier analyses, the *ang* phrase was called "topic" or "focus" (the latter is the traditional term in Phlippinist literature). Since the function of the *ang* phrase is not adequately described by neither of these terms from information structure (on its function cf. § 4.1.3 below), a terminology that avoids confusion as the one by Schachter (1993) is to be preferred.

The five semantic roles in (36) are the most common ones. The set of semantic roles that can be marked on the verb is lexically determined, that is, there is a fixed number of morphologically marked semantic roles for each verb. Since there are certain subgroups of verbs which can be marked for other semantic roles than the ones illustrated in (36)[12] the number of trigger-specific semantic roles indicated in individual descriptions of Tagalog slightly differs from one grammarian to the other.

4.1.2.   On the syntactic function of the trigger noun phrase marked by *ang*

The trigger system is pervasive in Tagalog. Its syntactic function and the relevance of argumenthood for that function will be the topic of this section.

In his seminal paper "On the subject of Philippine languages: topic, actor-topic, or none of the above", Schachter (1976) tries to show that

"there is ... no single syntactic category in Phlippine languages that corresponds to the category identified as the subject in other languages" (Schachter 1976: 513; also cf. Schachter 1993: 1428–1429).

In a more recent and more extensive study, Kroeger (1993) shows that triggers "have more properties of grammatical subjecthood ... than most syntacticians have assumed" (Kroeger 1993: 21). As it turns out, the trigger has its syntactic function in the following construction types:

(37) Quantifier floating
      Relativization
      Raising
      Number agreement
      Secondary or depictive predicates
      Obviation
      Possessor ascension
      Conjunction reduction
      Equi constructions
      Subjects of imperatives

Kroeger (1993) compares the trigger to the syntactic category of the nominative subject (cf. § 4.1.4). From this basis, we can now see what the role of argumenthood is in Tagalog. Since Bloomfield (1917) the Tagalog trigger system is often compared with voice systems of languages such as English or German. If we identify the actor-trigger construction with active voice and all the other trigger constructions with different types of passives we would expect the actor in the passive-like constructions to be a nonargument. But this is not how the Tagalog system works. The trigger constructions of Tagalog differ from passives and other diatheses in as much as the actor retains its argument status in constructions with nonactor triggers. Kroeger (1993: 40–48) offers three tests to prove the argument status of *ng* marked actors:

(38) - participial complements
      - participial adjuncts
      - adjunct fronting

If we briefly look at adjunct fronting, we can see that some nonverbal elements – usually adverbs – occur in a clause-initial position preceding the verb. Adjunct fronting is not allowed with noun phrases marked by the trigger and with actors and patients in nontrigger function. Example (39)

illustrates the ungrammaticality of a preverbal trigger phrase, example (40) shows the same for an actor in the nontrigger position. In contrast, participants marked by the locative marker *sa* (41) or by the benefactive marker *para sa* (42) can be fronted:

(39)   Kroeger (1993: 44):
     [Ang   libro=ng   ito]   ko   b-in-ili-Ø   para kay Pedro.
      T   book=LK   this   1s:P/A   /PFV/-buy-PT for   Pedro
     'This book I bought for Pedro.'

(40)   Kroeger (1993: 45):
     [Ng nanay]   siya   p-in-alo-Ø.
     P/A   mother   3s:T   /PFV/-spank-PT
     'By mother he was spanked.'

(41)   Schachter and Otanes (1972: 498); Kroeger (1993: 44):
     [Sa   akin] nila   i-b-in-igay   ang   premyo.
     LOC 1s   3p:P/A   IT/PFV/-give   T   prize
     'To me they gave the prize.'

(42)   Kroeger (1993: 44):
     [Para kay   Pedro]   ko   b-in-ili-Ø   ang   laruan.
     for   Pedro   1s:P/V   /PFV/-buy-PT T   toy
     'For Pedro I bought the toy.'

Each of the tests listed in (38) shows that actors are arguments irrespective of whether they are marked by the trigger *ang*. This fact makes nonactor-trigger constructions differ from passives which are defined in terms of argument reduction or valency reduction, to use Dixon and Aikhenvald's (2000: 7–12) terminology.[13] Moreover, nonactor triggers cannot be understood in terms of movement as defined in Government & Binding, since no external theta-role is absorbed nor is any case-assigning position absorbed which entails movement of the patient (NP with the internal theta-role) to the subject.

*4.1.3.   Assignment of participants to **ang** and **ng** and the function of the trigger position*

From the above argument tests we can conclude that an argument is either in the *ang* phrase or in the *ng* phrase:

(43)   V   *ng* _____   *ang* _____

   Given this knowledge, the question is how individual noun phrases with a particular role are assigned to these positions. The argument tests listed under (38) allow the actor to be assigned to the *ng* phrase. The adjunct-fronting test also allows patients (and instrumentals of some verbs) to be assigned to this position. But what about *ang*? – Any semantic role that can be part of the trigger system can be assigned to this position. In addition, the decision of which semantic role will take the *ang* position has to precede the assignment of other potential roles to the *ng* position. Thus, if the actor is in the trigger position, the patient (or instrumental) will be in the *ng* position (36a). If the patient is the trigger the same applies to the actor (36b). Finally, if neither the actor nor the patient are in the trigger position both of them will be marked by *ng* (36c - e). Semantic roles that are not eligible to the *ng* position and are not in the function of the trigger will be marked by *sa, para sa* and some other combined adpositions depending on their semantic role.
   The above description shows that semantic roles are not the primary factor that determines the linking from semantics to syntax in Tagalog – basically any semantic role which is part of the trigger system can take the *ang*-position. If it is not semantic roles, the question is what else determines the assignment of noun phrases to the trigger position. As it turns out, the function of the Tagalog trigger system has to do with referentiality. Schachter (1976: 514) describes the trigger as a marker of definiteness, a description which is clearly too narrow as can be seen from examples such as the following (Adams and Manaster-Ramer 1988; based on Bell 1978 on Cebuano):

(44)   Adams and Manaster-Ramer (1988: 83–84), from Bloomfield 1917:
       24)
       Sa   isa-ng   kapuluan   nag-ha-hari   ang   isa-ng
       LOC   one-LK   archipelago   AT-IPV-rule   T   one-LK

       tao-ng   may   dalawa-ng   maiikli-ng   sungay
       man-LK   exist   two-LK   short-LK   horn
       'On a group of islands ruled a man who had two short horns ...'

   In Himmelmann's (1997: 102–104) analysis, *ang* is a specific article. A
referent is specific if it is possible to identify it in principle. In his
operational definition, Himmelmann (1997: 103) defines specific articles
by a set of contexts of use. Apart from semantically definite contexts,
specific articles can occur in at least one typically indefinite context. For
Tagalog, the indefinite context is that of introducing new participants as in
(44) above. Whatever the exact meaning of the trigger may be, its
referential function seems to be uncontroversial (cf. e.g. Schachter 1993:
1420; Kroeger 1993: 14–15, 52–53). This function takes precedence over
semantic roles in argument linking.

4.1.4.   *Theoretical discussion*

Kroeger (1993) describes the trigger in terms of a nominative subject. This
is not fully adequate because the trigger is open to any semantic role that is
lexically determined by the verb to be part of the trigger system irrespective
of any thematic hierarchy. Thus, there is no passivization if roles from the
lower end of the hierarchy are supposed to take that position. Moreover,
there are tests of argumenthood (§ 4.1.2) but the results produced by these
tests do not determine the semantic roles that can be integrated into the
trigger system. However, even if the trigger does not fully qualify as a
subject, Kroeger (1993) clearly showed that it is a rather coherent syntactic
category.
   The Tagalog trigger system is associated with different types of
alignment. It is described in terms of nominative/accusative by some
linguists (Guilfoyle et al. 1992, Kroeber 1993) and in terms of
ergative/absolutive by some other linguists (MacLachlan and Nakamura
1997). In my view, none of these descriptions does justice to the Tagalog
trigger system. The impression that the trigger is a nominative is due to the
fact that it is indeed the privileged syntactic position in a large number of
constructions – an impression which is incorrect for the reasons mentioned

above. The ergative/absolutive analysis is often based on markedness in the sense that the actor-trigger is more marked than nonactor-triggers. But this is again not quite adequate (cf. Foley and Van Valin 1984: 136–138). Thus, I fully adopt Foley and Van Valin's (1984: 138) view as stated in the following quotation: "Tagalog defies simple classification as either accusative or ergative, and accordingly we will refrain from forcing it into either category".

If the assignment of participants to syntax does not necessarily depend on a thematic hierarchy, this is a problem for generative approaches based on Jackendoff (1990) as well as for Lexical-Functional Grammar (Bresnan 2001). Role & Reference Grammar clearly points out that participant assignment to syntax is not subject to a thematic hierarchy in Tagalog and that the trigger in this language is based on referential status (Foley and Van Valin 1984: 134–144). The conclusion it draws from these findings differs from mine. I shall first look briefly at the arguments of Role & Reference Grammar before discussing my view.

In Role & Reference Grammar, the trigger cannot be a syntactic pivot which is defined in terms of restrictive neutralization (Van Valin and LaPolla 1997: 275), since it does not depend on a thematic hierarchy. Consequently, it is described as a semantic pivot or as a pragmatic pivot depending on individual constructions as discussed by Schachter (1976) (cf. Foley and Van Valin 1984: 123). A pragmatic pivot is described as a pivot "in which the selection of the argument to function as pivot of a transitive verb is not predictable from its semantic role and may be influenced by discourse-pragmatic considerations, in particular the topicality and activation status of its referent" (Van Valin and LaPolla 1997: 291).

I opt for a different solution which abandons the view that the assignment of participants to syntax is exclusively based on semantic roles. There are two reasons which lead me to this conclusion. The first is based on the findings of Kroeger (1993) that the trigger is syntactically more coherent than assumed by Schachter (1976). It cannot be called a nominative subject if nominative case is defined in the standard way as coextensive with an {S,A}-pivot to which nominal participants are assigned according to a thematic hierarchy. In spite of this, its syntactic status should be taken more seriously. This is even more so if it turns out that syntactic categories may not necessarily depend on restricted neutralization – an option hinted at by the data from Liangshan Nuosu (Gerner 2002, 2004) (§ 3.2). My second reason has to do with the definition of pragmatic pivot in Role & Reference Grammar as quoted above. In the light of Kroeger's

(1993) findings that the trigger is syntactically more coherent, Role & Reference Grammar would have to analyse it in most constructions as a pragmatic pivot. As can be seen from the above definition, pragmatic pivots cover a number of different fields of discourse pragmatics. The function of the trigger in Tagalog only selects one coherent domain, i.e., referential status.

4.2.   Kapampangan: Another instance of reference-based linking

Kapampangan is another Philippine language spoken in the central plain of Luzon by about one million speakers. Like Tagalog, it is a verb-first language. Mithun (1994: 248) describes its case-marking system as ergative/absolutive:

(45)   Kapampangan: Two-place predicate, agent = ergative, patient = absolutive (Mithun 1994: 248):
    a. *Ikit   da   ka.*
       saw   3p:ERG 2s:ABS
       'They saw you.'

    b. *Ikit   mu   la.*
       saw   2s:ERG 3p:ABS
       'You saw them.'

(46)   Kapampangan: One-place predicate with its argument in the absolutive
    (Mithun 1994: 249):
    a. *Tinerak   ka.*
       danced   2s:ABS
       'You danced.'

    b. *Malumud   la.*
       drown   3p:ABS
       'They'll drown.'

    Full noun-phrases are marked by particles as in Tagalog, although the marking pattern they follow is ergative and thus differs from that language. There are two sets of particles, one for common nouns, the other for proper nouns. For each set, there is a distinction between singular and plural. The

particle for singular common nouns is *ning* for noun phrases in the ergative, *ing* for noun phrases in the absolutive and *king* for oblique cases (cf. example (47)). The pronouns, whose actual status is that of clitics, also occur in three sets corresponding to the ergative, absolutive and oblique case system, respectively. The pronominal markers referring to the core arguments, i.e. the markers of absolutive and ergative, also have to occur if there is a cor- responding overt *ning*-phrase or *ing*-phrase. The markers of the 3rd person singular absolutive *ya* and of the 3rd person plural absolutive *la* produce special fused pronominals. Thus, the pronominal clitic *ne* is to be analysed as *na* '3s:ERG' plus *ya* '3s:ABS' (also cf. (47)).

(47) Kapampangan: Clause with case-marking particles for ergative, absolutive and oblique (Mithun 1994: 250):
      *Anya   inatya   ne   **ning** matying **ing**   pau*
      that's.why   threw   3:ERG/3:ABS ERG   monkey   ABS   turtle

      ***king**   danum.*
      OBL   water
      'That's why the monkey threw the turtle into the water.'

Like Tagalog, Kapampangan verbs have a trigger system, but this trigger system is based on the absolutive as the privileged syntactic position (Mithun 1994: 259–262) in cases such as the relative-clause construction, the cleft construction and the wh-question construction. The following example is to illustrate a relative clause:

(48) Kapampangan: Relative clause with agent-coreference (Mithun 1994: 259–260):
      Dinatang   ne   ing   ipus   a   [s-um-aup   kang Ara]
      arrived   3:ABS   ABS   servant LK   /ANTP/will.help OBL Ara
      'The servant [who was going to help Ara] arrived.'

In the above relative clause with agent-coreference, the head noun must be in the absolutive position, while the agent is in the oblique function marked by *kang* for proper names. The verb *saup* 'help' in its agentive form marked by the infix *-um-* (*s-um-aup*) can thus be interpreted as an antipassive.

Like Tagalog, there are also semantic roles such as locatives, directionals and benefactives in the trigger function. Unlike in Tagalog, these markers have the function of applicatives, i.e., they are used if a noun phrase from the periphery has to be integrated into a core position. In the

following relative clause, in which the head noun is in the function of source, the verb must be in the source-trigger form:

(49)   Kapampangan: relative clause with source coreference (Mithun
        1994: 260):
        niting   [pisaliwan mi-ng   *ticket]*
        this   bought.from 1p:EXCL:ERG-LK   ticket
        'this (person) [we bought the ticket from]'

The discourse function of the absolutive depends on whether it is seen within the opposition of absolutive vs. oblique or within the opposition of ergative vs. absolutive, i.e., ergative agent or absolutive agent. In the former case, absolutives "represent significant participants within the discourse as a whole, worthy of attention" (Mithun 1994: 266). In the latter case, they refer to that noun phrase which is most immediately involved in a given state of affairs:[14]

> The distinction between ergative and absolutive agents depends on the immediacy of their involvement in the particular event predicated by the clause. A speaker may wish to highlight the involvement of a significant, identifiable patient (or beneficiary, instrument, location etc.) and categorize this as the absolutive; the agent is then ergative. Alternatively, the speaker may focus on the involvement of the agent, either because there is no identifiable patient, etc., or because that participant is not significant to the discussion. In that case, the agent, the only core participant, is cast as the absolutive. (Mithun 1994: 270)

From what has been said so far, it looks as if Kapampangan were a quite straightforward instance of an ergative/absolutive language with an absolutive pivot in which core arguments are linked to morphosyntax along standard mechanisms as presented in Dowty (1991) or Van Valin and LaPolla (1997). However, this is not the whole story. If we look at Kapampangan more closely, it turns out that the ergative absolutive pattern is only adopted with definite arguments:

> In Kapampangan, **both** absolutives and ergatives are overwhelmingly definite in natural connected speech. In over two thousand pages of transcribed speech, there were no instances of indefinite or nonidentifiable ergatives. Independently established identifiability is a characteristics of both core cases.
> (Mithun 1994: 269–270)

Indefinite arguments are expressed differently. They are either introduced as new participants by the presentative construction based on *atin* 'there is/are' (Mithun 1994: 251–252) or they occur in the form of caseless nominals linked to the verb (plus its pronominal arguments under certain circumstances, cf. Mithun 1994: 253) by *-ng* (called 'linker [LK]'). The latter form is not only used for indefinites but also for downplaying definite participants under certain circumstances (cf. (52) below). Example (50) is to illustrate the presentative construction, example (51) illustrates a clause with a caseless nominal:

(50) Kapampangan: presentative construction (Mithun 1994: 252):
    Ating   *magdalang tugak, butiti, itu, licauk, gurami,*
    exist:LK bringing   frog tadpole catfish licauk gurami

    at dinapu do caring boting maki-danum.
    and placed 3p:ERG/3p:ABS PL:OBL bottle with water

    'They brought frogs, tadpoles, catfish, licauk, gurami and placed them in bottles filled with water.'

(51) Kapampangan: indefinite arguments as caseless nominals (Mithun 1994: 252):
    *Potang kai kanita, i Nanang ku, gawa ya-**ng***
    later then to.that ABS Aunt my make 3s:ABS-LK

    ***ugis-batuin** a maragul ... king palarang.*
    shape-star LK big OBL foil

    'Then, my Auntie will cut out a big star shape from the foil.'

Clauses with caseless nominals are intransitive. Given the indefinite nature of their patients, one can conclude that "only those transitive events with definite or referential patients are classified grammatically as transitive" (Mithun 1994: 254).

If there are other definite/identified participants apart from the agent and patient arguments, it can happen that the patient argument is downplayed if the speaker wants to say that a peripheric element is more "worthy of attention" (Mithun 1994: 266, cf. above). In such a case, the peripheric element is in the absolutive and thus becomes an element of the core (applicative), the patient is treated as a caseless nominal analogous to example (51). In the following example, the agent (the ants), the patient (the door) and the benefactive (the grasshopper) are all identified. Since the grasshopper is "the important figure in the tale" (Mithun 1994: 265), it is

treated as an element of the core, while the door, which is of no particular relevance for the tale, remains caseless. Since the grasshopper is seen as the element most involved in the event presented in (52), it occurs in the absolutive, while the agent takes the ergative.

(52)   Kapampangan (Mithun 1994: 265):
    Nyang   buklatan de-ng   pasbul ring   Panas   ing
    when   open:BT 3p:ERG/3s:ABS door   PL:ERG ant   ABS
    Lipaktung
    grasshopper
    'When the ants opened the door for the grasshopper, ...'

    If it is true that only definite or referential arguments are accessible to the ergative/absolutive system of Kapampangan, semantic roles are of secondary importance for the assignment of participants to morphosyntax. What is of primary importance is again reference as in Tagalog. Once the referential status of both arguments of a two-place predicate is clear, it can be decided in what constructions they can occur. In the case of definite arguments, constructions with an ergative/absolutive pattern are selected. If the involvement of the patient is to be highlighted, it will occur in the absolutive with the agent taking the ergative. If it is the agent whose in volvement is to be focussed on, we will get an intransitive construction with the agent in the absolutive. Given the existence of applicatives in Kapampangan, even noncore elements can occur in the absolutive as in (52).

    With the absolutive being the position for the most involved argument, it comes as no surprise that this position turns out to be the syntactically privileged position of the relative-clause construction, the cleft construction and the wh-question construction. Even though Kapampangan looks like a thorough ergative/absolutive language, a closer look reveals that this is only half of the story, because its ergative/absolutive character depends on the referential status of agent and patient, and this pattern in turn depends on what Mithun (1994, 1999) calls "immediacy of involvement".

5.   Conclusion

To conclude this paper, I would first like to look at the consequences of the findings described in the above sections 2 to 4 for the theories described in section 1. At the very end, I shall try to sketch a functional motivation for why it is semantic roles and referential status which are selected for assigning participants to syntactic categories.

The problem that there may be semantic information beyond semantic roles and thematic hierarchies determining the assignment of participants to syntactic categories may be integrated with relative ease into a prototypical approach such as the one of Dowty (1991). The lack of pervasiveness (§ 2.1) can be accounted for by a relatively low prototypicality of the agents and patients involved in the predications concerned. The impact of affectedness (§ 2.2) on the agent will automatically reduce its status as a prototypical agent. For the case of mutually dependent arguments (§ 2.3) it may be possible to develop a mechanism which allows to calculate the potential impact on the prototypical status of each individual argument. The other theories may either account for some of the issues discussed in section 2 by relegating them to the lexicon, i.e., to particular case-marking properties of individual verbs, or by the mechanics of their linking system between a thematic hierarchy and a syntactic hierarchy. The former method may be particularly attractive for dealing with the lack of pervasiveness, the latter for affected agents. Where I cannot see a convincing solution is the case of mutually dependent arguments. Grammatical theories tend to focus on each argument individually without paying much attention to the possibility of semantic interdependences between arguments.

The two cases discussed in the context of reduced semantic-independent syntactic ezvidence (§ 3) create a number of problems for formal as well as for functional theories. Linking hierarchies intrinsically assuming the existence of a subject/object asymmetry such as formal accounts based on Jackendoff (1990, cf. (4) above) cannot account for neither of these cases for two opposite reasons. Either there is no syntactic criterion as in some constructions of Chinese (cf. §§ 3.1.2–3.1.4) or there is a clear-cut syntactic criterion such as the syntactically privileged position in Liangshan Nuosu (§ 3.2), but this position does not depend on a thematic hierarchy because any argument, be it a proto-agent (actor) or a proto-patient (undergoer), can occur in this position.

The case of Chinese presents another problem for generative theories. This problem has to do with the assumption that the subject/object asymmetry is universal and the question of how these theories can account

for different degrees of configurationality in different constructions. While those cases for which it seems reasonable to accept the existence of syntactic categories are unproblematic, the general assumption that all grammatical functions must be universally reflected in syntactic configurations forces cases with no subject/object asymmetry to be represented with a degree of configurationality which is too hierarchical for them. From this perspective, the approach of Lexical-Functional Grammar (Bresnan 2001) with its two structural levels of c-structure and f-structure seems to be preferable. The elements of a-structure are first linked to f-structure where they are assigned to the grammatical categories of subject and object. From these grammatical functions they can then be linked to various c-structures depending on their degree of configurationality.

For Role & Reference Grammar (Van Valin and LaPolla 1997), which does not take the existence of syntactic categories for granted (cf. § 1), constructions with no subject/object asymmetry are unproblematic. However, what is a problem for Role & Reference Grammar is a situation with a syntactically privileged position which is not based on restricted neutralization of semantic relations as postulated for Liangshan Nuosu. The existence of a syntactically privileged position not based on a thematic hierarchy seems to be a problem for all the theories discussed in this paper.

The case of the headless relative clause in Chinese (§ 3.1.3) points at another interesting option. Even though there is no theory for which the distinction between argument and nonargument is not of profound syntactic relevance (argument vs. adjunct, core vs. periphery, etc.), I am not aware of a theory in which argumenthood pure without any further division into subject and object yields a syntactically relevant category as in the case of headless relative clauses in Chinese. The centrality of argumenthood also shows up in the syntactically privileged position of Liangshan Nuosu (§ 3.2) and in the case of the ergative/absolutive pattern of Kapampangan (§ 4.2) which depends on the referential status of both arguments, the agent and the patient.

The case of topic extraction out of a relative clause in Chinese leads over to the relevance of the referential status for participant-assignment to syntax. As we have seen in section 3.1.4, subject/object asymmetry in topic extraction depends on the salience of the antecedent, i.e., on its referential status and on its animacy. Given the findings on Tagalog and Kapampangan, at least the involvement of reference in syntactic processes loses a lot of its extraordinary character.

As I pointed out in section 4.1.4, Tagalog is a challenge for generative approaches based on Jackendoff (1990) as well as for Lexical-Functional

Grammar (Bresnan 2001). Given the syntactic coherence of the trigger in Tagalog and given its functional coherence in terms of referential status, I offer a solution which does not take semantic roles and thematic hierarchies as the only domain determining the assignment of participants to syntax. To corroborate this analysis I tried to show that syntactic categories are also primarily associated with the referential status of a participant in Kapampangan, a Philippine language which seems to follow typologically well-known patterns of ergativity with an absolutive pivot.

If it turns out to be correct that referential status is another domain that determines the assignment of participants to syntax, one may ask whether there is a motivation for that. I would like to conclude my paper by sketching a motivation based on parsing. In two of my recent papers I have tried to explain how markers of certain grammatical categories can become markers of purely syntactic structures. The phenomena I looked at are markers of class/gender which become markers of phrasal structures (Bisang 2002) and markers of tense, person, illocutionary force and politeness which become markers of finiteness (Bisang, forth. b). The process involved in both cases is a particular process of reanalysis called exaptation by Lass (1990), regrammaticalization by Greenberg (1991) and hypoanalysis by Croft (2000). For a marker of a grammatical category with its own semantics to be used for purely syntactic purposes it must fulfil two conditions. It must be semantically general enough to be interpreted by the parser as coextensive with a syntactic structure X and it must be obligatory to be a reliable indicator of a syntactic structure X to the parser.

If we look at nominal participants we may ask what are the semantic properties that are obligatorily assigned to them in a clause and which of these properties are general enough to be associated with every possible participant. Two candidates which seem to fulfill these conditions are semantic roles and reference.[15]

Appendix: List of abbreviations

1, 2, 3	=	1st, 2nd, 3rd person	CAUS =	Causative
A	=	Agent	CL =	(Numeral) Classifier
ABS	=	Absolutive	COLL =	Collective Plural Marker
ANTP	=	Antipassive	CON =	Continuous Aspect
AT	=	Actor Trigger	Marker	
ATTR	=	Attributive Marker	CONJ =	Conjunction
BEI	=	Chinese Passive	COP =	Copula
BT	=	Benefactive Trigger	COV =	Coverb

DA	= Dative/Accusative	pronouns/agr markers)	
DEM	= Demonstrative	P/A	= Marker of nontrigger
DP	= Durative Aspect Marker	Agent/Patient	
ERG	= Ergative	PAT	= Patient Marker
EXCL	= Exclusive	PF	= Perfect
EXP	= Experiential	PFV	= Perfective
INDIC	= Indicative	PL	= Plural (with nouns)
INSTR	= Instrumental	PRON	= Pronoun
IPV	= Imperfective	PT	= Patient Trigger
IT	= Instrumental Trigger	Q	= Quantifier
LK	= Linker	REL	= Relative Marker
LOC	= Locative	s	= singular (with
LT	= Locative Trigger	pronouns/agr markers)	
NEG	= Negation	STP	= Stative Perfect Particle
OBL	= Oblique	T	= Trigger
P	= Patient	TOP	= Topic Marker
p	= plural (with	V	= Verb

Notes

1. I use the term participant as a general term for any noun phrase in the clause, be it an argument or an element of the periphery.
2. I don't include the information concerning 2nd objects here, although it is provided in Jackendoff (1991: 268).
3. I shall not go into the discussion of whether zero-objects should be analyzed as variables or pros (cf. Huang 1994: 48–57; Li and Huang 1996: 78–84).
4. The syntactic relevance of the referential status of a noun phrase is not limited to extraction in Chinese. It also operates in certain types of relative clauses. This can be seen from recipient or source arguments of three-place predicates. Under some circumstances the head noun must be represented by a pronoun in the relative clause, under other circumstances it can be represented by a zero element. It seems that the pronoun is associated with specific or definite head nouns and that its use is less likely if the patient argument of the relative clause is unmarked (I owe this example to Wang Jingling, p.c.):

   (i) a. *[péngyou sòng tā$_i$ yí   shù   huā   de]   nà   ge gūniang$_i$*
          friend   give s/he one bunch flower ATTR DEM CL girl
          'that girl to whom [his] friend gave a bunch of flowers'
       b. *[péngyou sòng   Ø$_i$ huā   de]   gūniang$_i$*
          friend   give   flower   ATTR   girl
          'a girl to whom [his] friend gave flowers'

5. Gerner (2004: 114) defines the feature of "ongoing" as follows:
   "I define as ongoing in Nuosu those clauses that are presented with a perspective from within by overt lexical or grammatical marking. Extensionally speaking, clauses are ongoing in Nuosu when they incorporate one of the following lexical and grammatical elements:
   - the continuous aspect maɲɯdʑɔ [33];
   - A- or V-oriented manner adverbs;
   - V with the structure V_1V_2: V_1 is an activity verb and V_2 is a directional verb."

6. Resultativity is understood in terms of Chinese linguistics (Li and Thompson 1981: 54–68). In Chinese and many other East and mainland Southeast Asian languages (Bisang 1992, 1996: 564–565), there is a particular construction consisting of two verbs V_1 and V_2 of which V_2 expresses a result of V_1.

7. My translation differs from Gerner (2004: 118), who translates this passage by a passive 'After the ox was borrowed, ...'. The active translation is closer to the Nuosu example because the different positions of agent and patient in (30) have nothing to do with voice.

8. If the relativized state of affairs is not marked for aspect (ongoing vs. resultative) the basic structure of the relative construction is the same with the exception that the coreferent argument is always zero.

9. This section is a shorter version of another paper of mine (Bisang forth. a).

10. For the sake of brevity, I shall only mention the marker used with common nouns in the ongoing text.

11. There are some more complex markers such as *para sa* 'for' (benefactive) or *sa pamamagitan* 'with' (instrumental).

12. Some other semantic roles occurring with stative verbs are: affectee (refers to the person affected by a state of affairs; cf. Ramos 1974b), involuntary actor (Schachter and Otanes 1972: 330–333), cause or force (a mostly inanimate cause which has an effect on the argument of a stative verb; Schachter and Otanes 1972: 313–314; Guzman 1976: 65 and 92) and mental cause (the causer of a psychological state; Drossard 1983).

13. Other arguments against the passive interpretation of the trigger are:
    - Nonactor triggers are not used for agent defocussing although this is a prototypical property of passives (Shibatani 1988; Schachter 1993: 1419).
    - Prototypical passives are less frequent and thus more marked than their corresponding active forms. This is not true of the Tagalog trigger system. Patient triggers even tend to be slightly more frequent than actor triggers (Shibatani 1988; Schachter 1993: 1419).
    - Voice systems typically only make a two-way distinction (active vs. passive). The Tagalog trigger system is more complex. (Schachter 1993: 1419)

14. In a later paper, Mithun (1999) presents immediacy of involvement as one of three ways in which participants may be related to states of affairs. The other

two ways are starting points as reflected in English subjects and the semantic roles of agent vs. patient.

15. Kibrik (1997) mentions the following other potential candidates which may be added to this list if they turn out to be relevant for syntactically privileged positions: elements of information structure (flow, in his terminology) and deixis (1st, 2nd, 3rd person).

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Meaning, form and function in basic case roles

Georg Bossong

1. Two preliminary remarks

Nothing of what follows is entirely novel, neither in empiricial content nor with respect to theoretical reflection. However, the aim of this contribution is to show the interrelatedness of a number of factors which have hitherto been analyzed separately. There are connections between meaning, form and function which have as yet not received the attention they deserve, and my claim is that to insist on these connections may shed some new light on long-standing problems in linguistic typology and universals research.

    This contribution is intended to consider some very essential properties of human language and to elucidate some aspects of the fundamental logic which underpins the most elementary linguistic structures. Ultimately, it attempts to provide a better understanding of "the great underlying ground-plans" (W. Lehmann).

2. Meaning: Metaphor, abstraction, and polarity

In all languages, the fundamental case roles cluster around two diametrically opposed semantic prototypes. Following Dixon, we might give one of these prototypes the label "A" or "agent"; the other prototype is best described as the negation of A, its conventional label being O or "object". The label "P" for "patient" is also frequently used, but this latter one is perhaps too concrete: an object is the entity or domain towards which the action is directed; it must not necessarily be a patient in a narrow sense. With respect to canonical transitivity, we might speak of a kind of basic polarity: prototypical two-place predicates describe actions starting from an A and directed towards an O. It should be noted right from the outset that in connection with one-place predicates this polarity is neutralized; in this contribution, I use the letter S (as "subject") for the only actant of the monovalent verb.

The semantics of A is multiple and variegated. Cross-linguistically, we observe that the core meaning of agenthood contains elements like "activity", "control", and "consciousness". Consciously controlled activity is not only at the base of language structure, but also of human experience; more precisely: because of its being the fundament of our experience, it has also turned out to constitute the fundament of language structure. A prototypical Agent ist capable of volition and intention; he is normally a human, or at least an animate being. In the flow of discourse, he is typically foregrounded as a thematic or topical element. In all these respects, an O behaves as the exact contrary of A: it does not control the action, but undergoes it; it is not active; prototypically, it is not capable of intention or volition, being situated lower in the animacy hierarchy than its agent counterpart; and it does not typically function as a topic in the flow of discourse.

The most important semantic features of the protoypes can be summarized as follows:

(I)   A   ↔   O

+	agentivity	–
+	control	–
+	consciousness	–
+	animacy	–
+	topicality	–

I insist on the prototypical nature of these semantic features (Dowty 1991). In real languages, two-place predicates represent an unlimited amount of semantic variety. Ultimately, every verb has its own meaning, and this implies that strictly speaking the case roles assigned change from verb to verb. Language could not work if every shade of meaning of every individual verb were specifically and explicitly accounted for. Language cannot do without abstraction. It is the first and foremost function of the abovementioned basic polarity to provide a framework for such an abstractive process to take place. Many case roles depending on different verbs and thereby differing more or less slightly, more or less clearly in their meaning, are lumped together in one single cover category. Such cover categories are highly abstract; nevertheless, they are not completely arbitrary, but cluster around a semantic core. A and O are the most important, the most fundamental of these cover categories. Human language is organized in such a way that it tends to subsume huge numbers

of specific meanings under one heading. The basic polarity of A and O serves exactly that purpose.

Essentially, abstraction works as a kind of metaphor. The meaning of the prototype is transferred to all kinds of actions and states. Agentivity becomes the universal pattern to which many different types of two-place predicates are assimilated. Almost any relation between two entities can be metaphorically interpreted as a consciously controlled action of a human being directed towards an object, goal or domain. There is a movement of semantic transfer from the core to the periphery. Abstract relationships can be expressed as instances of directed human actionality.

Individual instantiations of the prototypes may be better or less good; as in the psychological theory on prototypes, there are focal instances on the one hand, and instances which differ considerably from these on the other. Some verbs represent the semantics of A and O in an almost ideal manner. Verbs of the 'beat' or 'kill' type are an often quoted example. Compare examples such as Sapir's *the farmer killed the duckling* with traditional Semitic grammars where verbs such as *qatal* (Hebrew 'to kill') or *daraba* (Arabic 'hit') are consistently used in order to exemplify canonical transitivity. But even in such instances, things are not always straightforward; it is a well-known fact that most Caucasian languages express the notion of 'hitting' by verbs which take the instrument of the hitting as their object, with the person hit taking a locative case (valence frames of the type *John hit his hand/ a stick on Mary*). This example shows that languages differ greatly with respect to encoding semantic roles, and that even in a domain which would be considered as a focal instance of the prototype from the perspective of many familiar languages other encodings do in fact occur.

Concerning the metaphorical process of abstraction, many factors must be considered. Here, only short comments on two problems can be given: possible internal contradictions of semantic features; and the typologically diverse extent of the abstractive extension.

The meaning of the prototypes A and O is a cluster of features. None of the two can be defined by one single semantic feature. There are numerous types of verbs where two or more of these semantic features do in fact contradict each other. In particular, features related with the animacy hierarchy, such as [human] or [animate], do not necessarily coincide with the notion of actionality itself. In such cases, a conflict between animacy related and actionality related features can arise. Two typical instances are animacy-based Differential Object Marking and inverted marking in connection with *verba sentiendi*.

In the former case, objects exhibit a contradictory combination of features: being patients, they occupy a high rank in the animacy hierarchy, typically as high or even higher than the agent. In many languages, objects take a specific marking in such cases, in contrast to lower objects which are left unmarked. The differentiality of the marking reflects the internal contradiction between, or better, the less usual combination of, two types of semantic features.

In the latter case, the verbal notion itself is ambivalent and can be semantically interpreted in two competing ways. The content of *verba sentiendi* can either be viewed as a kind of action which emanates from an animate A, or it can be viewed as a flow which emanates from a source towards an animate A. If interpreted in the latter way, a contradiction arises: the action, instead of taking its starting point from A, is directed towards A; A is transformed into O. The specificity of the semantic relation is taken into account, but the animate character of the experiencer is neglected. If interpreted in the former way, the specific meaning of the verb is not taken into consideration, but simply assimilated to the prevailing pattern of actional verbs; 'A feels O' is treated like 'hits O', although the semantic relation is evidently quite different. Both solutions of the same dilemma are possible, and both occur, in various degrees, in individual languages. Variation can arise inside one and the same language, either synchronically, if two different constructions co-occur; or diachronically, if one construction replaces the other one in the course of time. Variation can obviously also be observed cross-linguistically; those cases where closely related languages encode the same semantic relationship in different ways are particularly instructive. As an illustration, let us briefly consider the expression of the notion 'to please' in some Western European languages.

'To please' is a typical experiencer verb. Semantically speaking, the two participant roles are SOURCE and EXPERIENCER. If measured according to the prototype of consciously controlled action, there is a contradiction between the non-agentive nature of the experiencer and its inherently animate character; at the same time, the source role cannot be considered as agentive. As a result of this conflicting state of affairs, there are two alternative strategies for encoding this particular combination of semantic roles: either the experiencer role, or the source role may be assimilated with A. In the former case, the valency frame is that of ordinary (canonical) transivity; in the latter case, the experiencer role is usually rendered by a dative or a functionally equivalent case (superessive and the like). Neither of these strategies fully reflects the semantics of this specific relationship. However, in the latter case this semantic class is separated from the main

type of two-place predicates; it is at least an attempt to do justice to its specificity, although the equation of A with SOURCE is another type of metaphorical abstraction. If A is equated with EXPERIENCER, on the other hand, the semantic specificity of this relationship is levelled down; in order to do justice to the animate and conscious nature of the experiencer, its non-agentivity is neglected. The A-O frame is generalized; its abstractiveness increases, and semantic differentiations are blurred. We may distinguish these two approaches as a *generalizing* vs a *specifying* *strategy*.

Both these strategies are currently used in the familiar languages of Western Europe. Leaving aside many secondary complexities, we can observe the following constellations:
- In English, the tendency from specifying to generalizing prevails. Today, the specifying strategy is limited to the verb *to please*, which is of Romance origin:

(1)   English
      A_{SCE} *please* O_{EXP} (rare today)

The Germanic verb *to like* had the same valency frame in Old and Middle English, and it was occasionally still used with this construction until the 19th century, but only in an archaizing literary style (Rossetti: *a certain path that liked me not*, OED). Today only the generalizing construction is possible in standard English. The diachronic development can be resumed as follows:

$$A_{SCE} \text{ like } O_{EXP} \;\rightarrow\; A_{EXP} \text{ like } O_{SCE}$$

Compare such everyday sentences as *I like London*.
- In Spanish, we observe the inverse tendency from a generalizing to a specifying strategy. The verb *placer*, inherited from Latin, has become very rare in the modern language:

(2)   Spanish
      A_{SCE} *placer* O_{EXP} (rare today)

The commonest way of expressing this notion today is the verb *gustar* which had in Latin the concrete meaning of 'to taste' and also of 'to develop a taste for, to like' (*gustare aquam* 'taste water' and *gustare amorem* 'enjoy love'). The same construction was in use in Medieval

Spanish; in Classical Spanish, a prepositional alternative came up (*gustar de*), but from the 18th century on, the specifying construction (with the dative as experiencer) became increasingly frequent (Corominas s.v.). Today this latter construction is absolutely predominant in all registers of the language. This diachronic development can be resumed as follows:

$$A_{EXP}\ \textit{gustar}\ O_{SCE}\ \rightarrow A_{EXP}\ \textit{gustar}\ PP\ (\textit{de})_{SCE}\ \rightarrow A_{SCE}\ \textit{gustar}\ DAT_{EXP}$$

Compare such everyday expressions as *Me gusta Madrid*.
- In Portuguese the older construction with *de* has been preserved until today; there is no comparable diachronic movement towards the specifying strategy. This state of affairs is in line with the more conservative character of Portuguese in general: Spanish has undergone many innovations unknown in Portuguese.

   (3)   Portuguese
         $A_{EXP}\ \textit{gostar}\ PP\ (\textit{de})_{SCE}$

Expressions of the type *Gosto de Lisboa* abound in the colloquial language.
– In French, we observe a drift towards the generalizing strategy similar to English, but at a much earlier date. In French, it is not just the construction which has changed (as in the case of English *to like*), but the verb has been replaced. The verb *plaire*, although still useable in the modern language, is much less frequent in the present day colloquial than the verb *aimer*. First attestations of this latter verb in the sense of 'to like' go back as far as the 11th century.

   (4)   French
         $A_{SCE}\ \textit{plaire}\ O_{EXP}$ (less frequent today)
         $\rightarrow$
         $A_{EXP}\ \textit{aimer}\ O_{SCE}$ (current expression)

Compare such everyday examples like *J'aime Paris*.
      We may conclude that different kinds of constellations can be observed: drift from the specifying to the generalizing strategy with the same verb (English) or with a different verb (French); drift from the generalizing to the specifying strategy (Spanish); maintenance of the generalizing strategy with the same verb in a closely related language (Portuguese).
      When comparing not just one or two, but a dozen of different verbs, a clear picture emerges (Bossong 1998). The tendency towards generalization

is very strong in English, somewhat less so in French, and much less so in Spanish. English has reached an extreme point in the process of gradual abstraction. The categories A and O have moved very far from the initial starting point, embracing more and more verbs which have little or no relationship with the original semantic core of the prototype. In particular, the case role A has spread over many semantic fields where the original notion of "controlled/ conscious action emanating from an animate participant" is no longer relevant. At the other end of the scale, we find a strong preference of the specifying strategy for instance in archaic Germanic, represented today by Icelandic (Andrews 2001), as well as in Caucasian languages and all over the Indian *Sprachbund* (Bossong 1992).

In the ongoing debate about the genetic classification of Amerindian languages, there is a distinction between 'splitters' and 'lumpers' – those researchers which tend to maximize the number of genetically independent families (e.g. Loukotka) and those who strive to reduce them to the strict minimum (e.g. Greenberg). It seems that not only researchers, but also languages can be characterized as 'splitters' and 'lumpers'. Icelandic and English, although being genetically related, are typical instances of such splitting and lumping languages: the great variety and frequent use of specifying constructions in Icelandic constrasts sharply with the highly advanced tendency towards generalization in English, where the metaphorical process of abstraction has come to an extreme point and where the basic polarity of A and O has become a universal model for the expression of two-place relationships of all kinds.

3.   Form: Accumulation, and the ambivalence of unmarkedness

Morphological unmarkedness is defined here as the absence of formal marking for a given category; it usually occurs in the framework of a privative opposition: zero-marking as opposed to positive marking by some kind of grammeme. As for the functional effect of unmarkedness of nominal constituents, an ambivalent situation emerges. We can observe two contrary effects.

On the one hand, unmarkedness signals independence, or autonomy, with respect to another category. "Subjects" show a strong tendency to be unmarked. At the same time, it is clear that subjects are more autonomous, more independent, less "governed" with respect to the predicate than objects. The absence of formal marking in the noun expresses this kind of relationship: the subject faces the predicate as an entity having equal rights.

On the other hand, unmarkedness signals integration, or incorporation, into another category. In the context under discussion here, we observe that a noun not provided by a morphological marker is ready to be incorporated into a verbal complex, whereas as noun provided with a marker is not. Consider the classical example of incorporation, the construction whose analysis gave rise to the invention of the notion of "incorporation" (Humboldt's *Einverleibung*): Nahuatl *ni-naca-cua* 'I-meat-eat' as opposed to *in naca-tl ni-c-cua* 'meat-AUT I-it-eat' (cf. Humboldt 1835 [1963]: 531; Chevalier 1979: 166; Iturrioz 2001: 715). The 'autonomizer' *–tl* (with its allomorphs) confers to the noun the status of independence vis-à-vis the verb; it has no case function, it simply signals that the noun provided with this ending is not liable to be incorporated. Conversely, the absence of this ending signals that the noun can be integrated into the predicate complex.

(II)   Unmarkedness: independence/excorporation ↔
                                 integration/incorporation

       accumulation S = A → independence

       accumulation S = O → integration

These two effects are clearly opposite. Unmarkedness can serve the purpose of autonomization as well as the purpose of integration, or to put it more sharply, it can signal incorporation and excorporation alike.

Let us now turn to the cause of unmarkedness. The motivation for a grammatical category to be left unmarked is easy to understand; it follows the principle of economy which can be formulated in a quite trivial way: mark what has to be marked; leave unmarked whatever can be left open. Marking is necessary for disambiguating; if there is no ambiguitiy, marking is superfluous. Marking is, of course, always possible; therefore, we find equipollent oppositions instead of privative oppositions in all human languages. Nevertheless, due to the economy principle just formulated, privativity is in fact the favourite option for morphological marking.

If we apply these reflections to the analysis of basic case roles, the following picture emerges. In connection with one-place predicates, no marking is necessary. S needs not to be marked, since it is the only argument of its verb. All types of semantic relationship are possible, but they must not be distinguished. Indeed, most languages prefer unmarkedness for S. The situation changes radically when we pass to two-place predicates. In connection with such verbs, disambiguation becomes necessary. The polarity of A and O calls for formal marking in order to

keep these two roles apart. Theoretically, we could expect systems with three forms: no mark for S with one-place verbs; and two different marks for A and O with two-place verbs. But one- and two-place verbs are parts of the same overall system. Their interrelatedness leads to the formation of structures where the unmarkedness of S is transferred to either A or O. The passage from one-place to two-place predicates is decisive for one of the most fundamental typological divides in human language. Depending on whether the unmarkedness of S is transferred onto A or onto O, the result is either an accusative or an ergative system. We might call this the 'morphological transfer of unmarkedness': when passing from mono-valence to bivalence, the unmarked case role S is equated either with A or with O, resulting in the basic morphological polarity of accusativity and ergativity (Plank 1979).

In the process of passing from monovalence to bivalence, the economy principle is applied in a specific manner. I have proposed to call it the 'accumulation principle': the function of either A or O is accumulated with the unmmarked form of S. As a result, we have not three, but only two different forms for the three relations: one zero-form for S and either A or O; and one positively marked form for either O or A. The universally preferred pattern of privativity is used in an optimal way.

It is not the aim of this contribution to analyze exceptions. However, a few words on two types of exceptions are necessary at this point.

First, privativity is not the only possible pattern; equipollence is always an option. There are some languages where the basic case of the system, be it the nominative in an accusative system or the absolutive in an ergative system, is morphologically marked. In such cases, the normal result is an equipollent opposition between nominative and accusative, or between absolutive and ergative respectively. Old Indo-European (Latin, Greek, Sanskrit) and Japanese are well-known examples of equipollence in the accusative configuration. For the ergative configuration, examples are somewhat more difficult to find, but they do exist: Limbu (van Driem 1987: 34), Chukchee (Comrie 1979: 223) and Tongan (Tchekhoff 1978: 60f.; Chung 1978: 52) have an equipollent contrast between absolutive and ergative nouns in a part of their respective system. Note that the ergative is always positively marked in these languages. In any case, equipollence is functionally equivalent to privativity; when equipollent oppositions are used instead of privative ones, there is no contradiction to basic marking principles, only a slight violation of an economy principle.

The second type of exceptions is of a different nature. In fact, there are languages with privative oppositions, but with an unexpected distribution

of features. In such cases, the accusative is unmarked and the nominative marked, or the absolutive marked and the ergative unmarked. As for accusativity, this constellation occurs in Old French, and also in some Cushitic languages spoken in Ethiopia and Somalia (Sasse 1974). In ergative languages, such an inversion of markedness relations is very rare; Nias, an Austronesian language spoken off the coast of Sumatra, seems to be a case in point (Bossong 2003: 32). Anyway, isolated instances of a different constellation do not invalidate the claim that in the overwhelming majority of languages the unmarked case in a privative opposition is the nominative, respectively the absolutive. The rare counter-examples can safely be considered as rule-confirming exceptions.

We now come back to the abovementioned ambivalence. As we have seen, unmarkedness may signal either independence, or integration. The accumulation types S = O and S = A are both logically possible; at first sight, they seem to be equivalent. But in the light of what was just expounded about the ambivalence of unmarkedness, it immediately becomes clear that the functional values of the two accumulation types are totally different. Unmarkedness is used to signal independence in the case of the accumulation S = A; it is used to signal integration in the case of the accumulation S = O.

4.   Function: *El zorro de arriba y el zorro de abajo*

The basic semantic polarity of A and O can be reinterpreted in terms of syntactic functionality. We have postulated topicality as one of the features of A; this feature can be interpreted on the semantic and on the functional level alike. In natural language, Agents tend to be treated as discourse topics. This is a natural tendency, deeply rooted in elementary linguistic habits: human beings tend to speak primarily about human beings, that is, of beings capable of consciously controlled activity. We can assume that the most fundamental type of coherent text construction is story telling. Relating the deeds of human protagonists is such an elementary discourse type that it is to be expected to show its influence on grammar everywhere. The rules of sentence combining have developed according to certain prototypes; it is postulated here that the most important of these prototypes is narrative discourse about human agents. Text building in general tends to follow this model. Specific rules of individual languages can be expected to reflect some essential characteristics of this prototype.

Agents tend to be topical. In the primary discourse type of narration, they are, syntactically speaking, the preferred pivot for corefence relations. Such coreference relations are established over a chain of subsequent sentences. Consequently, the pivot keeps a certain independence with respect to the successive chain of verbal predicates. An agent will perform, in the course of the narrative, different types of action and nevertheless remain constant. He will perform consciously controlled actions which are either directed towards a goal or not. Grammatically speaking, a discourse topic will tend to combine freely with either one-place or two-place verbs. Usually, transitive and intransitive actions will freely alternate in the course of the narration. From the perspective of text building, modelled upon the prototype of story-telling, it is therefore natural to encode the case-roles A and S alike. As shown, it is one of the two functions of unmarkedness to signal independence; consequently, unmarked encoding of both A and S is functionally motivated if seen from the perspective of text constitution. In other words: accusativity is an optimal strategy for expressing relationships beyond the level of kernel sentences. We can express this state of affairs by using a spatial metaphor: there is a force of attraction towards accusativity *from above*. This attraction emanates from linguistic ranks higher than the kernel sentence, that is, ranks constituted essentially by coreferentiality and oriented towards the construction of complex sentences and texts. The accumulation of A and S in one single category, and the formal unmarkedness of this category, can be interpreted as resulting from this force of attraction.

This fact explains why there are so few languages with so-called "deep" or "syntactic" ergativity. "Syntactic" in this context essentially means the expression of coreferential relationships beyond the level of kernel sentences. In fact, relations of this kind are more naturally expressed by using the accusative configuration, given the primary nature of the narrative type of discourse. Within the ergative configuration, problems can arise when expressing such basic and everyday concatenations of events as

John went in and took a glass of water
John took a glass of water and went out.

A and S freely combine when speaking about one and the same protagonist. In a strictly ergative system, such combinations are more difficult to express because A and S belong to two different grammatical categories. The reference of the protagonist remaining constant, there is a functional switch from S to A or vice-versa. (I do not consider here the structure of

languages with switch-reference systems; as is well-known, in such languages the change of reference prevails over the change of function.) Is it necessary to recall in this context the much debated example of Dyirbal (Dixon 1972)? As is well-known, two antipassives are necessary to come to grips with elementary everyday textual relationships. The most complicated morphological device is required to express the most elementary chain of events, namely a sequence of two transitive agents. It is not surprising that languages of this type are extremely rare. In Dyirbal, it is easier to speak about topical patients than about topical agents. Such a structural constellation is highly unnatural, at least if we assume story-telling to be the most fundamental prototype of text building. If modern scientific discourse had been the primary prototype, a constellation like that of Dyirbal would perhaps have proved more appropriate than the model of accusativity which prevails all over the world. In scientific registers of modern European languages, the passive is much more frequent than in ordinary spoken language; this shows that an ergative-like structure is highly useful in such a type of discourse. However, human languages have not developed from elaborated registers such as scientific writing, but from much more elementary prototypes such as story-telling.

Text construction with topical O as a pivot is not unknown even in accusative languages, not only in scientific texts with their all-pervading passive constructions, but also in specific registers such as cooking recipes. Recent studies have highlighted the growing use of the infinitive in this text class in various European languages (cf. Glaser 2002). The infinitive permits to leave the case-role A unexpressed, which is an advantage since it is not relevant for a cooking recipe to indicate who does the cooking. Moreover, objects can freely be used as constant topics, without the grammatical constraints which usually are observed in such cases. I quote a Spanish example (Mayerthaler 1993: I, 113):

(5)   Spanish [apparently ergative pivot]
      Tarta de manzanas. Triturar las manzanas y mezclar todo lo demás.
      Echar al molde y meter al horno entre 15 y 20 minutos. Luego sacar
      y poner encima lonchas finas de manzana. Volver a meter al horno
      hasta que se dore la manzana.

The syntax of the topical O in such a text is exactly similar to that of topical As and Ss in ordinary texts with finite verbs. O is not expressed by pronominal clitics, as would be obligatorily the case in other text classes; there is not even one pronominal form in the whole text. It would of course

be possible to say *echarlo al molde y meterlo al horno... luego sacarlo ... volver a meterlo ... después de sacarlo ... dejarlo enfriar*, but this is not the usual way of formulating recipes. In this class of texts, not the agent, but the object is topical and fuctions as pivot. Sequences of Os are just as pivotal and unmarked here as would be the case in a syntactically ergative language as Dyirbal. But in Spanish, and likewise in other European languages which use the infinitive in such cases, this type of text constitution is marginal, whereas it is fundamental in a language like Dyirbal. Syntactic ergativity is not unknown even in such clearly accusative languages as Spanish; but in contrast to Dyirbal is not an all-pervading principle of the language structure.

Most ergative languages solve the problem of text constitution in a different manner. As I have shown with respect to Basque, the constitution of text conherence through coreferentiality works on an pragmatic base. If noun phrase reference can be inferred from the context, it is left unmarked; if not, it can, and in some cases must, be specified by some grammatical device. There is no such thing as a pivot, neither on an accusative nor on an ergative base. Linguistic levels above the threshold of the kernel sentence are neutral with respect to the basic dichotomy of accusativity vs ergativity. If a tendency can be detected for coreferential relations to be treated rather in an accusatively structured way, this is due to the fact that text constitution in general tends to follow preferably an accusative pattern; but it has nothing to do with "deep" or otherwise mystified accusativity in otherwise ergative languages. A set of examples may help to clarify this point. First, let me quote two examples of clause combining in Ubykh, a extinct North-West Caucasian language (cf. Bossong 1982):

(6)   Ubykh [pivotless]
   a.   *tχə-məśa-Ø*   *Ø-s-ćʸa-wt-ən*
       write-read-ABS   3ABS-1ERG-know-FUT-FIN
       a-məśa-š°a-ya   *s-kʸ'a-n*
       ART-read-place-LOC   1ABS-go-PRS
       'I go to school in order to learn to read and to write.'

   b. *tət-ən*   *Ø-Ø-mə-bya- śa*   *ćʸ'a-t°'-ay-q'a*
       man-ERG   3ABS-3ERG-NEG-see-GER   out-go-again-PRET
       'He went out again without anybody seeing him.'

In the first example, we have a structure where the coreferential noun phrase *I* has the functions A and S in two subsequent clauses; it is ergative (A) in the subordinated clause and absolutive (S) in main clause. The noun does not appear in nominal form, although of course the verb takes the corresponding prefix of the 1st singular ergative. The coreferential deletion of the noun here seems to follow an accusative pattern. However, a closer examination of the second example reveals that this is a kind of optical illusion: what has been deleted is exactly the actant which has not to be specified for pragmatic reasons. It can easily be inferred from the context. It is not deleted because of a mystified "deep" subject pivot of an accusative type, but simple because of its being recoverable from the context. In the second example, the actant deleted is O, not A. Once again, it would be an illusion to take this as an argument for a "deep" ergativity of Ubykh; O can be deleted not because of it being an absolutive pivot of the Dyirbal type, but because of the simultaneous presence of a noun phrase in the ergative case; the deleted noun phrase is easily identifiable as an absolutive, since the presence of an overt ergative leaves no room for another interpretation.

Analogous observations can be made about the formation of relative clauses both in Ubykh and Basque which behave remarkably similar in this respect (cf. Bossong 1982: 224 and 1984: 356). In this place, I will quote again (cf. Bossong 1984: 379) a couple of Basque examples concerning the constitution of text in a concatenation of events related of a human agent. These examples represent the narrative prototype. The two examples are adapted from a famous historical novel by Domingo Agirre, written in the Bizcayan dialect; its title is *Auñemendiko lorea* 'The flower of the Pyrenees' (first published in 1898):

(7) Basque [pivotless; a: apparently accusative pivot; b: apparently
         ergative pivot]
   a. *Amando-k   artu eban   Euskal-erri-ra-ko*
      Amando-ERG take 3ABS-AUX-3ERG Basque-country-to-GEN

      bide-a.   Eldu   zan Auñemendi-raiño.   Aserre   ta
      way-ART   arrive AUX-3ABS Auñemendi-at   anger   and

      zer-esan   andi-ak idoro zituan
      what-say   great-ABS PL find 3ERG-3PL ABS-AUX

      'Amando took his way to the Basque country. He arrived at
      Auñemendi. He found much much anger and maledictions.'

b. *Gelditu*   *zan*   *Mendiola-n*   *Riktrudis-Ø.*
   remain   3ABS-AUX   Mendiola-LOC   Riktrudis-ABS

   Erregiña bat   *legez*   *zan*   *Ba-eukan*
   queen   one   like   3ABS-AUX   AFF-3ERG-3ABS

   lagun-tasun on bat-Ø   *Auzoko-ak*
   friend-ship   good   one-ABS   neighbour-ERG PL

   erruki eben.
   pity   3ERG PL-3ABS-AUX
   'Riktrudis remained in Mendiola. She was like a queen. She had
   good company. The neighbours pitied her.'

The first sequence of sentences could be taken as a proof of "syntactic accusativity": As and Ss follow each other freely, and both are equally deleted under the condition of coreference. However, the second set of sentences shows that this is an optical illusion: here, Os following Ss are likewise deleted under coreferentiality. If Basque had really a pivot, it would oscillate between accusativity and ergativity, which is obviously a nonsense. The function of the deleted argument can be recovered from the context: in (10a), the cooccurring absolutive makes it clear that the deleted NP must have the complementary function of an ergative (apparent accusativity); likewise, in (10b), the cooccur-ring ergative makes it clear that the deleted NP must have the complementary function of an absolutive (apparent ergativity). On the level of text constitution, Basque is neither ergative nor accusative; the application of these labels simply does not make sense. In the overwhelming majority of languages, ergativity is not oriented towards higher ranks; systematic use of absolutive pivots of the Dyirbal type is exactly the exception which confirms the rule. Similar exam-ples of pivotless text constitution can be quoted from Chukchee (Nedjalkov 1979: 242) and many other ergative languages.

Inversely, it goes without saying that languages which are basically accusa-tive use this structure for text constitution. Let us compare two simple sets of examples from Old Spanish and Arabic.

(8)   Old Spanish
Un rey havía un fijo, et diolo a criar a un philósopho en que fiava
mucho; et cuando el rey finó, fincó su fijo moço pequeño. Et crió lo
aquel philósopho fasta que passó por XV años. Mas luego que entró
en la mancebía, començó a despreçiar el consejo daquel que lo
criara, e allegósse a otros consegeros de los mançebos.

                                                 (Juan Manuel p. 127)

(9)   Arabic
kāna lahā   qarībun   yusammā   Yaqzānu. fa-tazawwağahā
was to-her   neighbour was-called Yaqzân, and-he-married her

sirran, ṯumma ʾinnahā   ḥamalat minhu   fa-waḍaʿat   ṭiflan.
secretly then   as-for-her she-bore from-him and-put-down a-child

fa-waḍaʿathu   fī tābūtin wa-ḫarağat   bihī   ʾilā sāḥili
and-she-put-him in a-box   and-she-went-out with-him to shore

l-baḥri, ṯumma qaḏafat   bihī   fī l-yami, fa-ṣādafa ḏālika
of-the-sea then   she-threw with-him in the sea and-met   that

ğaryu l-māʾi   bi-quwwati l-maddi, fa-ḥtamalahū   ʾilā sāḥili
flowing of-water with-might of-flood and-carried-him to   shore

l-ğazīrati   l-ʾu ḫrā
of-the-island the other

'She had a neighbour called Yaqzân. He married her in secret.
Then she was pregnant from him and gabe birth to a boychild.
She put him into a box and went out with him to the seashore.
Then she threw him into the sea. A mighty flood took him and
carried him to the shore of the other island. ' (Ibn Ṭufayl p. 28)

In both languages, textual accusativity manifests itself in the different
behaviour of nominatives (S=A) on the one hand, and accusatives (A) and
other oblique cases on the other. Whereas the nominatives are simply
deleted under coreferentiality, accusatives behave like datives or genitives
insofar as they must take the form of a pronoun in the appropriate case.
There is a fundamental asymmetry between the basic case roles with
respect to syntactic behaviour. Morphologically accusative languages such
as Spanish or Arabic are predominantly accusative also in their text
constitution.

According to the basic polarity of case-roles, O is the opposite of A. If
this is true with respect to meaning and form, it should also be valid with

respect to function. There is natural tendency for objects not to be topical (which does not exclude the possibility that in a given context an object might take the topic role). However, there is another point to be made concerning the essential properties of objects. It has to do with the above-mentioned tendency of unmarkedness to signal integration.

Objects are the first semantic determinants of the predicate. Most verbs can be classified according to their objects, not according to their subjects. A is semantically independent from the verb, more precisely, it tends to be more independent than O. To put it simply: if we take an everyday verb like 'to drink', it is evident that the object determines the kind of action, but not the agent. Contrasting *John drinks water* and *Mary drinks wine*, it becomes immediately clear that *water-drinking* is a kind of drinking quite different from *wine-drinking*, whereas it would be pointless to distinguish **John-drinking* from **Mary-drinking*. As a consequence, O tends to be integrated into the verbal complex, in contrast with A which tends to keep its distance. These fact are well-known, and it is hardly necessary to insist on them (Bossong 1985: 136). Only brief comments on two empirical domains will be given here.

First, let us consider the problem of *genitivus subiectivus* vs *genitivus obiectivus*, much debated since antiquity. In "Action Nominal Constructions" (Koptjewskaja-Tamm 2003) the argument(s) of the underlying verb are demoted; they are transformed into adnominal determinators which take the form of the genitive case in the classical languages. Such a genitive can represent a "subject" (i.e. S=A) or an "object" (i.e. O). In traditional grammars, subjective and objective genitive constructions are presented as equally grammatical. Undoubtedly this is true, as the classical ambiguity of *amor Dei* = 'love emanating from God' or 'love towards God' shows. However, this kind of presentation masks two important facts: a) *genitivus subiectivus* occurs mainly with nouns derived from monovalent verbs (Schwyzer and Debrunner 1966: 121); and in connection with bivalent verbs, *genitivus obiectivus* is far more frequent and more natural than *genitivus subiectivus*. We have to do here not with a grammaticalized pattern, but with pragmatic probability: in the majority of instances, the interpretation of the genitive as *obiectivus* is more obvious, it suggests itself more easily than the interpretation as *subiectivus*.

The first verse of the Iliad can be quoted as an example:

(10) Greek (Classical)
     a. *Μῆνιν ἄειδε θέα, Πηληϊάδεω Ἀχιλῆος*   (Il. 1, 1)
         'sing, oh Muse, the wrath of Achilles, son of Peleus'

Mῆνις 'wrath' is derived from the intransitive verb *μηνίω* 'to cherish wrath'; so, this is a typical case of *genitivus subiectivus* in connection with a monovalent verb. In contrast, the interpretation of the genitive as an *obiectivus* in connection with a bivalent verbal root is the most natural and most frequent one. Compare the following two examples from the second book of the Iliad where we find the underlying verb as well as the derived Actional Noun Construction:

   b. *Ἀγάμεμνον, μηκέτι νῦν ... ἀμβαλλώμεθα ἔργον*   (Il. 2, 436)
       'oh Agamemnon, let us not delay the work any longer'
       (transitive *ἀναβάλλομαι* 'to delay, postpone, procrastinate')

   c. *οὐκέτ' ἔπειτα Τρωσὶν ἀνάβλησις κακοῦ ἔσσεται*   (Il. 2, 380)
       'for the Troans, there will be no longer a delaying of evil'
       (*ἀνάβλησις* derived noun 'delay, Aufschub')

ἀνάβλησις ἔργου 'delay of the work' sounds as natural as *ἀνάβλησις κακοῦ* 'delay of evil'; *ἀνάβλησις Ἀγάμεμνος* 'delay of Agamemnon' is probably not agrammatical (unfortunately, there are no native speakers of Homeric Greek which we could ask for their judgment), but it is certainly less natural and less frequent; at any rate, it does not come to mind as the first interpretation.

In Latin, both types of transformations are possible, and they can even occur in combination (Pinkster 1988: 141; Kühner and Stegmann 1914 [1988]: II, 415; Hofmann and Szantyr 1965: II, 65):

(11)   Latin
      Cicero amat patriam → *Ciceronis amor patriae*

However, the *genitivus obiectivus* is more frequent, and in the abovementioned example it would clearly be more natural to formulate *amor patriae* as a specific type of 'love' than in would be in the case of an isolated *amor Ciceronis*; out of context, *amor Ciceronis* would probably be interpreted as the 'love for Cicero (by some enthusiastic latinist)'.

This is obviously an ergative behaviour, not in the sense of a fixed grammaticalized rule, but in the sense of a probabilistic tendency. It would be easy to further illustrate this constellation by examples from other languages, such as German.

A nice example of *genitivus obiectivus* can be found in a poem written by the Hispano-Arabic author Ibn Ṣāra al-Šantarīnī (2001: 192):

(12)   Arabic
    yā   man   yuᶜaddibunī   māḏā turīdu   bi-taᶜḏībī
    VOC who   he-tortures-me, what you-want by-torture-my
    wa-ʾiḏrārī
    and-damage-my
    'Oh you who tortures me, what do you want by torturing me?'

My torture means 'my being tortured', *my damage* means 'my being damaged'. Although in Arabic, too, other constructions are possible, *genitivus obiectivus* is clearly preferred.

All these examples clearly show two things: there is a tendency towards ergative structures in ranks below the level of kernel sentences, even in languages with all-pervading accusativity; this tendency is not fully grammaticalized, it remains a statistical probability, a preference of interpretation which may vary according to context and which may give raise to specific lexicalizations. In other words: although many instances of ergative behaviour can be detected in accusative languages, it would be an "optical illusion" to speak of "deep" (or "high" or "shallow" or whatever) ergativity in these languages. They remain basically accusative. But the tendency towards ergative-like structures on lower ranks of language is a universal phenomenon. It is due to the fact that O is the closest semantic determinator of the predicate.

We now come to compounding and incorporation. Noun compounding can be considered as a kind of incorporation: in a determinative compound, the determinant loses its independence and coalesces with the determinate, which remains the head of the construction. The determinant is unmarked for case, number, or gender. Unmarkedness signals the full integration of the determinant into the whole formed by determinant and determinate. The key word is integration.

As for the relationship of basic case-roles with Action Nouns, there is a graduated scale of integration in many languages. If we take German as an example, the following picture emerges. The distance between determinant and determinate is greatest when the determinant either takes the form of an adjective or of a prepositional phrase; distance and integration are in a balance when it appears in the genitive case; integration is accomplished

when the determinant loses all grammatical or lexical marks and enters a compound construction. The point to be made is the following: in connection with determinate Action Nouns derived from two-place predicates there is often an ambiguity of interpretation between A and O; but whenever both arguments are explicitly expressed, O is closer to the determinate noun and tends towards full integration. If uttered in isolation, the genitive in *Chomskys Interpretation* can be interpreted either as *subiectivus* or as *obiectivus*; but in combination with another determinant, only one interpretation is possible, namely the one where the closer integrated noun functions as O.

(13)   German
    die Chomsky'sche Interpretation Humboldts
    die Interpretation Humboldts durch Chomsky
    Chomskys Humboldt-Interpretation

A similar constellation can be found in many languages. It can take many different forms, but the basic relatedness of A with distance, and O with integration is probably a universal of human language. We may confidently assume that if there is an integration scale of the type just outlined, more distance will always be correlated with A, whereas a higher degree of integration will systematically be associated with O.

To quote just one more example: it is a well-known fact that Sanskrit makes heavy use of nominal compounds. Here, we observe the same tendencies, as the following clauses clearly show (cf. Coulson 1976: 88, 157):

(14)   Sanskrit
    a. *nr̥pa-sya   darśanam*
       king-GEN SG seeing
    b. *nr̥pa-darśanam*
       king-seeing
       both 'the sight of the king' (*subiectivus* and – preferably –
       obiectivus)
    but

c. *bālānāṃ   nṛpa-darśanaṃ*
child-GEN PL king-seeing
'the children seeing the king' (GEN = A, COMP = O)

In his work on the nominal style of scientific Sanskrit, Peter Hartmann (1955: 174) quotes a fascinating example:

d. *parimāṇa-sya parimāṇa-janaka-tva*
measure-GEN measure-generative-ness
'the fact that measure (extension) generates measure'

Despite the identity of *parimāṇa*, it is perfectly clear that the first occurrence (GEN) is to be interpreted as A, the second one (determinant in the compound) as O.

Similar regularities can be found with respect to what is traditionally called "incorporation", that is, the integration of a noun into a verbal complex (Mithun 1984, 1986; Baker 1988). The classical example of an incorporating language is Nahuatl (Classical Aztec, Launey 1978: 167). Here, Ss and Os are frequently incorporated into the verbal complex, whereas As never are. In this domain, too, we observe an ergative constellation in an otherwise clearly accusative language.

Let us summarize. Objects tend to semantically determine the verbal predicate and to become integrated into it to form a notionally unified whole. With one-place verbs, there is no difference between agents and objects as to their degree of integration into the verbal complex, all oppositions being neutralized; there is no necessity to mark any case-role. With two-place verbs, the opposition between A and O is actualized. As we have seen, Os show a higher degree of semantic and formal proximity with the verb than As. On the level of predicate construction, it is therefore natural to encode the case-roles O and S alike. It is one of the two functions of unmarkedness to signal integration. Consequently, we can say that unmarked encoding of both O and S is functionally motivated if seen from the perspective of the internal construction of the predicate. In other words: ergativity is an optimal strategy for expressing relationships underneath the level of kernel sentences. Using the same spatial metaphor as above with respect to accusativity, we might say that there is a force of attraction towards ergativity *from below*. This attraction emanates from linguistic ranks lower than the kernel sentence, mainly from the verbal predicate and

its internal semantic structure. The accumulation of O and S in one single category, and the formal unmarkedness of this category can be functionally explained as a result of this force of attraction.

We have seen that on the level of predicate construction, a kind of ergative behaviour can be observed even in otherwise accusative languages. In most cases, such a behaviour manifests itself in the form of a probabilistic tendency, not in the form of strictly grammaticalized rules (as would be the case if, for some reason or other, the *genitivus subiectivus* would be generally ruled out as agrammatical). The behaviour of most accusative languages in this respect is symmetrical with the behaviour of most ergative languages, where we find a kind of accusativity on higher ranks, not in the form of strict rules but rather of probabilistic tendencies.

There will certainly be general agreement that the level of kernel sentences is the central axis of human language. As Wittgenstein has put it: "Die Welt ist alles, was der Fall ist." (*Tractatus logico-philosophicus* 1.1). To be the case, that means a speech act which affirms a certain constellation of one predicate in combination with one, two, or less frequently three arguments to be true. Kernel sentences are constituted essentially by such speech acts. Linguistic structures are organized around this kernel, or centre, or backbone, or whatever metaphor we might use to describe it. On a lower level, we find the rules and tendencies of predicate construction. On higher levels, the combinations of kernel sentences in subordination and text constitution develop their own tendencies and rules. On the central level of kernel sentences, both types of rules meet.

We now come back to the metaphor alluded to in the title of this chapter: the title of the last novel of the famous Peruvian writer José María Arguedas, *The fox from above and the fox from below* (first published in 1972), refers to the Andean highlands as opposed to the Atlantic coast region. The symbol is taken from the *Huarochirí*, a collection of rites and traditions of the Incas preserved in a 17th century Quechua manuscript. One of the foxes comes down from the mountains, another one mounts up from the sea. They meet halfway and exchange their views on life and the difference of their experiences (Taylor 1987: 91).

The duality of ergative and accusative structures is basic in human language; most other types can be reduced to this fundamental dichotomy. While ergativity is optimal for predicate construction, accusativity is optimal for text constitution. The level of kernel sentences is exposed to the antagonism of these two forces. The balance to be found varies from language to language, and it varies in time. In a worldwide perspective it appears that predominantly accusative languages are a majority. It also

appears that many – not all – ergative languages show some structural split, whereas accusative languages are usually more consistent. The tendency towards ergativity seems to be, all in all, somewhat weaker than the tendency towards accusativity. We might conclude, *a posteriori*, that the force from above is slightly stronger than the force from below. Text constitution is more central for building grammatical categories than predicate construction.

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Semantic macroroles and language processing

Robert D. Van Valin, Jr.

1. Introduction

It is widely assumed in the discussion of both language production and comprehension that semantic roles play an important role in both processes. Yet there are different types of semantic roles proposed in different linguistic theories, and this raises two questions. The first is, exactly what type of semantic role is most appropriate for language processing? Verb-specific roles? Thematic relations? Generalized semantic roles? The second question is, given that the different types of semantic roles are embedded within different grammatical theories, what is the relationship between the grammatical theories and processing models? The relationship of grammatical theories to models of language processing is a controversial one. At the one extreme, Chomsky has always maintained that the study of linguistic competence is logically prior to and independent of the investigation of linguistic performance and consequently that considerations from performance, including psycholinguistic and computational modeling of it, have no bearing on or relevance to theories of competence (see e.g. Chomsky 1965). At the other end of the spectrum stand Kaplan and Bresnan (1982), who maintain that theories of linguistic competence should be tied to testable models, psycholinguistic or computational, of linguistic performance.

The purpose of this paper is to investigate these two questions. It will be argued that the type of semantic role most relevant to language processing is the notion of semantic macrorole, which was originally proposed and developed in the theory of Role and Reference Grammar. Since semantic macroroles do not exist in a theoretical vacuum, this leads to an investigation of the relationship between the syntactic theory that posits them and models of language production and comprehension. Where in the processing model does the grammatical model fit? Does this relationship have any consequences for the grammatical theory?

Role and Reference Grammar [RRG] (Van Valin and LaPolla 1997; Van Valin 2005) is a theory of syntax in which semantic macroroles play a

central role and which explicitly attempts to be a grammatical model of both language production and comprehension; this can be seen in Figure 1, which lays out the organization of the theory.
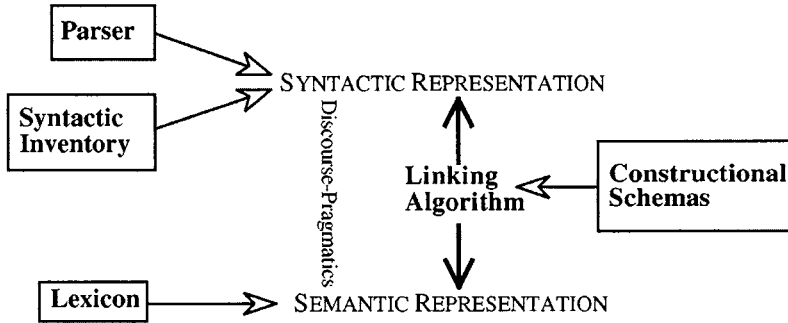
Figure 1. The organization of Role and Reference Grammar

RRG posits only a single syntactic representation for a sentence, which is the overt form of the sentence; there are no underlying syntactic structures, transformational rules or derivations. This syntactic representation is related to the semantic representation of the sentence by a set of rules called the 'linking algorithm'. In Figure 1 the arrow representing the linking algorithm is double-headed; this indicates that it not only links a semantic representation to the appropriate syntactic representation, but that it also links a syntactic representation to a semantic representation. The basics of the linking system will be summarized in section 2. In terms of language processing, it is reasonable to assume that a speaker has some communicative content in mind, that this is translated into a semantic representation and that this is mapped into a morphosyntactic form which is then uttered; in other words, the process of language production involves at least in part a mapping from semantics to syntax, or, in RRG terms, a semantics-to-syntax linking. Conversely, the hearer takes the acoustic (or other) input, parses it into a morphosyntactic structure and assigns a meaning to it; in other words, the process of language comprehension involves at least in part a mapping from syntax to semantics, or, in RRG terms, a syntax-to-semantics linking. It is in this sense that RRG purports to be a grammatical model of language production and comprehension.[1]

The primary question which this paper seeks to address is, how does RRG fit with psycholinguistic models of language processing? An answer to this question is a contribution to the larger issue of the relationship of

grammatical models to processing models. Psycholinguists have often argued for a particular model of language production or comprehension without taking developments in theoretical linguistics into account, and consequently it would strengthen their claims if it could be shown that the components they posit correspond to theoretical constructs developed and justified on the basis of extensive linguistic evidence. And conversely, if the constructs posited by grammatical theorists on the basis of purely linguistic evidence and argumentation correlate with those postulated by psycholinguists on the basis of experimental and other evidence, this supports the claim of the grammatical theory to be a plausible model of a speaker's linguistic competence. A final question to be addressed is, do the processing models have any implications for the grammatical model?

The discussion will proceed as follows. In section 2, the notion of semantic macroroles will be introduced as part of a brief summary of the RRG linking system. In section 3, the RRG system will be compared with Bock and Levelt's (1994) model of grammatical encoding in language production. In section 4, an RRG-based model of parsing and language comprehension will be outlined. Conclusions will be presented in the final section.

2.   Semantic macroroles in the Role and Reference Grammar linking system: A brief summary[2]

As shown in Figure 1, the linking algorithm links the syntactic and semantic representations, and accordingly the basics of each of those representations must be introduced. The syntactic representation is known as the 'layered structure of the clause' and consists of two projections: the 'constituent projection' containing the predicating element, usually but not necessarily a verb, its arguments and any modifying adjuncts, and the 'operator projection' containing grammatical categories like aspect, tense, negation and illocutionary force. The constituent projection consists of the 'nucleus' of the clause, containing the predicate, the 'core' of the clause, containing the nucleus and the arguments of the predicate, and the 'periphery' of the clause, housing the adjuncts modifying the core. Each of these layers may be modified by one or more operators. The structure of a simple sentence in English is exemplified in Figure 2 on next page.

A couple of notes are in order. NPs headed by common nouns and adjunct PPs have a layered structure analogous to that of clauses; NPs headed by
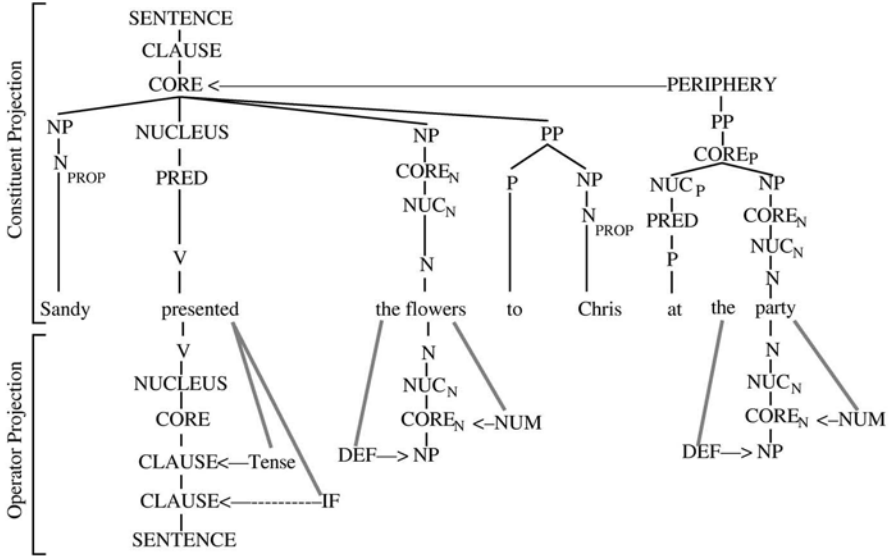
Figure 2. The layered structure of a simple English sentence

proper nouns and pronouns lack a layered structure, as they do not take operators. The PP headed by *to* does not have a layered structure, because *to* is non-predicative, i.e. it does not license its object, *Chris,* which is an argument of the verb *present,* which can be seen clearly in the alternative form *Sandy presented Chris with the flowers.* Illocutionary force in English is signaled by the position of the tense morpheme; when it is linearly core-internal, as in Figure 2, it signals declarative illocutionary force. There are additional possible positions in a sentence not represented here, e.g. the pre-core slot [PrCS], the position in which displaced question words occur in languages like English and German, and the left-detached position [LDP], the position of left-dislocated elements (see Figure 3).

Syntactic structures are stored as syntactic templates in the syntactic inventory in the grammar. Syntactic templates are language-specific syntactic forms which are composed of the universal components of the layered structure of the clause. There are principles which determine the selection of syntactic templates for semantics-to-syntax linking; the default principle is that the core template must have as many argument slots as there are arguments in the semantic representation of the core. Complex structures are composed of multiple templates, as illustrated in Figure 3. (The arrows with filled heads indicate selection of a template from the

syntactic inventory; the arrows with unfilled heads indicate combinatory operations.)
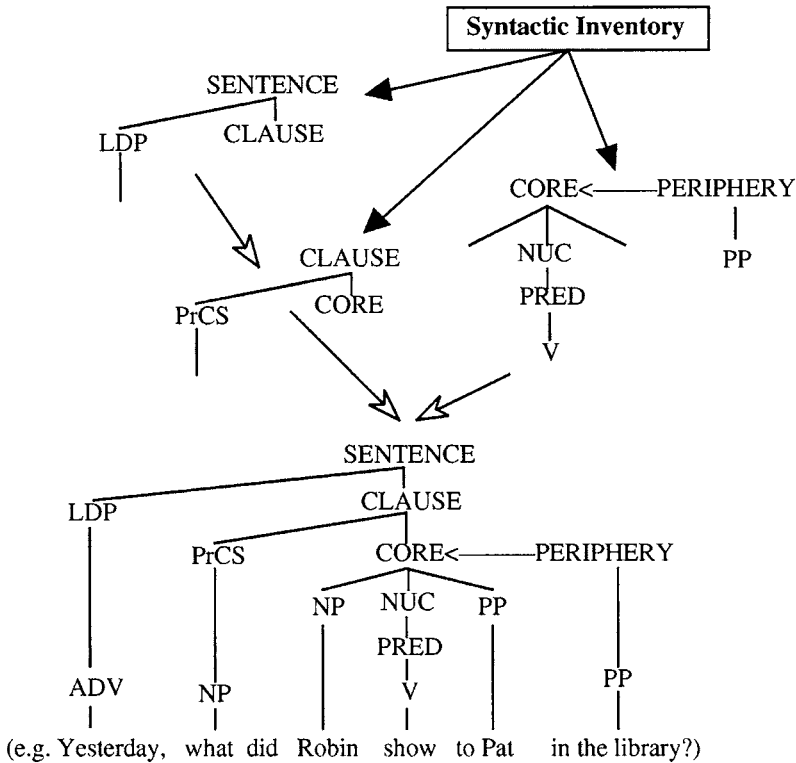
Figure 3. Combining syntactic templates from the syntactic inventory

The semantic representation of a sentence is based on the decompositional representation of the predicate in the nucleus. The decompositional system is based on the *Aktionsart* distinctions originally proposed in Vendler (1967), with some extensions. The classes are given in (1), with example sentences involving each type plus its causative counterpart are given in (2).

(1) a. States: *be sick, be tall, be dead, love, know, believe, have*
     b. Achievements: *pop, explode, collapse, shatter* (intransitive)
     c. Semelfactives: *flash, tap* (the intransitive versions); *cough, glimpse*

    d. Accomplishments: *melt, freeze, dry* (the intransitive versions); *learn, receive*

    e. Activities: *march, walk, roll* (the intransitive versions); *swim, think, rain, read, eat*

    f. Active accomplishments: *devour, walk to the store, eat the pizza*

(2) a. State: *The boy is afraid.*

      a'. Causative state: *The dog frightens/scares the boy.*

      b. Achievement: *The balloon popped.*

      b'. Causative achievement: *The cat popped the balloon.*

      c. Semelfactive: *The light flashed.*

      c'. Causative semelfactive: *The conductor flashed the light.*

      d. Accomplishment: *The ice melted.*

      d'. Causative accomplishment: *The hot water melted the ice.*

      e. Activity: *The soldiers marched in the field.*

      e'. Causative activity: *The sergeant marched the soldiers in the field.*

      f. Active accomplishment: *The soldiers marched to the field.*

      f'. Causative active accomplishment: *The sergeant marched the soldiers to the field.*

The decompositional system is adapted from that proposed in Dowty (1979); it is summarized in Table 1.

Table 1. Lexical representations for *Aktionsart* classes

Verb Class	Logical Structure
STATE	predicate' (x) or (x,y)
ACTIVITY	do' (x, [predicate' (x) or (x, y)])
ACHIEVEMENT	INGR predicate' (x) or (x,y), or
	INGR do' (x, [predicate' (x) or (x, y)])
SEMELFACTIVE	SEML predicate' (x) or (x,y)
	SEML do' (x, [predicate' (x) or (x, y)])
ACCOMPLISHMENT	BECOME predicate' (x) or (x,y), or
	BECOME do' (x, [predicate' (x) or (x, y)])
ACTIVE ACCOMPLISHMENT	do' (x, [predicate$_1$' (x, (y))]) & INGR
	predicate$_2$' (z, x) or (y)
CAUSATIVE	α CAUSE β, where α, β are LSs of any type

Examples of some English sentences with their logical structures are given in (3).

(3) a. STATES

The window is shattered.	**shattered**′ (window)
Fred is at the house.	**be-at**′ (house, Fred)

b. ACTIVITIES

The children cried.	**do**′ (children, [**cry**′ (children)])
Carl ate snails.	**do**′ (Carl, [**eat**′ (Carl, snails)])

c. ACHIEVEMENTS

The window shattered.	INGR **shattered**′ (window)
The balloon popped.	INGR **popped**′ (balloon)

d. SEMELFACTIVES

Dana glimpsed the picture.	SEML **see**′ (Dana, picture)
Mary coughed.	SEML **do**′ (Mary, [**cough**′ (Mary)])

e. ACCOMPLISHMENTS

The snow melted.	BECOME **melted**′ (snow)
Mary learned French.	BECOME **know**′ (Mary, French)

f. ACTIVE ACCOMPLISHMENTS

Carl ate the snail.	**do**′ (Carl, [**eat**′ (Carl, snail)]) & INGR **consumed**′ (snail)
Paul ran to the store.	**do**′ (Paul, [**run**′ (Paul)]) & INGR **be-at**′ (store, Paul)

g. CAUSATIVES

The dog scared the boy.	[**do**′ (dog, Ø)] CAUSE [**feel**′ (boy, [**afraid**′])]
Max broke the window.	[**do**′ (Max, Ø)] CAUSE [BECOME **broken**′ (window)]
The cat popped the balloon.	[**do**′ (cat, Ø)] CAUSE [INGR **popped**′ (balloon)]
Felix bounced the ball.	[**do**′ (Felix, Ø)] CAUSE [**do**′ (ball, [**bounce**′ (ball)])]
Mary fed the pizza to the child.	[**do**′ (Mary, Ø)] CAUSE [**do**′ (child, [**eat**′ (child, pizza)]) & INGR **consumed**′ (pizza)]

A more complete semantic representation of a clause contains operators as well. This is illustrated in (4) and (5).

(4)   Semantic representation of operators

$\langle_{IF}DEC\langle_{EVID}HS\langle_{TNS}PAST\langle_{STA}IRR\langle_{NEG}\emptyset\langle_{MOD}OBLG\langle_{EVQ}SG\langle_{DIR}\emptyset\langle_{ASP}PERF\langle LS\rangle\rangle\rangle\rangle\rangle\rangle\rangle\rangle\rangle$[3]

(5)   a.   Has Kim been crying?
       b. $\langle_{IF}INT\langle_{TNS}PRES\langle_{ASP}PERF\ PROG\langle \mathbf{do}'\ (Kim,\ [\mathbf{cry}'\ (Kim)])\rangle\rangle\rangle\rangle$

A key component of the RRG linking system is the semantic macroroles.[4] There are two semantic macroroles, actor and undergoer, which are the two primary arguments of a transitive predication; the single argument of an intransitive predicate can be either one, depending upon the semantics of the verb. This is illustrated in (6).

(6)   a.   Kim [Actor] ate the bagel [Undergoer].
       b.   The bagel [Undergoer] was eaten by Kim [Actor].
       c.   Chris [Actor] jogged in the park.
       d.   Pat [Undergoer] fell asleep in class.

Actor and undergoer are called 'macroroles' because each of them subsumes a number of more specific thematic relations; this is illustrated in (7).

(7)

		Actor	Undergoer
a.	The farmer [A] killed the duckling [U].	Agent	Patient
b.	The rock [A] broke the window [U].	Instrument	Patient
c.	The lawyer [A] received the summons [U].	Recipient	Theme
d.	Many tourists [A] saw the accident [U].	Experiencer	Stimulus
e.	Sally [A] presented Bill [U] with the award.	Agent	Recipient
e'.	Sally [A] presented the award [U] to Bill.	Agent	Theme
f.	The mugger [A] robbed Sam [U] of $50.	Agent	Source
f'.	The pickpocket [A] stole $50 [U] from Sam.	Agent	Theme
g.	The clown [A] amused the child [U].	Agent	Experiencer

The relationship between argument positions in logical structure and actor and undergoer selection is expressed in the Actor-Undergoer Hierarchy; it is given in Figure 4.[5]

ACTOR   UNDERGOER
———————————————————————>
         <————————————————————————————————
Arg of   1st arg of   1st arg of   2nd arg of   Arg of state
DO   **do′** (x,...**pred′** (x,y) **pred′** (x,y)   **pred′** (x)
   [——>' = increasing markedness of realization of argument as macrorole]

Figure 4. The Actor-Undergoer Hierarchy

This hierarchy states that the leftmost argument in the logical structure will be the actor and the rightmost the undergoer. While the actor selection principle is absolute and invariable across languages, there is variation with respect to undergoer selection; namely, with some verbs in some languages, it is possible to select a higher ranked argument as undergoer. This is exemplified in the English dative shift and transfer alternations in (8).

(8)   a. Sally gave the flowers [U] to Kim [NMR].
      a′. Sally gave Kim [U] the flowers [NMR].
      b. Sally presented the flowers [U] to Kim [NMR].
      b′. Sally presented Kim [U] with the flowers [NMR].
      c. [**do′** (Sally, Ø)] CAUSE [BECOME **have′** (Kim, flowers)]

In an active voice English core, the undergoer is the direct NP that immediately follows the nucleus. In (8a,b) the lowest ranking argument in the logical structure in (8c) is selected as undergoer; this is the default or unmarked selection. In (8a′,b′), on the other hand, the second lowest ranking argument has been selected as undergoer, yielding a marked selection.

Subject selection (or in RRG terms, 'privileged syntactic argument' [PSA] selection), is based on the hierarchy in (9) and the principles in (10).

(9)   Privileged syntactic argument [subject] selection hierarchy:
      arg of DO > 1st arg of **do′** > 1st arg of **pred′** (x, y) > 2nd arg of
      pred′ (x, y) > arg of **pred′** (x)

(10) Privileged syntactic argument ['subject'] selection principles:
      a. Accusative constructions: Highest ranking direct core argument
         in terms of (9)

b. Ergative constructions: Lowest ranking direct core argument in terms of (9)
c. Restrictions on PSA in terms of macrorole status:
    1. Languages in which only macrorole arguments can be PSA: German, Croatian, ...
    2. Languages in which non-macrorole direct core arguments can be PSA: Icelandic, ...

In an accusative language like English, the default choice for subject is the highest ranking macrorole in terms of (9), which would be the actor. It is possible to override this in a passive construction, in which the undergoer functions as subject (cf. (6b)).

The components of the RRG linking system are summarized in Figure 5.

SYNTACTIC FUNCTIONS: PSA   Direct Core Arguments   Oblique Core Arguments

Privileged Syntactic Argument [PSA] Selection: ⇕
Highest ranking MR = default (e.g. English)
Lowest ranking MR = default (e.g. Dyirbal)

SEMANTIC MACROROLES:

ACTOR				UNDERGOER
Arg of	1st arg of	1st arg of	2nd arg of	Arg of state
DO	**do**′ (x,...	**pred**′ (x, y)	**pred**′ (x, y)	**pred**′ (x)

Transitivity = No. of Macroroles   ⇕
    Transitive = 2
    Intransitive = 1
    Atransitive = 0

Argument Positions in **LOGICAL STRUCTURE**   ⇕

Verb Class   ⇕   Logical Structure

STATE   **predicate**′ (x) or (x, y)
ACTIVITY   **do**′ (x, [**predicate**′ (x) or (x, y)])
ACHIEVEMENT   INGR **predicate**′ (x) or (x, y)
SEMELFACTIVE   SEML **predicate**′ (x) or (x, y)
ACCOMPLISHMENT   BECOME **predicate**′ (x) or (x, y)
ACTIVE ACCOMPLISHMENT
do′ (x, [**predicate₁**′ (x, (y))]) & INGR **predicate₂**′ (z, x) or (y)
CAUSATIVE   α CAUSE β, where α, β are LSs of any type

Language- Universal

Figure 5. Summary of RRG linking system

The linking between syntax and semantics is subject to a general constraint called the 'Completeness Constraint'; it is given in (11).

(11) Completeness Constraint:
All of the arguments explicitly specified in the semantic representation of a sentence must be realized syntactically in the sentence, and all of the referring expressions in the syntactic representation of a sentence must be linked to an argument position in a logical structure in the semantic representation of the sentence.

In Figure 1, discourse-pragmatics is mentioned, and it plays a significant role in the linking algorithm, one which varies in important ways across languages. The status of the referent in context (e.g. well established, not mentioned but inferable, not mentioned and not inferable) strongly influences the type of linguistic expression used to denote it, and information-structural distinctions such as topic and focus can affect word order, case marking, subject selection and many other grammatical phenomena. See Van Valin and LaPolla (1997), sect. 7.6 for detailed discussion.

The linking algorithm from semantics to syntax is presented in (12). A detailed example will be presented below to illustrate its operation in English.

(12) Linking algorithm: Semantics to Syntax
1. Construct the semantic representation of the sentence, based on the LS of the predicator.
2. Determine the actor and undergoer assignments, following the Actor-Undergoer Hierarchy in Figure 4.
3. Determine the morphosyntactic coding of the arguments
   a. Select the PSA, based on the PSA selection hierarchy and principles in (9)–(10).
   b. Assign the argument(s) the appropriate case markers and/or adpositions.
   c. Assign the agreement marking to the main or auxiliary verb, as appropriate.
4. Select the syntactic template(s) for the sentence.
5. Assign argument(s) to positions in the syntactic representation of the sentence.
   a. Assign the [-WH] argument(s) to the appropriate positions in the clause.
   b. If there is a [+WH] argument, then, depending on the language,

1. assign it to the normal position of a non-WH-argument with the same function, or
2. assign it to the precore or postcore slot, or
3. assign it to a position within the potential focus domain of the clause (default = the unmarked focus position).
   c. A non-WH argument may be assigned to the precore or postcore slot, subject to focus structure restrictions (optional).
   d. Assign the argument(s) of LS(s) other than that of the predicator in the nucleus to
      1. the periphery (default), or
      2. the precore or postcore slot, or
      3. the left-detached position.

Let's suppose that the message that the speaker wants to convey is that Sandy gave some flowers to Chris at a party and that the verb *present* is selected for the sentence. The output of step 1 in (12) is given in Figure 6.

⟨$_{IF}$DEC⟨$_{TNS}$PAST⟨**be-at'** (party, [[**do'** (Sandy, Ø)] CAUSE [BECOME **have'** (Chris, flowers)]])⟩⟩⟩

Figure 6. Output of step 1 in (12)

The semantic representation of the NPs filling the argument positions is not given, in the interest of space. The next step is to assign macroroles, following the hierarchy in Figure 4. This verb allows variable undergoer assignment, but in this example the default selection will be made. The result is given in Figure 7, in which the logical structure of *present* has been illustrated.

...[**do'** (ACT: Sandy, Ø)] CAUSE [BECOME **have'** (NMR: Chris, UND: flowers)]...

Figure 7. Output of step 2 in (12)

It is important to keep in mind that the representation in Figure 7 is not a new 'level' of representation of any kind; it is an informationally enriched version of the representation in Figure 6. The next step involves adding morphosyntactic information to the representation. The actor will be the PSA ('subject'), yielding an active voice sentence, and then case,

prepositions and agreement are assigned (see Van Valin 2005, chs. 4, 5, for presentation of these rules).

...[**do**′ (ACT: Sandy, Ø)] CAUSE [BECOME **have**′ (NMR: to Chris, UND: flowers)]...
      [PSA: NOM]   Active, 3sg   [ACC]   [ACC]

Figure 8. Output of step 3 in (12)

The next step involves selecting the syntactic templates for the sentence, for the clause as well as for the NPs and PPs in it. Since there are three arguments in the semantic representation, a core with three argument slots is required. There are also NP templates for two proper nouns and two common nouns. The two PP templates are different, reflecting the contrast between a predicative preposition (which acts as a predicate, contributes semantically to the clause, and licenses its object, e.g. *at the party* in this example), which has a layered structure, and a non-predicative preposition (which is basically just a case marking an argument of the verb, e.g. *to Chris*), which does not have a layered structure. The operator slots are determined by the operator values in Figure 6 on next page, including the unrepresented NP operator values which would be represented in a complete semantic representation.

The final step is step 5, which is the assignment of the arguments in the logical structure to positions in the syntactic representation of the sentence. This involves linking referring expressions from the logical structure into the appropriate NP template, linking the objects of prepositions to their prepositional templates, and then finally linking the NPs and PPs to the structural positions in the clause. Step 5a is rather vaguely formulated, because these principles are to a large degree language-specific. In English, the subject (PSA) is the first NP in the core, while the undergoer is the immediately post-nuclear direct NP, followed by any oblique core arguments and then phrasal adjuncts. Step 5d is relevant in this example, because there is a logical structure, **be-at**′ (x, y), which is not part of the logical structure for *present* but rather takes the logical structure for *present* as one of its arguments. This is how adjunct PPs are represented semantically. The result of step 5 is the representation in Figure 2. An abbreviated representation of the entire semantics-to-syntax linking process is given in Figure 10; numbers refer to the steps in the linking algorithm.

SENTENCE
|
CLAUSE
|
CORE
|
NUCLEUS
|
PRED
|
V
:
V
|
NUCLEUS
|
CORE
|
CLAUSE<—Tense
|
CLAUSE<——IF
|
SENTENCE

<———————————PERIPHERY
|

PP
P   NP

PP
|
CORE$_P$
NUC$_P$ NP
|
PRED
|
P
|

NP
N$_{PROP}$

NP
|
CORE$_N$
|
NUC$_N$
|
N
:
N
|
NUC$_N$
|
CORE$_N$ <–NUM
|
DEF—> NP
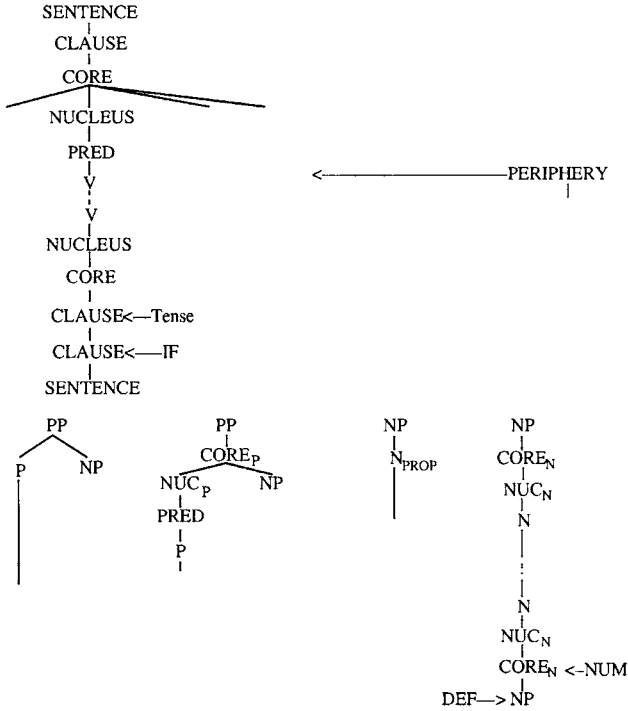
Figure 9. Output of step 4 in (12)
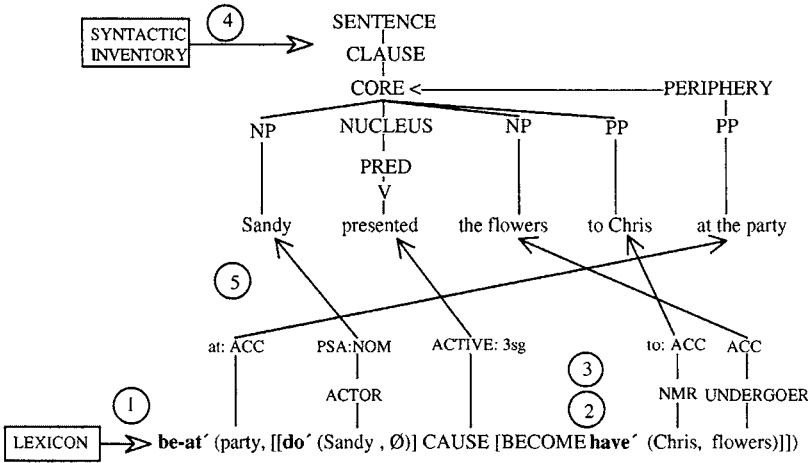
Figure 10. Abbreviated linking diagram summarizing Figures 6–9

Turning to the linking from syntax to semantics, the basic idea of the syntax-to-semantics algorithm is to glean all of the information possible from the overt morphosyntactic cues in the sentence and match that with information from the logical structure of the predicate in the nucleus. Executed properly for a grammatical sentence, the result should be that all referring expressions in the syntax are linked to an argument position in the semantic representation, and all argument positions in the semantics are linked as well, thereby satisfying the Completeness Constraint in (11). The syntax-to-semantics linking algorithm may be summarized as in (13).

(13) Linking from syntax to semantics (summary)
     a. The parser outputs a labeled tree structure.
     b. The first step is to derive as much information from the overt morphosyntactic features of the clause: case marking/word order, the voice of the verb, adpositions.
     c. The second step is to retrieve the LS of the verb from the lexicon and assign macroroles where possible.
     d. The information from these steps should link everything in the core to the argument positions in the LS; if there is an element in the PrCS, it will be linked last, to the remaining unlinked argument position in the LS.

Step (13a) is clearly an idealization that is appropriate for a grammatical theory but not, obviously, for a processing model. The issue of the interaction between the grammar and the parser will be a major topic in section 4.

The linking from syntax to semantics for the simple English sentence *Kim smashed the glass* is illustrated in Figure 11 on next page.

Step 1 involves recognizing the verb and its voice; since this is a transitive clause and the verb is active voice, then the PSA ('subject') is the actor and the postnuclear direct NP must be the undergoer. The second step involves retrieving the logical structure of the verb from the lexicon and assigning macroroles; in this case, the x argument is the actor and the y argument the undergoer. The third and final step involves matching the information from the first two steps: *Kim* is the actor, and the actor is the x argument, therefore *Kim = x*, and similar reasoning to arrive at *the glass = y*. The values of the operators would be read off the structure as well, yielding a more complete semantic representation.

An example involving a WH-question is given in Figure 12.

SENTENCE
|
PARSER ⟹ CLAUSE
|
CORE

NP   NUC   NP
|
PRED
|
① V
|
Voice? -- Active   Kim   smashed   the glass
∴ PSA = Actor | |
Actor   Undergoer
③
② Actor   Undergoer
| |
LEXICON ⟹ **[do´** (x, Ø)] CAUSE [BECOME **smashed´** (y)]
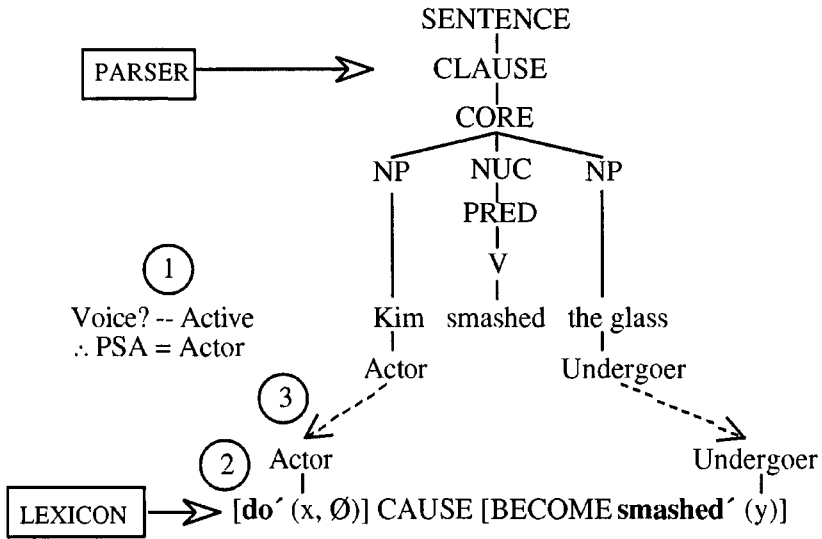
Figure 11. Syntax-to-semantics linking in simple English sentence

SENTENCE
|
PARSER ⟹ CLAUSE
|
CORE
PrCS
NP   NUC   PP
|
PRED
① |
NP   V
Voice? -- Active
∴ PSA = Actor   What   did   Sandy   present   to Chris
| | |
NP   Actor   to: NP
③
② Actor
|
LEXICON ⟹ **[do´** (x, Ø)] CAUSE [BECOME **have´** (y,   z)]
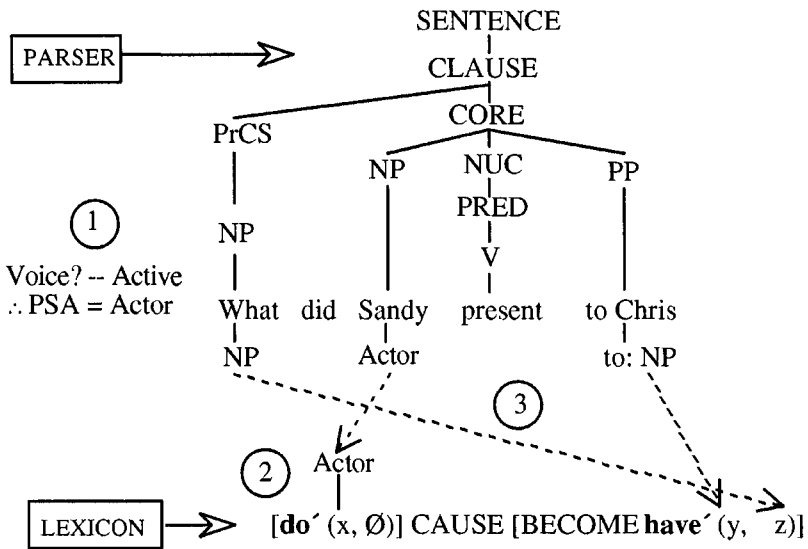
Figure 12. Linking from syntax to semantics in English WH-question

WH-questions in English are challenging, because the WH-word is functionally unmarked; *what, who* or *which X* could be actor, undergoer, or object of a preposition in a simple sentence, and the possibility of long-distance extraction adds even more complexity. The first step yields the following information: *what* is an NP, *Sandy* is an NP and the actor, because the verb *present* is active voice, and *Chris* is the object of the preposition *to*. In the second step the logical structure of *present* is activated, but unlike in Figure 11, the only macrorole that can be assigned is actor to the *x* argument; undergoer cannot be assigned, because this verb allows variable undergoer selection, as in (8). In the third step, the linking of *Sandy* to the *x* argument is straightforward. The linking of the non-actor arguments in this case is determined by the following principle: if the non-macrorole core argument with a three-place verb is marked by a dative or locative-type case or a locative adposition, it is linked to the first argument of ...**predicate'** (y, z) in the logical structure, otherwise to the second argument position in ...**predicate'** (y, z).[6] Hence in this example *Chris*, which is marked by a locative preposition (*to*), is linked to the *y* argument position (recipient). All of the XPs in the core have been linked, and there is one NP in the PrCS unlinked and one unlinked variable in the logical structure; in order for the Completeness Constraint to be satisfied, these two must be linked, yielding the correct result: the *z* argument is the thing given (theme), and that is the correct interpretation of *what*.

The semantic macroroles of actor and undergoer are central to both directions of linking; they are crucial interface notions between syntax and semantics, as they are determined semantically but play a vital role in the syntax. In addition to the subject selection principles in (10), the RRG rules governing case assignment, finite verb agreement and preposition assignment all crucially refer to semantic macroroles.

This presentation of the RRG linking algorithm has been highly simplified, but the basic outline of how it works should be clear. It has been applied to a broad range of phenomena in a significant number of languages; see Van Valin and LaPolla (1997), Van Valin (2005) and the references in the RRG bibliography for detailed exemplification. In the next two sections, the issue of how this linking theory fits with psycholinguistic models of production and comprehension will be addressed.

3.   RRG and language production

In the discussion of language production the model proposed in Levelt (1989) and Bock and Levelt (1994) will be employed. The model or 'blueprint' for the speaker proposed by Levelt is summarized in Figure 13.
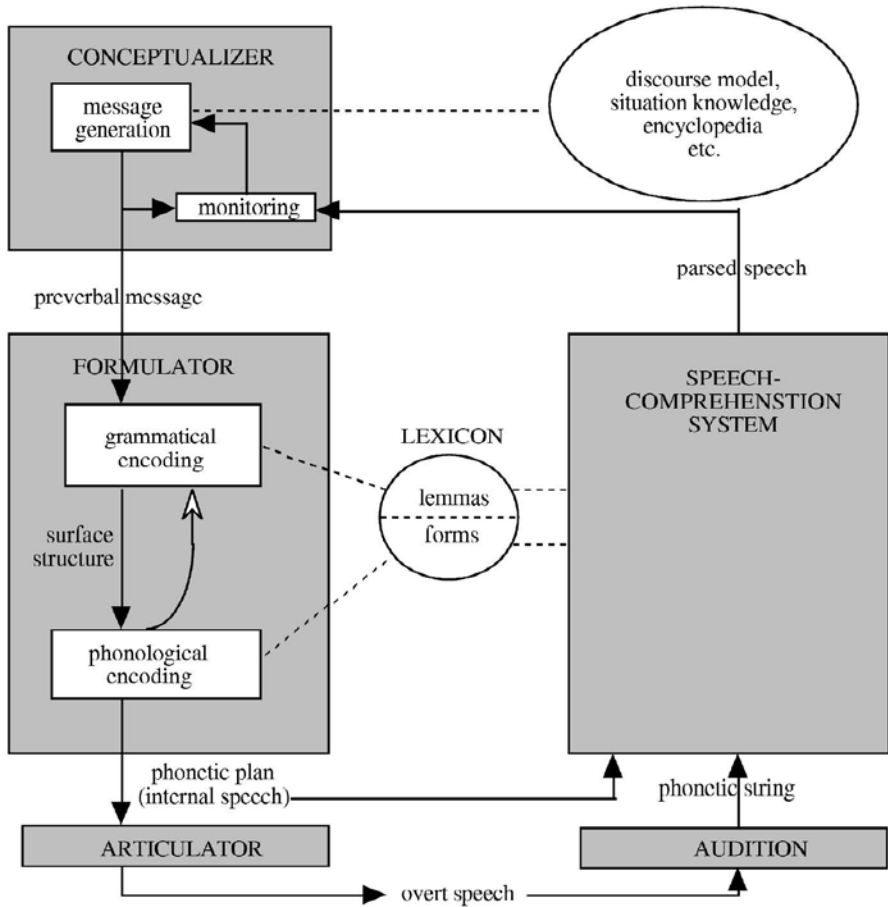
Figure 13. Blueprint for the speaker, from Levelt (1989)

The three grey boxes on the left along with the lexicon represent the components involved in production, and the only parts that RRG is relevant to are the lexicon and the box labeled 'grammatical encoding' in the FORMULATOR.

Bock and Levelt (1994) lay out what goes on grammatical encoding as follows. The first step is functional processing, which has two components: lexical selection and function assignment. Lexical selection is based on the output of the CONCEPTUALIZER, in which the message to be communicated is generated. The appropriate lemmas are activated, and a semantic representation of the message is created. Function assignment involves determining subject, direct object, etc., their case forms, and the inflectional properties of forms in the sentence. It is controlled primarily by what Bock and Levelt call 'event roles', i.e. thematic relations, and 'attentional roles', i.e. information-structural functions like topic and focus.The second major step is positional encoding, which likewise has two components, constituent assembly and inflection. Constituent assembly, as the term implies, involves putting together the syntactic framework for the sentence, and inflection concerns the overt morphosyntactic realization of the grammatical categories such as tense, agreement, and case. In positional processing, the elements that were the output of functional processing are now mapped into positions in a syntactic structure and their inflections morphologically instantiated. The output of this process is sent to the next component for phonological encoding.

The process described by Bock and Levelt is similar to semantics-to-syntax linking in RRG. Lexical selection corresponds to step 1, in which the semantic representation of the sentence is constructed, based on the logical structure of the predicator; see Figure 6. Function assignment corresponds to steps 2 and 3 in (12): macrorole assignment and PSA ('subject') selection, along with the determination of the case and agreement properties of the arguments and predicator. Event roles (as represented by argument positions in logical structure) are an integral part of macrorole assignment, and attentional roles may affect subject selection, case assignment and other morphosyntactic processes in some languages. The information that results from functional processing (see Bock and Levelt (1994: 968), Figure 5) is very close to that given in Figure 8, the output of step 3 in (12). Positional encoding subsumes steps 4 and 5 in (12). Constituent assembly is, in RRG terms, the combining of syntactic templates to create the syntactic framework for the sentence (see Figures 3, 9), and then the elements in the representation in Figure 8 are linked to positions in the syntactic structure and their inflectional properties are realized as well. The output of these two steps is a pre-phonological, morphosyntactic representation of the sentence, just as in Bock and Levelt's model.

Levelt (1989) and Bock and Levelt (1994) argue for the components of their model based on extensive psycholinguistic evidence. The RRG linking algorithm in (12) is the result of research on the clause-internal morphosyntax of a large number of typologically quite diverse languages. Yet the two models parallel each other in a most striking and direct way, and this convergence can be seen clearly in Figure 14. This suggests that RRG is in fact a plausible model of grammatical encoding, i.e. the grammatical facet of speech production, and conversely, this parallel provides strong linguistic support for the Bock and Levelt model.
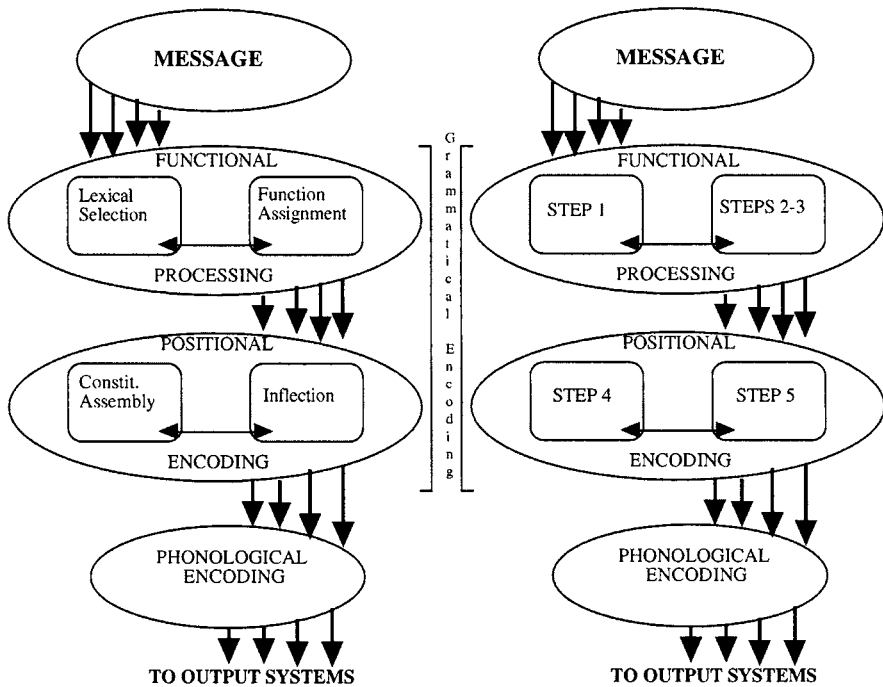
From Bock and Levelt (1994)   Bock and Levelt model restated
                                     in terms of the RRG Semantics-to-
                                     Syntax Linking Algorithm

Figure 14. Grammatical encoding in Bock and Levelt (1994) and in RRG

4. RRG and language comprehension

The summary of the syntax-to-semantics linking algorithm in (13) begins with an idealization that is quite reasonable from a grammatical point of view but not from a psycholinguistic point of view: the parser outputs a labeled syntactic tree structure, and then the linking rules apply to interpret it. The evidence from studies of sentence comprehension is overwhelming that speakers do not wait until they hear the entire sentence before they start to interpret it; rather, the interpretation process begins as soon as the first constituents are recognized. Furthermore, the idealization that all core-internal elements are linked before an element in the pre-core slot is linked, as in (13d) and Figure 12, is also not psycholinguistically plausible; rather, the evidence is that speakers try to give the WH-word an interpretation as soon as possible (see e.g. Stowe 1985; Clifton and Frazier 1989; Boland, et al. 1995; Traxler and Pickering 1996; Koenig, et al. 2003. Hence evaluating the RRG syntax-to-semantics linking algorithm with respect to language comprehension is a more complex task than the one in the previous section.

Since parsing and interpretation occur simultaneously, it is necessary to integrate the RRG system into the parser as well as the interpretive mechanism. One way this could be accomplished is suggested by the approach to sentence comprehension put forth by Townsend and Bever (2001). They propose a two-phase comprehension process: the first is called 'pseudosyntax', which is statistical and results in an initial assignment of syntactic structure and thematic relations, and the second, which they call 'real syntax', is a Chomsky (1995)-style minimalist derivation to check the results of the first phase. They adduce a large amount of convincing evidence for the initial phase and very little for the second. Their model as a whole will not be adopted here; rather, the focus will be on the 'pseudosyntax' phase, since it involved parsing and assigning the initial interpretation to the sentence. They characterize it as follows.

> *Pseudosyntax* consists of the immediate initial processes that isolate major phrases, differentiate lexical categories, and assign initial thematic relations. Pseudosyntax involves recognition of function morphemes and lexical categories, which segregate and distinguish phrases and verbs. Assignment of words to syntactic categories and major phrases coincides with the application of frequent sentence patterns that assign these phrases to thematic roles. The sentence patterns that are appropriate for a particular sentence depend on subcategorization properties of verbs.
>
> (Townsend and Bever 2001: 187)

They label the 'frequent sentence patterns' referred to above 'canonical sentence templates', with the statistically dominant one being 'NVN = actor action patient'. They present considerable experimental evidence supporting the role of canonical sentence templates in 'pseudosyntax' (see their Chapter 7). Thus, 'pseudosyntax' involves statistically-driven templatic parsing, in which the templates contain information about the thematic relations of the XPs.

How could 'pseudosyntax' be implemented in RRG terms? The notion of syntactic template was introduced in section 2, and for the purposes of parsing there could be macrorole-augmented syntactic templates. Hence a somewhat simplified version of the RRG equivalent of Townsend and Bever's NVN template would be as in Figure 15.
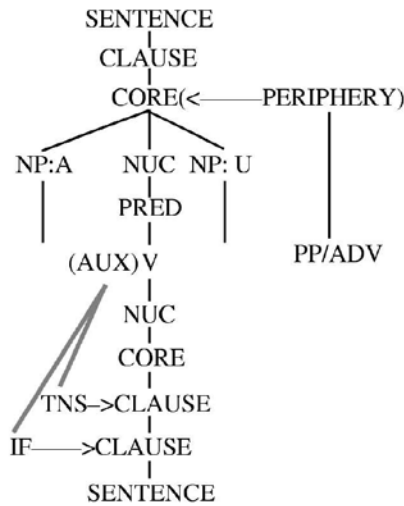
Figure 15. NP-V-NP template

The use of semantic macroroles in the templates has a distinct advantage over thematic relations. If the templates were augmented with thematic relations, then there would not be one NP-V-NP template but many, each with different combinations of thematic relations. For the English sentences in (7a–d,g), for example, five different subtypes of the template would be required, because there are five different combinations of thematic relations in these sentences. But all of them conform to the Actor-V-Undergoer template in Figure 15, which provides the basic interpretation of all of them. Tense and illocutionary force are both included in the operator

projection of each template, because they are the obligatory operators in every English utterance.

Let us further postulate that the logical structures of verb and other predicates are stored in the lexicon with the macrorole assignments of their arguments precompiled as much as possible, in order to expedite interpretation. Verbs such as *present* and *give,* which allow variable undergoer assignment, could have two logical structures, one with each possible assignment. Moreover, the logical structures could also have templates for possible operators. This could be represented as in (14).

(14)   Lexical representations for English verbs and other predicates
    a.   ⟨IF ⟨TNS ⟨STA ⟨NEG ⟨MOD ⟨DIR ⟨ASP **⟨LS⟩**⟩⟩⟩⟩⟩⟩⟩
    b.   e.g. *kill* [**do′** (A: x, Ø)] CAUSE [BECOME **pred′** (U: y)]
    c.   e.g. *present* [**do′** (A: x, Ø)] CAUSE [BECOME **have′** (U: y, *with*: z)]
    c′.   [**do′** (A: x, Ø)] CAUSE [BECOME **have′** (*to*: y, U: z)]

When there are multiple logical structures for a single verb, as in (14c), each of them would be assigned a statistical value based on their relative frequency of occurrence.

Some additional templates for simple sentences in English are given in Figure 16a and b.

Figure 16a. Additional templates

Figure 16b. Additional templates

No macrorole information needs to be added to the NP-V template, since the single argument in the syntax will correspond to the single argument in the logical structure by definition.

The final component required is a beam-search algorithm of the kind proposed in Jurafsky (1996). Such a search algorithm considers candidate structures and lexical items within a specific range of probability, dropping candidates that fall outside that range as the process moves forward.

The operation of this system may now be illustrated through a couple of relatively simple examples. The sentence in Figure 11, *Kim smashed the glass,* would be analyzed as in (15).

(15)   Simple example: *Kim smashed the glass.*
   1. Templates activated.
   2. NP-V-NP template selected, yielding Figure 17.[7]
   3. LS retrieved from lexicon:
      $\langle_{\text{IF}} \langle_{\text{TNS}} \langle_{\text{STA}} \langle_{\text{NEG}} \langle_{\text{MOD}} \langle_{\text{DIR}} \langle_{\text{ASP}} \langle$ [**do´** (A: x, Ø)] CAUSE [BECOME **smashed´** (U: y)] $\rangle\rangle\rangle\rangle\rangle\rangle\rangle\rangle$
   4. XPs linked to argument positions in LS via annotations:
      $\langle_{\text{IF}} \langle_{\text{TNS}} ... \langle$ [**do´** (A: Kim, Ø)] CAUSE [BECOME **smashed´** (U: the glass)]... $\rangle\rangle\rangle$

5. Tense and other operators added:

⟨$_{IF}$ *DEC* ⟨$_{TNS}$ *PAST*⟨[**do**′ (A: Kim, Ø)] CAUSE [BECOME **smashed**′ (U: the glass)]⟩⟩⟩

SENTENCE
|
CLAUSE
|
CORE
/ | \
NP: A   NUC   NP: U
| | |
  PRED
| | |
  V
Kim   smashed   the glass
|
NUC
|
CORE
|
CLAUSE←–TNS
|
CLAUSE←————IF
|
SENTENCE

Figure 17. Output of step 2 in (15)

The NP-V-NP template is the only one that completely matches the input string, and so it is selected. The macrorole annotations on the template and in the logical structure for *smash* make interpretation, i.e. linking of the NPs in the sentence to argument positions in the logical structure, virtually instantaneous, once the logical structure is accessed.

A slightly more complex example involving a three-place verb is given in (16).

(16)   *Sandy presented Chris with the flowers.*
1. Templates activated.
2. Three-place verb template selected, since it alone fits the NP-V-NP-PP pattern, yielding Figure 18.
3. LS retrieved from lexicon; (14c) selected because of preposition *with*:

⟨$_{IF}$ ⟨$_{TNS}$ ⟨$_{STA}$ ⟨$_{NEG}$ ⟨$_{MOD}$ ⟨$_{DIR}$ ⟨$_{ASP}$ ⟨[**do**′ (A: x, Ø)] CAUSE [BECOME **have**′ (U: y, *with*: z)]⟩⟩⟩⟩⟩⟩⟩⟩

4. XPs linked to argument positions in LS via annotations:

⟨$_{IF}$ ⟨$_{TNS}$ ... ⟨[**do**′ (A: Sandy, Ø)] CAUSE [BECOME **have**′ (U: Chris, *with*: flowers)]... ⟩⟩⟩

5. Tense and other operators added:
$\langle_{IF}$ *DEC* $\langle_{TNS}$ *PAST*$\langle$[**do**´ (A: Sandy, Ø)] CAUSE [BECOME **have**´ (U: Chris, *with*: flowers)]$\rangle\rangle\rangle$

```
                    SENTENCE
                     CLAUSE
                       CORE

      NP:A     NUC   NP: U   PP: NMR
               PRED
                V
      Sandy  presented Chris with the flowers
               NUC
               CORE
           CLAUSE<–TNS
           CLAUSE<———IF
             SENTENCE
```

Figure 18. Output of step 2 in (16)

Again, the linking of the XPs in the syntax to argument positions in the logical structure is immediate and straightforward because of the macrorole annotations on both representations. It is worth mentioning again the advantage of using macroroles instead of thematic relations. If the templates were augmented with thematic relations, then the correct template could not be selected until the verb had been identified and its theta-grid or argument structure accessed, since the template for *John saw Mary* would have to be different from the one for *John kissed Mary,* given the differences in thematic relations across the two sentences. In macrorole terms, however, the two are identical, and one template works for both, just as it works for all of the sentences in (7a–d, g). Hence selection of the correct syntactic template does not depend on prior identification of the predicate in the nucleus in an approach utilizing semantic macroroles.

As noted at the beginning of this section, WH-questions pose a problem for a simple adaptation of the syntax-to-semantics linking algorithm to a comprehension model, since speakers do not appear to wait until all of the other elements in the clause are linked before trying to interpret the WH-

expression. The early interpretation of WH-expressions can, however, be handled in terms of annotated templates. The templates for 'subject' and 'non-subject' WH-questions in English are given in Figure 19; active voice is assumed for both.

'Subject' WH-Q template   'Non-subject' WH-Q template

Figure 19. WH-question templates

The templates clearly differentiate 'subject' from 'non-subject' WH-questions; the second template represents only one of the 'non-subject' possibilities. An example of how these templates work is given in (17).

(17) *What did Sandy present to Chris?*
1. Templates in Figure 19 and others activated
2. 'Non-subject' WH-Q template selected, yielding Figure 20:
3. LS in (14c′) retrieved from lexicon:
   $\langle$IF $\langle$TNS $\langle$STA $\langle$NEG $\langle$MOD $\langle$DIR $\langle$ASP $\langle$[**do**′ (A: x, Ø)] CAUSE [BECOME **have**′ (*to*: y, U: z)])$\rangle\rangle\rangle\rangle\rangle\rangle\rangle\rangle$
4. XPs linked to argument positions in LS:
   $\langle$IF $\langle$TNS ... $\langle$[**do**′ (A: Sandy, Ø)] CAUSE [BECOME **have**′ (*to*: Chris, U: what)]...$\rangle\rangle\rangle$
5. Tense and other operators added:
   $\langle$IF *INT* $\langle$TNS *PAST* $\langle$[**do**′ (A: Sandy, Ø)] CAUSE [BECOME **have**′ (NMR: Chris, U: what)]$\rangle\rangle\rangle$

```
                        SENTENCE
                           |
                        CLAUSE
                   _____|_____
                  |               CORE
                PrCS         _____|_____
                  |        NP:A  NUC  PP: NMR
               NP: −A        |   PRED    |
               [WH]          |    |      |
                  |          |    Y      |
               What  did  Sandy present  to Chris?
                                |
                               NUC
                                |
                               CORE
                                |
                          TNS–>CLAUSE
                                |
                       IF——>CLAUSE
                                |
                            SENTENCE
```

Figure 20. Output of step 2 in (17)

Here again, the interpretation is determined by the annotations on the template and those on the logical structure, and the recognition of the template immediately supplies the interpretation of the WH-expression as actor or non-actor. Obviously, these are very simple examples, but they illustrate how a macrorole-annotated system of syntactic templates could function in a language comprehension system. From an RRG perspective, there is nothing 'pseudo' about pseudosyntax; the syntactic structures and interpretive principles required are taken directly from the grammatical model.

What happens when breakdowns such as garden paths occur? What happens when an unfamiliar structure is encountered? These are situations in which step-by-step reparsing and reinterpretation is required (Fodor and Inoue 1994), and this can be straightforwardly handled in the RRG system: in addition to the kind of templatic processing discussed above, there is also the option of step-by-step processing as well. In this mode, the syntactic representation of the sentence is constructed, and then the steps of the syntax-to-semantics linking algorithm are executed in a deliberate manner which allows for double checking of all relevant features of the construction. In other words, this mode mirrors the procedures depicted in Figures 11 and 12.

The discussion thus far has concerned comprehension processes in a language with fixed word order in which the position of an NP in the clause

determines its interpretation for the most part. The situation is potentially very different in languages with flexible word order which rely on case marking to signal semantic functions, such as German, Russian and Dyirbal. For such languages fixed templates with semantic macroroles assigned to specific positions in the core are not (directly) relevant to the comprehension process. Rather, the macrorole information that is derived from positional information in English-type languages is derived from case marking on NPs. Accordingly, it is necessary to separate the case-to-macrorole mapping relations from the syntactic templates. This can be accomplished by using the kind of 'bare' templates as in Figure 9. An example of a possible German template is given in Figure 21; it includes a precore slot structure for clauses with an initial WH-word or non-WH NP.
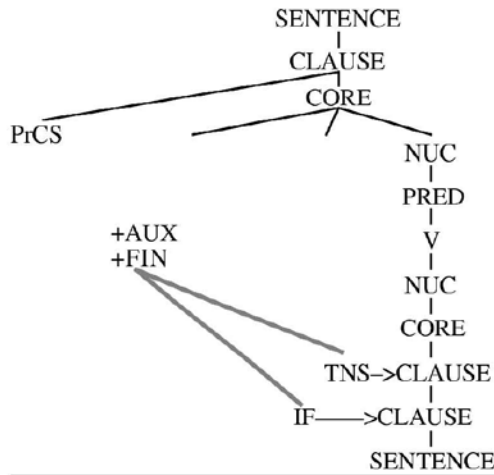
Figure 21. Possible German template

This represents main clauses in which there is either a modal auxiliary element or a tense other than the simple present or past. There is neither syntactic category nor macrorole information in the template. There is no category information because either the precore slot or the pre-nuclear position could be filled by NPs or PPs, depending on the verb, and there is no macrorole information, unlike the templates in Figures 15, 16 and 19, because macrorole interpretation in German is independent of position in the clause.

The case-to-macrorole relations can be captured in terms of what might be called 'case association principles', examples of which are given in (18).

(18) Case association principles for German
      a. NOM [Actor > Undergoer]
      b. ACC [Undergoer]
      c. DAT [NMR]
      d. GEN [NMR]

These case association principles express the interpretation of the different cases in terms of macroroles; they represent the interpretation that would result if one extrapolated back from the different cases using the standard RRG case assignment rules for an accusative language. The nominative case is marked 'Actor > Undergoer' to reflect that the default interpretation of the nominative is as actor, but with passive verbs or with a certain class of intransitive verbs, it can be an undergoer, cf. the English examples in (6). In addition, there is a correlation in German between nominative case and 'subject' (privileged syntactic argument, in RRG terms), and this is independent of the correlation between nominative case and actor, since it applies to cores with passive verbs. In finite clauses the one syntactic property that the 'subject' always has is that it is the controller of verb agreement.

The application of the syntactic template in Figure 21 and the case templates in (18) to a sentence like (19a) is summarized in (19b).

(19) a. *Den Hut*   *ha-t*   *der Mann*
         the.MsgACC hat   have-3sgPRES   the.MsgNOM man
         der Frau   *geschenkt.*
         the.FsgDAT woman   give.PSTP
         'The hat the man gave to the woman [as a gift].'
      b. 1. a. Template in Figure 21 and others activated
            b. Ditransitive with PrCS template selected
         2. Case association principles are applied, yielding Figure 22:
         3. LS retrieved from lexicon;
            $\langle_{\text{IF}} \langle_{\text{TNS}} \langle_{\text{STA}} \langle_{\text{NEG}} \langle_{\text{MOD}} \langle_{\text{DIR}} \langle_{\text{ASP}} \langle [\textbf{do}' \text{ (A: x, Ø)]}$
            CAUSE [BECOME **have**′ (NMR: y, U: z)]$\rangle\rangle\rangle\rangle\rangle\rangle\rangle\rangle$
         4. XPs linked to argument positions in LS via annotations:
            $\langle_{\text{IF}} \langle_{\text{TNS}} ... \langle [\textbf{do}' \text{ (A: Mann, Ø)]}$ CAUSE [BECOME **have**′
            (NMR: Frau, U: Hut)]... $\rangle\rangle\rangle$
         5. Tense and other operators added:
            $\langle_{\text{IF}}$ *DEC* $\langle_{\text{TNS}}$ *PAST*$\langle [\textbf{do}' \text{ (A: Man, Ø)]}$ CAUSE [BECOME
            have′ (NMR: Frau, U: Hut)]$\rangle\rangle$

SENTENCE
|
CLAUSE
|
CORE

PrCS
NP:NOM NP:DAT|NMR| NUC
[PSA; A]
PRED

NP: ACC|U|
|
Den Hut   hat   der Mann   der Frau   geschenkt

|
V
|
geschenkt

NUC<—ASP
|
CORE
|
TNS–>CLAUSE
|
IF——>CLAUSE
|
SENTENCE
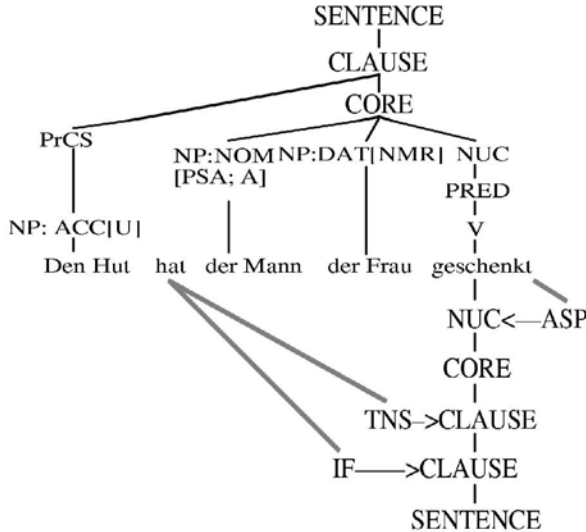
Figure 22. Output of step b2 in (19)

There are situations in German in which the case system breaks down, in the sense that the case markings fail to unambiguously indicate the semantic macroroles of the arguments. This possibility is illustrated in (20).

(20) *Die Frau   ha-t   das Mädchen   gesehen.*
      the.FsgNOM/ACC have-3sgPRES the.NsgNOM/ACC see.PASTP
      'The woman saw the girl,' or 'The girl saw the woman.'

Both of the readings in the translation are grammatically possible, but there is an overwhelming preference for the first interpretation. In light of this preference, the question arises as to what interpretation is being given to the NPs in such a sentence. If the case markings signal semantic macroroles, then the lack of unambiguous case marking entails that no semantic macroroles are being associated directly with these arguments. In other words, no case association principle from (18) can be selected. Rather, it appears that the first NP is being interpreted as the 'subject', i.e. the agreement trigger, and this assignment leads to the interpretation of the NP as the actor, once the voice and meaning of the verb have been processed. This suggests that there is an additional interpretive rule in German, which applies when a case association principle in (18) cannot be selected; it is given in (21).

(21)   In clauses with non-distinctive case marking, interpret the first NP as
the agreement trigger.

In the processing of a sentence like (20), (21) rather than any of the
principles in (18), will guide the interpretation. The macrorole interpre-
tation of the agreement trigger (PSA) is determined from the voice of the
verb, as in step 1 in Figure 11.

For a processing model to handle languages like English and like
German, it must encompass both position-based and case-based macrorole
interpretation. The Argument Dependency Model [ADM] (Bornkessel
2002; Schlesewsky and Bornkessel 2004; Bornkessel and Schlesewsky, this
volume) provides for both types of interpretation. It contains three phases,
which may be characterized as in (22).

(22)   Argument Dependency Model
a. Phase 1: basic constituent structure and morphological analyses
b. Phase 2: determination of syntactic and thematic relations among
elements in sentence
1. In sentences with unambiguous case marking, the relational
interpretation of NPs is based on the case marking.
2. In sentences without unambiguous case marking, the relational
interpretation of NPs is based on the position of NPs in the
clause.
c. Phase 3: "all of the information types processed separately during
phase 2 are integrated with one another and reanalysis processes
are initiated if necessary" (Schlesewsky and Bornkessel 2004:
1228).

ADM posits two different interpretive pathways in phase 2, one based
on morphology and the other based on word order. In German, the two
pathways operate simultaneously, and information derived from the
morphology pathway, the case association principles in (18), has priority
over the interpretation based on (21), when they conflict. Only the
positional pathway yields an interpretation at step 2 when there is
insufficient morphological information to determine macrorole assignment,
as in (20). The processing in (19b) illustrates morphologically based
interpretation. In English, on the other hand, only the second pathway is
available, due to the lack of distinctive case marking.[8] This is exemplified
in (15)–(17).

ADM builds upon Friederici's (1999, 2002) neurocognitive model of language comprehension, and its three phases correspond to the three phases proposed in Friederici's model. The architecture of ADM and how RRG maps onto it are summarized in Figure 23.
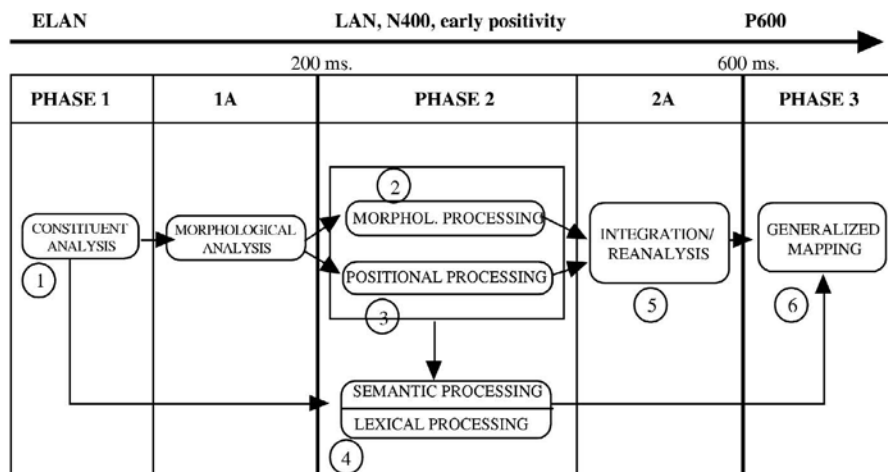
Figure 23. The Argument Dependency Model [ADM] (Bornkessel 2002, Schlesewsky and Bornkessel 2004, Bornkessel and Schlesewsky, this volume)

(1) in phase 1 involves template selection and identification of the verb or predicating element. (2) in phase 2 is the mapping from case marking to macroroles using the case association principles in (18). (3) in phase 2 is the positional interpretation of NPs; in languages like English it involves the mapping from structural positions to macroroles, as in (15)–(17), while in a language like German it involves the principle in (21). In (4) in phase 2, the logical structure of verb/predicating element is selected and skeletal semantic representation of sentence is constructed, i.e. step 3 in e.g. (15) and (16). (5) in phase 2A involves reanalysis of macrorole and other semantic function assignments, when there is a clash between results of thematic and syntactic processing. Finally, (6) in phase 3 finishes off the syntax-to-semantics linking. RRG thus fits rather naturally with ADM, and there are encouraging initial experimental results involving RRG and ADM reported in Bornkessel, Schlesewsky and Van Valin (2004) and Bornkessel and Schlesewsky (this volume).

5.   Conclusions

This paper has investigated the function of semantic macroroles in language production and comprehension, and this entailed an examination of the relationship between the linguistic theory in which semantic macroroles play an integral part, Role and Reference Grammar, and specific models of language production and comprehension. Macroroles have been shown to be relevant to both production and comprehension. In terms of Levelt's blueprint for the speaker in Figure 13, it has been argued that the RRG semantics-to-syntax linking algorithm is a good model for the grammatical encoding process in the FORMULATOR in the production process, and that the constituents of the syntax-to-semantics linking algorithm constitute a plausible parsing and interpretation component for the SPEECH-COMPREHENSION SYSTEM. In particular, there seems to be a natural fit between RRG and ADM. This discussion has shown that the components of a linguistic theory can be used directly in psycholinguistic models of language processing. This suggests that RRG has potential as a psychologically real model of the human language capacity, but any firmer conclusions along these lines must be confirmed by experimental testing of predictions generated by RRG analyses, something which is beyond the scope of this paper.[9] This also provides support for the psycholinguistic models: their grammatical components are now supported by the weight of considerable cross-linguistic evidence.

Does the application of a linguistic theory like RRG to language processing have any consequences for the theory itself? The answer seems to be 'yes'. RRG analyses have striven to posit as little idiosyncratic information in the lexical entries of verbs as possible and to derive as many of their properties as possible from general rules and principles. This has meant, for example, having general principles governing macrorole assignment and general rules to assign the prepositions that mark oblique core arguments. While this is desirable from a linguistic point of view, since these general rules and principles capture linguistically significant generalizations, this is not necessarily desirable from a processing point of view. From this perspective, the fewer rules that have to be applied the better, and the more information that is precompiled, the more efficiently the system will operate. The value of precompiling became quite clear in the discussion of comprehension. The parsing templates contain the output of the first step in the syntax-to-semantics linking algorithm precompiled in them, i.e. which argument is actor, which is undergoer, what the preposition marking the oblique core argument is. The logical structures in

(14) likewise contain the information from the next step precompiled: macrorole assignment and preposition assignment. This precompiling reduces the syntax-to-semantics linking to a single step: match the information on the template to the information on the logical structure, resulting in a very fast and efficient comprehension process. Moreover, this eliminates the disparity, noted at the beginning of section 4, between the treatment of WH-expressions in the PrCS in the linking algorithm in (13) and the psycholinguistic evidence that they are interpreted as quickly as possible: with precompiling, the WH-expression is assigned an interpretation right away and not after all of the other elements have been linked. Thus, the comprehension system has taken the syntactic templates and syntax-to-semantics linking rules and precompiled them into semantically augmented syntactic templates and informationally-enriched logical structures, yielding an efficient adaptation of the grammar for parsing and interpretation.

This is not without implications for semantics-to-syntax linking as well. Assuming that the same logical structures are used in both production and comprehension, the precompiling of macrorole and preposition assignment would mean that step 2 and part of step 3 in (12) would fall together into step 1; they are all part of functional processing in Bock and Levelt's model. If the lexicon in an RRG grammar were to be organized in what is possibly the most efficient way for language processing, then macrorole information and prepositions would be precompiled in logical structures. The generalizations about macrorole assignment and preposition assignment would be captured by the general principles and rules which hold across all entries in the lexicon.

Acknowledgements

Notes

1. It might be suggested that this would be true of any syntactic theory, and in a very general sense that is correct: to the extent that processing models contain a grammatical component, any grammatical model could in principle be plugged in. However, RRG is different from most other grammatical models by explicitly being bidirectional in its linking system: from semantics to syntax, and from syntax to semantics. Since it is quite clear psycholinguistically and neurolinguistically that production and comprehension are quite distinct processes, there is no reason to suppose that the two directions of linking should be identical, either. However, most grammatical theories are not bidirectional, positing a unidirectional relationship or mapping between syntax and semantics; this is particularly true of derivational theories.
2. For detailed presentations of RRG, see Van Valin and LaPolla (1997) and Van Valin (2005). A bibliography of work in RRG can be found at http://linguistics.buffalo.edu/research/rrg.html.
3. Abbreviations: A, ACT 'actor', ACC 'accusative', ASP 'aspect', DAT 'dative', DEC 'declarative', DIR 'directionals', EVID 'evidentials', EVQ 'event quantification', HS 'hearsay', IF 'illocutionary force', INT 'interrogative', IRR 'irrealis', LS 'logical structure', MOD 'modality', NEG 'negation', NMR 'non-macrorole', NOM 'nominative', OBLG 'obligation', PASTP 'past participle', PERF 'perfective', PRES 'present', PROG 'progressive', PSA 'privileged syntactic argument', STA 'status', TNS 'tense', U, UND 'undergoer'.
4. See Van Valin (1999, 2003) for detailed discussion of semantic macroroles.
5. Certain complications arise in what are called 'primary-object languages' (Dryer 1986); see Van Valin (2005) and Guerrero and Van Valin (2004) for detailed discussion.
6. This is not an English-specific principle; as shown in Van Valin and LaPolla (1997) and Van Valin (2005), it applies to a wide range of languages, including Dyirbal and Croatian.
7. The selection of the NP-V-NP template in Figure 15 is the endpoint of a process of activating compatible templates, ranking them (Gorrell 1987) in terms of frequency (Jurafsky 1996) and other factors, such as minimality (Schlesewsky and Friederici 2003), and selecting the most highly ranked template at each constituent. In this way templatic parsing is compatible with incremental parsing. Detailed discussion of the factors in template ranking and selection are beyond the scope of this paper.
8. The case marking differences among English pronouns are basically irrelevant, as they are completely redundant with respect to the information supplied by word order, which is the same for full NPs and pronouns.
9. Work on language acquisition using RRG is supportive as well; see Van Valin and LaPolla (1997), Epilog, and Van Valin (1998, 2001, 2002), Weist (2002).

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Thematic roles as event structure relations[1]

Maria Mercedes Piñango

1. Introduction

Research on language representation and language processing converges on
the observation that auditory sentence comprehension arises from the
combined efforts of syntactic representation grouping meaning-bearing
units (lexical items) in the form of phrases according to hierarchical
principles (e.g. x-bar schema). Crucial to the comprehension process is the
interpretation of "participant" roles (i.e., individuals in an event). Beyond
their referential properties, these elements tend to be represented syntacti-
cally as noun phrases (NP's) and semantically as (semantic/ thematic) roles
– where this semantic relation is obtained from the semantics of the
predicate with which the specific argument appears. At issue is therefore
the nature of the relation between these two kinds of information, and the
implications of this relation to our understanding of how syntactic and
semantic structure in general come together during sentence comprehen-
sion. Accordingly, the present article asks the following questions: What
are the principles that guide the correspondence between thematic roles
(i.e., argument structure) and syntactic structure (i.e., NP's) in a sentence?
What contribution do lexical and compositional factors make to this
process? What do they tell us about thematic role organization, in particu-
lar, and about the organization of the language faculty in general? These
questions are explored from a processing perspective, capitalizing on the
patterns of impairment observed in Broca's aphasia in the context of
sentence comprehension in the normal system.
These questions are prompted by the observation that whereas the
traditional approach to theta-role linking is "predicate centered", that is, it
is based on the individual relationship between a predicate and its argument
in syntactic representation (i.e., θ-theory (Chomsky 1981)), it has become
increasingly apparent that the notion of semantic roles as lexicalized
objects licensed by a verb is in fact not enough to account for the variability
in linking that this correspondence shows. Instead, to explain the
correspondence, semantic roles have to be evaluated with respect to the full

semantic representation in which the predicate and its arguments are found (i.e., lexico-conceptual structure). That is, semantic role linking has to appeal to event representation semantics, in addition to lexical distinctions that connect the semantics of a predicate with its syntactic requirements (e.g. Bresnan 2001; Croft 1998, 2001; Dowty 1991; Geuder and Butt 1998; Goldberg 1995; Jackendoff 1983, 1990, 2002; Sag and Pollard 1991; Van Valin and LaPolla 1993; Van Geenhoven 1998).

The evidence presented here is consistent with this general approach and suggests that this two-level view of argument interpretation is not only possible but also desirable from the perspective of the dynamic implementation of language (e.g, sentence comprehension).

The organization of the article is as follows. Part two discusses the fundamentals of the representational properties of the syntax-semantics correspondence approach to be explored, including the corresponding predictions regarding the dynamic implementation of this model through sentence comprehension. Part three presents the linguistic aspects of sentence comprehension in Broca's aphasia. This includes the presentation of a descriptive generalization of the comprehension deficit which, as will be seen, capitalizes on fundamental properties of thematic role organization proposed in the correspondence model. Part four presents two pieces of experimental evidence. The first is a summary of evidence on Broca's comprehension of constructions with psychological verbs (e.g. Piñango 1998, 2000). The second, concerns the contrasts in comprehension observed in the presence of syntactic alternations. Independently, these two kinds of phenomena – psychological verbs and syntactic alternations – have one thing in common: they represent non-movement based challenges (i.e., mismatches) to the *canonical* correspondence between syntax and semantics. Consequently, they allow us to observe in greater detail the true nature of semantic roles and test the hypothesis that semantic roles are but the syntactically visible properties of event representation. To forecast, the evidence presented will support the notion that thematic role assignment is not only independent from syntactic representation but also, that, complete correspondence of these relations with syntactic structure requires a fully-formed event representation which is compositionally-based by definition. And it is this necessary dissociation between lexical and compositional information that creates in the language system the possibility of mismatches; mismatches that ultimately constitute the creative source of the language system.

2. A model of argument linking from the perspective of sentence comprehension

2.1. The Interface Model

The interface-based model of sentence comprehension presented here is couched in the principles of conceptual semantics and the tripartite architecture of the language faculty (e.g. Jackendoff 1983, 1990, 2002).[2] One of the main features of this architecture is that the subcomponents of the system (Phonology, Syntax, Semantics/LCS) are connected to each other via correspondence rules or interfaces (e.g. Jackendoff 1990, 1997, 2002; Bierwisch and Schreuder 1992; Wiese 2001; Wiese and Piñango 2002).

Regarding the syntax-semantics correspondence, two levels and an interface compose this connection: A lexico-conceptual structure level (LCS) codifying event representation, quantification, anaphora etc.. and with units such as objects, substances, times and quantities; A syntactic structure level containing two sub-layers (i) relational structure implementing morphological relations such as case marking and agreement and (ii) constituency structure (e.g. phrase structure) with lexical (N, V, A, Adv, P) and functional (e.g. Determiner, Tense, Complementizer) categories as its units. Mediating the LCS and syntactic levels is an interface containing information rooted on both the components that it mediates. On the semantic side, the interface makes 'visible' to syntax semantic and discourse and information structure relations such as focus/topic, and semantic roles (Jackendoff 1990: 48). On the syntactic side, the interface makes 'visible' to the semantics the various constituents potentially associable with contentful information (e.g. NPs, VPs) and approximating *semantic* constituents. This process is done through patterns of agreement, linear order, and case marking, among others. Consequently, according to this view, grammatical relations are not primitives per se, they are correspondence rules that connect morphosyntactic/structural properties (e.g. verb agreement) with a specific discourse prominence relation (e.g. "the referent of this constituent is the most prominent participant in this proposition"). From this perspective, and in line with most proposals on the nature of grammatical relations, notions such as subject and object constitute 'default' discourse functions.

In sum, the present view of the syntax-semantics correspondence incorporates a system of correspondence whose purpose is to "package" semantic and syntactic information in a manner that is relevant to the other component. For present purposes, this information includes *semantic* roles

on the semantic side and constituency structure and relative default-discourse prominence – in the form of grammatical relations – on the syntactic side. (e.g. Perlmutter 1983; Perlmutter and Rosen 1984; Grimshaw 1990; Wiese 2001; Bresnan 2001; Jackendoff 1990, 2002; Avrutin 2002; Van Valin and LaPolla 1997).

The canonical organization of these components can be illustrated as follows (adapted from Jackendoff 1990: 45)[3]:

Lexico-conceptual structure - event representation -	$[_{Event}$ GO $([_{Thing} JOHN],[_{Path}$ TO $([_{Place}$ IN $([_{Thing} ROOM])])])]$
Interface - Canonical correspondence -	$< agent_i,$ $\qquad\qquad\qquad\qquad goal_j>$ **Subject**$_i$ $\qquad\qquad$ **Oblique**$_j$
Syntactic structure	$[_S[_{NP}$ N$]_i$ $[_{VP}$ V $[_{PP}$ P$_{into}$ $[_{DP}$ **Det** $[_{NP}$ N$]_j]]]$ "John ran into the room"

Figure 1. LCS-Syntax correspondence: canonical organization at the interface

There are some important implications of the way in which this model is presented here: 1) There are no indices connecting semantic roles to lexico-conceptual structure. The reason is that by definition semantic roles are relations in conceptual structure (Jackendoff 1990: 55). Accordingly, under this definition, the semantic role of *agent* is only shorthand for 'argument of the function GO' (where GO is a primitive of the semantic system). As can be seen in this model, semantic roles have a dual property: they belong to and are interpreted in event representation, yet, through the interface they are 'visible' to syntax. 2) Likewise, grammatical relations have a dual function: they are syntactic objects as they are defined both configurationally and morphologically, yet, they are 'visible' to semantics in that they provide for a default measure of discourse prominence that serves in the process of argument linking (e.g. "assign highest semantic role to highest grammatical function").[4] It is this dual function that gives them the status of correspondence rules.

2.2.   The mismatches

For the purposes of semantic role mapping, in a nominative-accusative language, canonicity is defined as the default correspondence between the first nominative-marked NP in the sentence, the most prominent discourse individual and the "highest" semantic relation licensed in the event representation of the clause (in agentive events, the *agent* role, in psychological events, the *experiencer* role). As can be seen from Figure 1, the model thus defines *canonicity* in terms of a default correspondence. Implicit in the configuration of the model is the possibility that this default correspondence may not always take place. This possibility is afforded by the fact that these connections are carried out among partly independent levels of information (syntax vs. semantics), with different units and organizing principles.

   Accordingly, within this model at least two kinds of mismatches are possible: mismatches between LCS and grammatical functions which arise when grammatical functions do not reflect the corresponding semantic prominence (e.g. subject function does not correspond to the highest semantic relation in the representation). And mismatches between syntax and grammatical functions which arise when syntactic word order does not reflect the prominence order of grammatical functions (e.g. direct object precedes subject). In the remainder of the article I present evidence supporting the notion that this mismatch approach to the connection between levels of representation captures crucial properties of the processing and cortical distribution of semantic roles as observed through Broca's aphasia. Before proceeding with the experimental record, however, I present a brief description of Broca's aphasia, including the descriptive generalization of the comprehension deficit that connects it to the model just presented.

3.   Semantic role linking from a brain-language relations perspective: Experimental record

3.1.   Broca's aphasia

Broca's aphasia is a clinical syndrome that results from a focal lesion to the anterior left hemisphere (e.g. Goodglass and Kaplan 1972). Even though it is traditionally associated with Brodmann areas 44, 45 and 6, it is now recognized that this cortical description is only an approximation to the true

cytoarchitectonic properties underlying this functional region (Amunts et al. 1997; Alexander et al. 1990; Naeser et al. 1989; Zilles et al. 1997). From the linguistic point of view, this population is of interest because its performance in both sentence comprehension and production offers the potential of a characterization in terms of independently motivated linguistic mechanisms. It is the materialization of this possibility that makes this aphasia syndrome a window into the cortical organization of language (see, e.g. Grodzinsky, Piñango, Zurif and Drai 2000).

3.2. The slow-syntax hypothesis: A descriptive generalization of Broca's aphasia comprehension

As is well-known, the specific nature of the Broca's comprehension deficit is a matter of debate (see Grodzinsky 2000 and exchanges therein for a representative sample of the debate). Nevertheless, there are several points on which most of the literature converges: a) the deficit is morphosyntactic in nature, and b) the deficit is best characterizable as an *implementation* limitation of language and not as lack of linguistic knowledge (e.g. Burkhardt et al. 2003; Burkhardt et al. 2004; Haarmann and Kolk 1991a, 1991b; Kolk and Wiets 1996; Friederici and Kilborn 1989; Frazier and Friederici 1996; Piñango 1998, 2002; Piñango and Burkhardt 2005; Swinney et al. 1996). This converging view is encompassed by one particular descriptive generalization – the slow-syntax hypothesis (SSH) – which says the following: Syntactic structure (i.e., configurational structure) formation is protracted – slower to develop – in the Broca's system, as a result, syntax-dependent mechanisms are observed but only sometime after they occur in the normal system.[5]

One direct implication of this characterization of the Broca's deficit is that in the absence of timely syntactic structure formation, the comprehension system is forced to resort to alternative means of interpretation. Such alternative means include semantic structure which is built up from the lexical meanings. By definition, the linking system in this case will always be *canonical* (as defined in our model). That is, in the absence of syntactic structure to determine the true linking, the interface mechanism will assume the one that maps the first argument presented in the sentence with the most prominent grammatical position (i.e., subject) and with the most prominent thematic role available in the semantic representation (e.g. agent).

This model of the interface between syntax and semantics predicts that in certain cases, the alternative mechanism will compensate for the syntactic deficit. This will happen with sentential constructions where the linking between the syntactic and semantic levels is in fact *canonical*, that is, where the syntactic representation indicates a linking that is the same as that described in event representation. So, once the syntactic structure is finally formed in the Broca's system, it confirms the linking already posited by the default settings in the interface.

In other cases, the temporal availability of this alternative mechanism of interpretation will create a problem for the comprehension system. This will happen when the true correspondence between the syntactic and semantic levels deviates from the default canonicity. In these cases, the semantic system will provide for one interpretation (reflecting the *canonical* representation) when in fact syntactic structure (once it is formed) will actually support the alternative. The product of this conflict is what we generally observe as *chance* performance in off-line tasks. This is particularly clear for agentive passives and agentive object relative clauses. In line with the description given above, these constructions have in common that the relative prominence of semantic roles in event representation <agent, theme> is in mismatch with that suggested by grammatical relations [SUBJ, OBJ], since in those cases, the subject NP is linked to the *theme*, contrary to the canonical mapping (e.g. Shwartz, Saffran and Marin 1980; Grodzinsky, Piñango, Zurif and Drai 2000; O'Grady and Lee 2004; Piñango 1998, 2001).[6]

If true, this generalization captures two main insights about Broca's aphasia which drive almost all descriptive generalizations proposed in the literature: 1) it maintains the locus of Broca's comprehension as exclusively syntactic in nature and 2) it describes the deficit in terms of a minimal impairment with widespread consequences. In this manner this characterization makes Broca's aphasia comprehension a possible window of opportunity to observe the behavior of the language system, particularly as it pertains to the syntax-semantics correspondence.[7]

As stated then, the SSH makes the following general prediction: comprehension effects are observable in the Broca's system as the result of the interaction between a slowed syntactic representation and semantic structure (i.e., lexico-semantic specifications). If thematic roles are purely syntactically-determined, contrary to the Interface Model presented here, Broca's comprehension should show a systematicity: always *correct* when there is a possibility of a canonical interpretation (when thematic role order in event representation matches word order) and always *incorrect* (i.e.,

below-chance performance) when the interpretation deviates from that canonical correspondence. This compensatory function would be triggered during comprehension because in the absence of the compositionality provided by syntax, only lexically determined information would be available for comprehension. And this information being always the same, would systematically create the wrong linking in cases where wordorder deviates from canonical linking.

By contrast, if, as the Interface Model proposes, semantic role linking is part and parcel of an independent event representation, which is itself the result of a compositional process supported by syntactic representation as comprehension unfolds, Broca's comprehension patterns should show instability but only in those cases where more than one event can be construed from the lexical items present in the sentence. That is, the comprehension pattern would reduce to simple guessing (*chance* performance) only in those cases where there is the possibility of a mismatch (arising from conflicting correspondence principles).

These two positions and their corresponding predictions are explored in the experimental evidence presented directly below.

4.   Experimental record: LCS-GF mismatches

4.1.   Psychological verbs

Piñango (2000) examines the comprehension of so-called 'non-canonical' constructions by Broca's patients, by capitalizing on the alternation between the subject-experiencer (*fear*-type) and object-experiencer (*frighten*-type) verbs; altogether known as psychological verbs.

This contrast offers two advantages 1) It excludes *agent* semantic roles. This serves to determine the internal organization of the system without the well-known asymmetry that agenthood introduces in the argument structure. 2) It shows a deviation from the relative order of semantic roles without the need to resort to (overt) syntactic displacement: The boy fears the movie <*experiencer, stimulus*> vs. The movie frightens the boy <*stimulus, experiencer*>. Most importantly, as it is set out, this minimal pair allows us to observe a clear violation of the one-to-one correspondence between the so-called canonical order of semantic roles, and the corresponding grammatical functions. It therefore constitutes a potential source of LCS-GF mismatch.[8]

The experiment. In this experiment two manipulations were made: verb type (*fear* vs. *frighten*-type verbs), and construction (active vs. passive sentences). A total of 58 experimental sentences were tested distributed among conditions in the following manner: 12 *fear*-type actives, 12 *fear*-type passives, 12 *frighten*-type actives, 12 *frighten*-type passives and 10 object relative sentences (included as control). All sentences were semantically reversible. In addition 58 different contexts were constructed (one for each experimental sentence) to induce non-agentive reading (for object relatives the contexts induced an agentive reading). The "context" was provided before each sentence. Both contexts and experimental sentences were presented auditorily over head-phones (sentences and contexts were recorded by a native speaker of English). The following illustrates the procedure:

Presentation of Characters: (pointing to the mom) "this is a mom", (pointing to the daughter) "this is a daughter". This was done for each picture for each sentence tested.

Context: "The mom found out that her daughter had been shop-lifting at the mall. Because of this"...(pause).

Sentence: "The mom was outraged by the daughter"

At the same time, the patient was showed the two pictures. He was then asked to match his interpretation of the sentence just heard with the picture that best described it. Each subject was tested over 4 separate sessions. There was no limit set as to the number of times the subject could listen to the sentence or the context.

Six subjects participated in the study: Two neurologically intact control subjects, and four Broca's patients RD, JC, JB and HB. All 4 of the Broca's patients were medically stable and all were tested at least 2 years post-onset. Their clinical classification was based on the Boston Diagnostic Aphasia Examination (BDAE) (Goodglass and Kaplan 1972) and all had lesion sites consistent with this classification (i.e., in the anterior left hemisphere). The control subjects matched the Broca's patients in age and level of education. They were all right-handed and native speakers of English.

Given this experimental design, the two main verb types subject-experiencer (*fear* verbs)   vs. object-experiencer (*frighten* verbs) were presented in two different constructions: active vs. passive. This resulted in four different conditions: *fear*-active, *fear*-passive, *frighten*-active, and *frighten*-passive, illustrated as follows:

(1) a. Context: The boy saw how the girl took care of the sick puppy. Because of this.....

    b. Sentence: The boy adores the girl.   *Fear* active <exp,stim>

(2) a. Context: The boy cheated when he was playing chess with the girl. Because of this.....

    b. Sentence: The boy was disliked by the girl.

                                              Fear passive <stim,exp>

(3) a. Context: The girl felt that her new friend was a nice boy because he also had a blankie. Because of this......

    b. Sentence: The boy charmed the girl. *Frighten* active <stim,exp>

(4) a. The little boy saw that the little girl was really cute. Because of this....

    b. The little boy was charmed by the little girl.

                                    Frighten passive <exp,stim>

The Interface Model in combination with the slow-syntax hypothesis predicts *above-chance* performance but only in cases where there is default correspondence between grammatical functions and lexico-conceptual representation. Consequently, both the *fear*-type active construction and *frighten*-type passive construction should yield *above chance* performance. These are the constructions where the highest semantic role (experiencer) is mapped onto the highest grammatical relation (subject). In these two instances, therefore, absence of timely syntactic information to confirm the mapping is unnecessary because both the event representation and the linear order of arguments supports the canonical correspondence.

By contrast, the remaining two conditions: *fear*-type passive and *frighten*-type active should yield performance no different from *chance*. This prediction is based on the observation that neither of these two constructions fits the canonical mapping (i.e., the highest thematic role is not mapped onto the highest grammatical function: *experiencer* = oblique (for *fear* passive), and object (for *frighten* active)), so for these constructions, correct interpretation relies heavily on the morphosyntactic and configurational properties of the sentence. However, as described by the SSH, in the Broca's system, such representation is unavailable in a timely manner and as a result, there is nothing to distinguish between the two possibilities. Accordingly, both interpretations, i.e., default-

correspondence based and syntactically-based, are equally viable in the comprehension system. This results in *chance* performance.

In addition to these experimental conditions, one 'control' condition was examined: the agentive object relative clause (e.g. "The boy who the girl is pushing is wearing a blue shirt"), which has been shown consistently to elicit *chance* performance in Broca's patients (e.g. Grodzinsky et al. 2000). Performance in this condition would thus serve as an indicator that the patients chosen were indeed representative of the Broca's population.

As Piñango (2000) reports, these predictions were borne out by the results. Matching control subjects performed flawlessly in all conditions thus supporting the validity of the experimental paradigm and the constructions tested. As expected, Broca's patients showed performance not significantly different from *chance* (NS) on object relative clauses (Mean= 4.5/10, NS). And this performance level was no different from that observed in the *frighten* active condition (Mean= 5.25 /12, NS) and in the *fear* passive condition (Mean= 5.75 /12, NS). That is, only those conditions that created a mismatch between LCS and GF yielded *chance* performance. The other two conditions showed performance clearly *above chance* for the *frighten* passive (Mean= 9.75 /12, p<.05), and for the *fear* active condition (Mean= 10.25 /12, p<.05).[9]
This evidence shows that syntactic construction in itself is not correlated with performance level (i.e., performance is not necessarily *above-chance* for all active constructions). And most importantly for present purposes, it suggests that the basic insight of the Interface Model – that semantic role ordering stems from event representation and not from syntactic structure – is observable through the comprehension system.

One question arises however, and that is what would the Broca's performance be in cases where more than one semantic role ordering is lexically allowed? According to the Interface Model these cases would create a potential for a mismatch with the grammatical function correspondence tier because the linking of at least one of the alternants would result in a non-canonical correspondence with event representation. The possibility of addressing this question is afforded by dative and locative alternating verbs.

4.2. Dative and Locative alternations

Dative and Locative alternations offer a window into our understanding of the mapping between semantic roles and syntactic representation because at

least in English, they present two semantic role orderings with a corresponding linking to grammatical functions. That is, in both kinds of verbs, the semantic alternation signals a change in both semantic role ordering and in grammatical function: Datives <theme, goal> vs. <goal, theme> (e.g. give the car to Bill vs. give Bill the car); Locatives <theme, location> vs. <location, theme> (e.g. They spray paint on the car vs. They spray paint the car with paint).

Yet, the two kinds of alternation differ in terms of the number of syntactic frames that determine them. Dative alternations have two syntactic frames NP PP, vs. NP NP, whereas locative alternations have only one possible syntactic frame NP PP even though in the latter, both semantic roles can occupy either function. (e.g. They spray the house with red paint vs. They spray red paint *on* the house). These two kinds of alternating verbs contrast with the well-known non-alternating kind also involving a locative: "They *put* the flowers on the table". In this type of three-argument predicate there is no ambiguity: there is one semantic role ordering <theme, location>, one prominence hierarchy [OBJ > Oblique], and one syntactic word order [NP PP].

In terms of the comprehension of these constructions, two main possibilities emerge regarding how this information could be codified. One possibility is that all this information be syntactically specified. According to this view, semantic roles are intimately linked to syntactic positions (i.e., word order), consequently in dative verbs the necessary syntax-semantics correspondences are established in the lexicon. So if the system were to encounter a <theme, goal> order for the verb *give* it would immediately know that it has the syntactic realization [NP, NP], and no other. This would happen even if it knows that *give* also has the alternative realization [NP, PP] because in this model of lexical knowledge the connection between semantic role orderings and syntactic frames is fixed.

Such an ambiguity could not emerge for the locative alternants either (e.g. spray) because in those cases there are two possible semantic relations <theme, location> vs. <location, theme> mapping onto two syntactic frames [NP,PP] which are distinguishable by pre-specified prepositions.

In terms of Broca's patients performance, two kinds of predictions are available: in the absence of timely syntactic information, the system will resort to pre-specified knowledge (in this case lexically-based linkings), which will emerge either 1) as above-chance performance for both alternations (since linking comes ready-made from the lexicon) or 2) will emerge as *above-chance* performance for the *dative* alternation and *below-*

chance performance for the locative alternation (in case that the Broca's patients are not sensitive to the prepositions).

A second possibility sponsored in the Interface Model is that semantic roles are not defined in terms of syntactic positions because semantic roles belong to event representation and are not reduceable to syntactic objects. The "cost" of this situation is that the connection between syntactic positions and semantic roles is not necessarily fixed at the lexical level and only occurs when it matters, during the comprehension process. In the unimpaired system the two possibilities are indistinguishable, but in the case of the Broca's system, the possibilities make different predictions. In this latter case, the Interface Model in combination with the slow-syntax hypothesis would predict that both kinds of alternations (but not the non-alternating type) should emerge as *chance* performance in the comprehension system of Broca's patients. This is so because in the Broca's system there would not be timely syntactic information that can allow the connection between syntactic positions, grammatical functions and their semantic roles. Given the many-to-many connection between semantic role order and grammatical function order for both alternating verbs, no canonical mapping is available: in principle both semantic roles can map onto the first post verbal NP which can be either the direct or the indirect object. That is, if it is the case that thematic role ordering is not syntactically-determined but established within event representation, the Broca's deficit would allow both orderings <theme, goal> and <goal, theme> to emerge as equally available and feasible linkings since there is no other type of information to constrain it.

The experiment. Five subjects participated in the study: two neurologically intact control subjects, and three Broca's agrammatic patients RD, JC, and JB. All three of the Broca's agrammatic patients were medically stable and all were tested at least 2 years post-onset. They were clinically classified based on the BDAE. The control subjects matched the Broca's patients in age and level of education. They were all right handed and native speakers of English.

Besides the ordinary clinical testing, these subjects underwent pre-testing specific to this study to corroborate their knowledge of the various verbs to be used. This was done via a verb-to-picture matching task. All subjects performed flawlessly in this task.

In terms of materials, 50 declarative active sentences were constructed containing 10 dative alternating verbs, 10 locative alternating verbs and 10 locative non-alternating verbs (see examples below). The alternating verbs

were utilized twice, once for each syntactic frame: [NP NP] vs. [NP PP]. The locative non-alternating verbs were utilized once.

In contrast to the psychological verbs experiment, for this study an anagram task was chosen in order to reveal the possible orderings the subjects could be entertaining in the process of deciding which was the syntactic configuration for the predicate.

Each sentence was distributed onto the cards in the following way:

(5)   a. (THE MOM GAVE) (THE BABY) (THE BOTTLE)
      b. (THE MOM GAVE) (THE BOTTLE) (TO) (THE BABY)

Given the focus on the post-verbal alternation, subjects were provided with a "subjet+verb" card expected to give them a head start on the interpretation of the sentence. This would allow them, in turn, to concentrate on the distribution of the two internal arguments with respect to each other and with respect to the preposition (when applicable). The following examples illustrate the conditions tested:

(6)   a. Mary handed <u>the homework</u> *to the student*   Dative Alternating
                                              V NP PP *<ag, th, goal>*
      b. Mary handed *the student* <u>the homework</u> V NP NP *<ag, goal,th >*

(7)   a. Lois sprayed *acid* <u>on the attacker</u>   Locative Alternating
                                              V NP PP *<ag, th, goal>*
      b. Lois sprayed <u>the attacker</u> *with acid*   V NP PP *<ag, goal,th >*[10]

(8)   Harriet put the cup on the chair   Locative Non-Alternating
                                              V NP PP *<ag, th, goal>*

Chi-square tests for goodness of fit were applied to each mean. These tests reveal that whereas performance for non-alternating verbs was significantly different from *chance*, X^2 (1,n=10)=6.4, p<.025), performance for alternating verbs was not. For datives with [NP PP] frame performance was at *chance* X^2 (1,n=10)=1.6, p >.1; and for datives with [NP NP] frame performance was also at *chance*, X^2 (1,n=10)=.4, p>.1; for locatives with [NP PP] frame (as in *Mary sprayed the children with paint*) performance was at *chance*, X^2 (1,n=10)=.4, p>.1, and for locatives with [NP PP] frame (as in *Mary sprayed paint on the children*) performance was also at *chance*, X^2 (1,n=10)=.4, p>.1.

Table 1 shows the results:

Table 1.   Broca's comprehension of active sentences with the locative and dative alternation

	Dative V NP-PP 'give' <ag,th,goal>	Dative V NP-NP <ag,loc,goal>	Locative V NP-PP 'spray' <ag,th,loc>	Locative V NP-PP <ag,loc,th>	Non-alt. V NP-PP 'put' <ag,th,loc>
RD	7	8	3	6	9
JB	8	5	5	6	8
JC	6	5	4	6	10
Mean	7	6	4	6	9
	70%	60%	40%	60%	90% p <.05

Source: Piñango 1998 – Brandeis University. Dissertation

By and large the main type of mistake the patients made was to leave the preposition out and place only the NP's cards following the subject+verb card. When asked to place the preposition, the patients would reluctantly put it at the end of the sentence, between the NP's or right after the verb (only once or twice one subject, RD, placed the preposition at the beginning of the sentence). Crucially though, this only happened for the alternating conditions. All three subjects were at *above-chance* levels for the non-alternating locative condition. This suggests that patients were, on the one hand, sensitive to the existence of the preposition, but, on the other hand, unable to make a decision regarding its placement in cases where it was not unambiguously specified.

Chance performance on both alternating conditions further supports the main prediction regarding pre-established linking in the lexicon as it is clear that differences in availability of syntactic frames have no impact in the comprehension of locative and dative alternations. Instead, lack of ambiguity in grammatical function ordering and absence of alternation (as in the case of 'place *<agent, theme, goal>*') allowed the Broca's system to arrive at the right linking. As the SSH proposes, this linking should originate in the event representation projected by the predicate. It is this possibility that would allow the system to overcome any delays in syntactic structure formation during the comprehension process.

5.   Discussion

The evidence just presented shows that in the absence of phrase structure properties and the corresponding morphosyntax, availability of semantic role orderings both in event representation and at the level of grammatical function (e.g. at the level of the interface) creates ambiguity in the connection between semantic roles and syntactic positions. The slow-syntax hypothesis points to a temporal limitation in syntactic structure formation which subsequently causes an instability in comprehension. As the Interface Model predicts, this instability is observed whenever, the correspondence suggested by the incoming syntactic representation deviates from the default canonical ordering established at the interface. In the case of psychological verbs, this is observed in *fear*-passive constructions and *frighten*-active constructions. It is only in these cases where two possibilities become available: the one offered by the interface in the absence of timely syntactic information, and the one offered by the interface once syntactic information has been computed.

In the case of the dative and locative alternations, event representation (in the form of semantic role prominence ordering i.e., thematic hierarchy) is clearly not enough to guide the correspondence to syntactic positions. I argue here that this is because the other mediating component, grammatical function, also has ambiguous specification (i.e., both thematic roles can occupy both direct and indirect object positions and without any overt syntactic manipulation), and in the absence of biasing discourse, there is no reason for the system to favor one grammatical function ordering over another. In this model this is in fact what it means to say that predicates undergo alternation.

The Interface Model thus proposes that even though all these correspondence possibilities may be lexically encoded neither one is "more" canonical. So, ultimately, correct comprehension of constructions with these predicates depends on the timely implementation of syntactic structure.

The evidence presented here thus supports the notion that the correspondence between syntax and LCS is not one-to-one but that instead it is ruled by a rather complex system of correspondences where factors like thematic role hierarchy, grammatical functions prominence and morphosyntax interact. To be sure, and for a long time now, these factors have been known to play a role in the comprehension system. The contribution of the Interface Model has been to integrate them in a manner that is consistent with the way language behaves as a representation and as a processing

system. It is this combination that allows us to use it in our exploration of the impaired system, and that in turn enables us to make inferences to the normal case.

Finally, given the localization values of Broca's aphasia (for a comprehensive record of the evidence to this effect see Grodzinsky 2000, and for converging evidence from neuroimaging in addition to lesion studies see Friederici 2002 and references therein), the evidence presented shows that the mechanisms involved in GF-LCS matching do not seem to depend on the integrity of the left anterior region (i.e., Broca's area). This in turn, supports the notion that the cortical distribution of language follows independently motivated distinctions analogous, I suggest here, to those outlined in the Interface Model.

6.   General conclusions

Here I have asked the following questions: What is the principle of correspondence that connects thematic roles to NP's in a sentence? What is the source of the linking principle: lexical? compositional? What do comprehension patterns tell us about semantic role organization, in particular, and about the organization of the language faculty in general?

With respect to the first question, the evidence presented here has shown that semantic roles do not seem to behave like syntactic objects. Instead, semantic roles behave as projections from event representation onto grammatical functions which, in turn, connect them to syntactic positions. In this respect, "canonicity" is defined as one default correspondence of relative orderings from each representational tier onto the next. As the evidence has shown, delay in configurational representation (in this case due to brain damage) creates almost unnoticeable damage in comprehension, but only as long as the prominence relations in the other tiers match (e.g. *fear* actives, *frighten* passives and non-alternating locatives).

With respect to the second question, the evidence presented suggests that semantic roles are mapped based on their own event-dependent order, but that in the absence of timely hierarchical syntactic information such mapping will rely on the canonical correspondences. If these are not available (as in the case of the alternating predicates), then the system will be unable to settle on one.

The evidence argues then for an Interface system where morphosyntax, on the on the one hand and lexico-conceptual structure (including event

structure) on the other are dissociable levels of representation. Finally, this evidence shows that language representation, its dynamic implementation and neurological distribution are more intimately related than we tend to believe. As a result they serve as mutually constraining sources of evidence.

Notes

1. The author wishes to thank Ina Bornkessel, Matthias Schlesewsky, and Angela Friederici for insightful comments on the ideas presented here in the context of the Conference "Thematic Role Universals" (MPI for Cognitive Neuroscience, December 2002). The author also thanks the ZAS Semantics Circle (Humboldt University, Berlin) and an anonymous reviewer whose comments and suggestions have made the article a more interesting read. All errors remain her own.
2. Here Conceptual Semantics is defined as the branch of model-theoretic semantics that focuses on how the mind encodes its construal of the world. Accordingly, and in contrast to other branches of semantics, conceptual semantics makes a *psychological claim* about the meaning formatives it proposes which lend itself to experimental investigation.
3. This representation and the necessary linkages between the two levels have been greatly simplified to allow the focus on *argument* linking. For full elaboration of the proposal on which the model is based see Jackendoff (1983, 1990).
4. This observation captures the essence of most theories of argument linking. In these approaches, argument linking is carried out by appealing to grammatical relations either as primitives (lexical-functional grammar), or as shorthand for configurational relations (government binding/minimalism) (cf. Bresnan 2001; Jackendoff 1990: 261 and references therein).
5. The specific nature of this impairment has been characterized in various ways: in terms of slowing in the implementation of syntactic *dependencies* (e.g. Swinney et al. 1989), in terms of speed of degeneration of the syntactic signal (e.g. Friederici and Kilborn 1989), or as a general limitation of processing resources (e.g. Kolk and Wiets 1996). Moreover it is unclear whether the processing limitation in Broca's aphasia can be tied to a limitation in *syntactic memory* (as opposed to *syntactic integration*) (e.g. Fiebach et al. 2002). Clearly, the answer to this question is contingent upon what the crucial differences between these two posited subsystems turn out to be. Deciding among these possibilities is therefore beyond the scope of this paper. For present purposes what matters is that all these claims converge on two crucial observations embodied in the slow-syntax hypothesis: The Broca's system pattern of performance is caused by a *processing* impairment

(either memory or integration based) which can be viewed as *slowing* in the system. Such as slowing seems to affect specifically the *syntactic* component.

6. Two clarifications are in order with respect to this proposal: 1) even though the result of syntactic slowing is a "mapping" conflict, such a conflict has its root in a syntactic processing deficit. In this manner the present proposal differs from strictly "mapping" – based hypotheses such as Schwartz and Saffran and Marin 1980's and Lee and O'Grady's 2005 which crucially do not connect the mapping difficulty to any specific processing problem; 2) Even though all processing-based generalizations in the literature stem from an assumption of a processing-resources deficit, the slow-syntax hypothesis (viewed here as a family of generalizations with similar insights) proposes in fact a *syntactic* processing deficit, thus maintaining a syntactic locus.

7. An anonymous reviewer asks whether the cause of the delay in structure formation in Broca's aphasia would not have a non-syntactic triggering factor. The answer to that question is two-fold: on the one hand, to the extent that the language system connects to other cognitive capacities it should be assumed that whatever process depends on the integrity of the left anterior region could have had in its development a non-linguistic origin (see Grodzinsky 2000 in reference to "acalculia"). In fact such a proposal connecting syntactic processing with general procedural mechanisms has been made convincingly in the literature (e.g. Friederici 2002). On the other hand, to the extent that syntax is not the only procedure-based component in the language system and that the evidence shows that the focal lesion in question exclusively affects not only the language system, but the *syntactic* component of this system, the claim that Broca's aphasia presents a *linguistic* (as opposed to general cognitive) impairment is maintained. That is, independently of the evolutionary and/or computational connections between the language and other cognitive capacities, the pattern of impairment in the Broca's system seems to result from a language-specific deficit.

8. A reviewer asks whether this mismatch between grammatical functions and LCS for object-experiencer verbs (*frighten* verbs) cannot be overcome by assuming that these verbs contain a causative component in their lexical entries, thus reversing the prominence relations of the semantic roles involved. Two observations can be made on that point: 1) There is indeed a connection between causation and object-experiencer verbs. This has been used to explain the linking mismatch for these verbs: causal arguments (such as the *stimulus* of *frighten*-verbs or those of transparent causative predicates e.g. *cause*) systematically map onto the subject of the sentence. However, what it is not the case is that having a causative component changes the relative prominence of the *stimulus* argument with respect to the *experiencer*. In this respect, Grimshaw (1990) notes that if object-experiencer verbs were to have the same semantic role ordering as subject experiencer verbs, as the reversal in thematic prominence would entail, they (object-experiencer verbs) should behave like any other dyadic verb, but they do not. They differ from

subject experiencer verbs with respect to passivization, nominalization and anaphora resolution. Consequently, a unified semantic characterization of these two kinds of verbs would leave us without any possibility of explanation (Grimshaw 1990: 19–21). 2) Instead, the general approach taken is that causativity has implications for linking of arguments to grammatical functions e.g. Grimshaw's Aspectual Hierarchy 1990: 22–33, or is realized strictly as a syntactic category e.g. Pesetsky (1995)'s CAUS. As can be seen, the model presented here follows closely Grimshaw's two-hierarchy correspondence approach, only that instead of an aspectual hierarchy, the present model posits grammatical functions – which embody the aspectual distinctions described by Grimshaw 1990 – as the elements of the interface.

Even though in depth discussion of these issues is outside the scope of this paper, the brief presentation above, supports the original observation that in object-experiencer verbs syntactic structure suggests a semantic role prominence that is in mismatch with that obtained in event representation. The source of this mismatch is suggested to be the causation component which does not alter the thematic role prominence yet forces the less prominent role to link to the subject position.

9. There are at least two other reports on the comprehension of psychological verbs: Grodzinsky 1995 and Beretta and Campbell 2001. Even though those two reports focus on only part of the contrasts (i.e., neither report performance on *frighten* active constructions), in line with Piñango 2000, they report a systematic difference in performance between *fear* active constructions and their passive counterparts. There is less agreement as to the exact nature of the fear-type passives with respect to chance performance. In contrast to the results presented here and to those of Beretta and Campbell 2001, however, Grodzinsky 1995, report *below chance performance*. The possible reasons for this discrepancy are several. In Piñango 2000, I discuss extensively the methodological factors that could have been involved in such a finding. Accordingly, I assume that Grodzinsky 1995's do not really reflect the nature of the evidence. This assumption is further supported by Beretta and Campbell (2001)'s findings which replicate the results presented here.

10. Regarding the locative alternation it is important to note that associated with the alternation there is an aspectual distinction widely discussed in the literature. While in the sentence "John loaded the cart with hay" there is a necessary implication that "the cart" has been completely filled with "hay", no such implication exist with "John loaded hay on the cart". This semantic implication nevertheless is not relevant since it does not affect the nature of the *semantic role relations* observed for the predicate.

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Generalised semantic roles and syntactic templates: A new framework for language comprehension

Ina Bornkessel and Matthias Schlesewsky

1. Introduction

Language is typically viewed as a system that maps form onto meaning and vice versa. Therefore, one of the most fundamental questions within the study of language and its properties concerns the link between the interpretive properties of an utterance and its surface form. A case in point is the realisation and interpretation of sentential arguments. Whereas the association between the morphosyntactic form of an argument and its interpretation is straightforward when syntactic and interpretive prominence coincide, argument linking becomes more complex when the two hierarchies are in conflict, e.g. in sentences with object-experiencer verbs such as the German example (1).

(1) ... *dass der Junge dem Mädchen auffällt.*
      ... that [the boy]$_{NOM}$ [the girl]$_{DAT}$ is-striking-to
      '... that the boy is striking to the girl'
      ('... that the girl notices the boy.')

In example (1), the verb *auffällt* ('to be striking to / to notice') projects an argument hierarchy with an Experiencer and a Stimulus argument. However, the lower-ranking Stimulus *der Junge* ('the boy') is realised as the (syntactically higher-ranking) subject. This apparent linking paradox has inspired numerous syntactic and/or lexical approaches to argument realisation (e.g. Belletti and Rizzi 1988; Pesetsky 1995; Levin and Rappaport Hovav 1995; Wunderlich 1997; Ackerman and Moore 2001).

From the perspective of language comprehension, sentences such as (1) pose a similar – or perhaps even graver – problem. Language is understood incrementally, such that each incoming word is integrated syntactically and maximally interpreted as it is encountered (Crocker 1994; Stabler 1994). Therefore, verb-final sentences require the assignment of an interpretation

to the arguments even before the verb is processed. In the case of a sentence such as (1), (pre-verb) incremental interpretation may be envisaged as assigning a structure in which the nominative-marked subject (*der Junge*) is higher-ranking than the dative-marked object (*dem Mädchen*) in terms of both formal properties (e.g. agreement with the verb) and interpretive properties (i.e. in terms of +cause/+control). When the verb is encountered, however, the first of these two assumptions remains valid, whereas the second must be revised. This type of (hierarchical) interpretive revision has been shown to engender additional processing cost at the position of the verb in comparison to analogous sentences ending in a verb projecting a "canonical" interpretive hierarchy (e.g. *folgen*, 'to follow') (Bornkessel, Schlesewsky, and Friederici 2002, 2003, cf. Figure 1A). Note that the interpretive assignments undertaken during the incremental comprehension of sentences such as (1) appear to be best described in terms of generalised semantic roles (e.g. macroroles: Van Valin 1993; Van Valin and LaPolla 1997; proto-roles: Dowty 1991; Primus 1999; hyperroles: Kibrik 1997). Associations between arguments and individual semantic/thematic roles such as Agent and Patient are not feasible because of the large number of individual roles with which a single case may be associated (cf. Wunderlich 1985; Barðdal 2003). Rather, empirical results support the assumption that only a very general interpretive hierarchy is established between arguments before the verb is encountered (Frisch and Schlesewsky 2001; Bornkessel 2002; Bornkessel et al. 2003; Schlesewsky and Bornkessel 2004).

Interestingly, the scope of incremental interpretation appears to be reduced when the morphological informativeness of the arguments is reduced as in (2).

(2)   ... *dass Amanda Sängerinnen auffällt.*
        ... that Amanda$_{NOM/ACC/DAT}$ singers$_{NOM/ACC/DAT}$ is-striking-to
        '... that Amanda is striking to singers'
        ('... that singers notice Amanda.')

Here, both arguments are fully ambiguous with respect to case marking before the verb is encountered. While this distinction between (1) and (2) is clearly irrelevant from a time-insensitive perspective since the linking problem remains the same between the two, from the time-sensitive view of language comprehension, it entails a change in the degree of information available to the processing system on-line. Indeed, experimental results show that the increased processing costs for object-experiencer verbs in

sentences such as (1) are not observable in structures such as (2) (Bornkessel et al. 2002, cf. Figure 1B). This finding suggests that no interpretive hierarchy is established between the arguments before the verb is processed when the arguments are fully ambiguous with respect to case marking. By contrast, syntactic aspects of incremental structuring still take place even in these types of sentences, as shown by an increase in processing load when the clause-final verb agrees in number with the second argument, thereby requiring a revision towards an object-initial structure (Bornkessel, McElree, Schlesewsky, Friederici 2004).

A: Unambiguous   B: Ambiguous
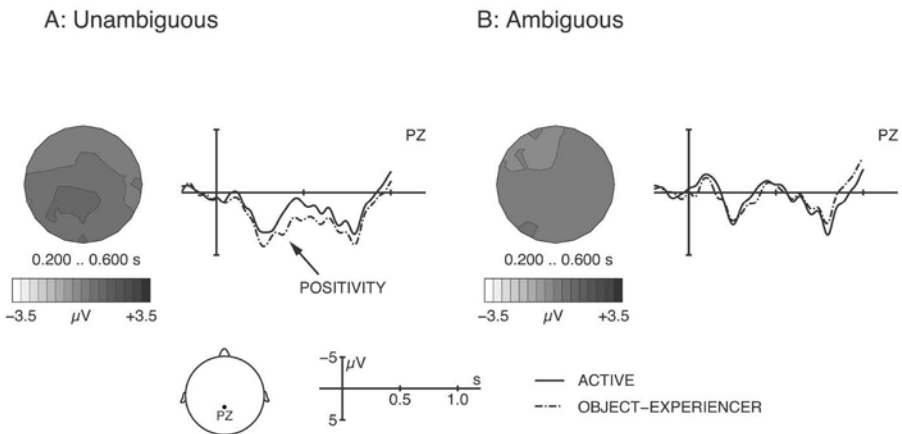
Figure 1. Grand average event-related brain potentials (ERPs; see Note 5) for object-experiencer (dash-dotted line) vs. active (solid line) verbs in clause-final position (onset at the vertical bar) in unambiguously case-marked (A) and ambiguously case-marked (B) sentences. Negativity is plotted upwards. The topographical maps show the distribution of the effects (object-experiencer – active).

The findings described above pose an interesting challenge for models of language comprehension, as they speak against processing strategies using syntactic prominence to compute interpretive prominence and vice versa. Under the assumption of a close correspondence between linguistic competence and performance, this challenge further extends to theories of grammar. In the following, we will present a sentence comprehension model that captures the processing phenomena described above, before turning to the question of how this comprehension perspective may be linked to formal grammatical theories. We will argue that the competence

basis suggested by the empirical data is best described by grammatical models assuming a separation between syntactic structure in the form of syntactic templates and argument linking via generalised semantic roles. A number of further empirical results in favour of such a separation will be discussed in the following.

2.   The Argument Dependency Model

The experimental findings discussed in the introduction suggest that hierarchical relations between arguments may be established in several possible ways. Thus, in German, formal properties lead to a strategy in which the first argument is analysed as agreeing with the verb (i.e. as the subject of the clause in traditional terms). When morphological case marking provides additional information with regard to the interpretive properties of the arguments, generalised semantic roles are also assigned. These observations indicate (a) that argument interpretation is logically independent of syntactic positions / assignments, and (b) that certain preferences observable in online processing may result from formal rather than interpretive requirements. Both properties of the comprehension system are implemented in the Argument Dependency Model (ADM) (Bornkessel 2002; Schlesewsky and Bornkessel 2004). This model, which was originally formulated as a model of argument comprehension, has recently been extended to cover the comprehension of core relations (i.e. arguments and verbs) more generally (the "extended Argument Dependency Model", eADM; Bornkessel and Schlesewsky 2005). The basic properties of the ADM's processing architecture are depicted schematically in Figure 2.

In keeping with Friederici's (2002) neurocognitive model of language comprehension, the ADM assumes that the initial phase of sentence comprehension comprises processes of basic constituent structuring, in which only word category information is taken into account. Within the eADM, this initial structure-building phase is modelled in terms of syntactic templates, which are essentially pre-compiled phrase structure rules encoding only word category information. On account of their particular properties, these templates guarantee for the independence of the phrase structure representation from relational and interpretive properties (e.g. agreement, case, generalised semantic roles). They thus fulfil the preconditions motivated in the introduction.
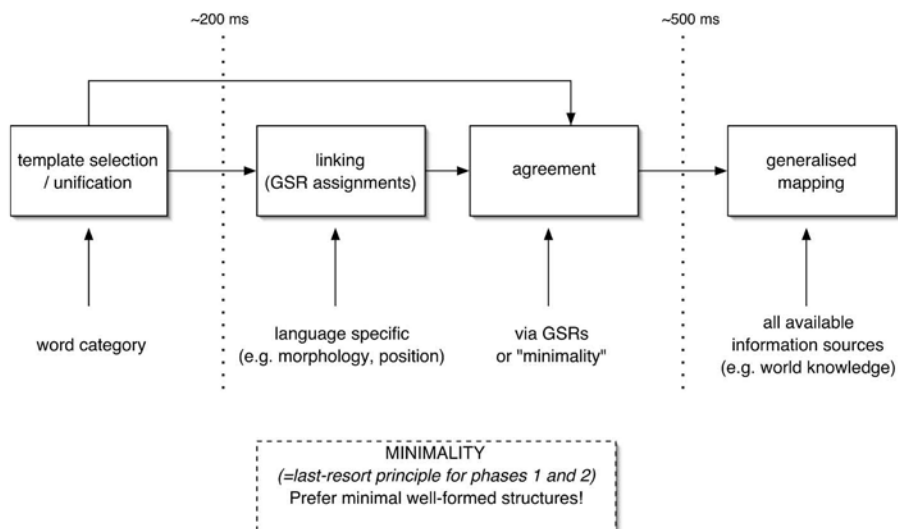
Figure 2. A simplified schematic depiction of the processing architecture assumed within the Argument Dependency Model (ADM).

Relational and interpretive assignments then take place in a subsequent second processing stage. The primary "goal" of phase 2 is argument linking, either via a combination of argument properties and the logical structure of the verb or, if no verb information is available yet, via the assignment of GSRs. Note that the most crucial information encoded in the GSRs assumed here is a (hierarchical) interpretive dependency between the arguments in the sense of Primus (1999).[1] Formal relational information such as agreement is also assigned on the basis of the GSR information. When the available information is insufficient to allow for the assignment of GSRs (e.g. when there is case ambiguity in German; see example 2), the system defaults to a "minimality" principle, which states that minimal well-formed structures are preferred and, therefore, that unnecessary dependencies should be avoided whenever possible. Crucially, minimality only leads to the assignment of formal features (such as agreement) but not interpretive information (such as GSRs). In this way, the difference between GSR assignments on the basis of whichever features are informative in this respect in a particular language and the "last resort" principle minimality derives the dissociation between unambiguously and ambiguously case marked structures in German that was discussed in the introduction. At the same time, the architecture of phase 2 has the capacity to model cross-linguistic differences in relational argument processing by

allowing variation in the properties deemed informative for GSR assignments (see Bornkessel and Schlesewsky 2005).

The third and final phase of comprehension comprises a "generalised mapping" step in which all available information types are mapped onto one another. Thus, the information sources thought to contribute to argument linking in phase 2 are integrated with "non core" information such as world knowledge and frequency of occurrence. In addition, a well-formedness check is initiated and repair operations are performed if required.

In the following, we will discuss the consequences of the ADM's processing assumptions for language architecture more generally. In this respect, it is important to keep in mind that, in contrast to grammatical theories, the ADM is a strictly time sensitive model of language comprehension, which aims to derive processing behaviour at each point in the input sequence. Thus, while we will argue comprehension strategies are informative with respect to certain representational issues, we do not mean to imply a direct correspondence between processing theories and theories of grammar.

3. The "structural case problem"

The results on incremental argument processing described above are difficult to reconcile with most existing models of language comprehension, because these are typically based on grammatical theories assuming a direct link between particular syntactic positions and morphological case (e.g. Chomsky 1981, 1995, 2000). Not only do these theoretical approaches posit an assignment of case via structural positions, they have even stated that case should be viewed as a "free rider" that may be checked as a by-product of other grammatical requirements such as agreement checking (Chomsky 1995: 282).[2] Indeed, in the spirit of this theoretical approach, a great deal of experimental research has examined processing differences between structural and non-structural cases (e.g. De Vicenzi 1999; Gorrell 1995, 2000; Hopf, Bayer, Meng, and Bader 1998; Bader, Meng, and Bayer 2000; Fodor and Inoue 2000; Townsend and Bever 2001; cf. also den Dikken 2000, for a theoretical implementation).

However, if a direct link indeed existed between structural positions and morphological case and if this knowledge played an active role during the comprehension process, the preference to interpret the first argument in a sentence such as (2) as agreeing with the finite verb – a property restricted

to nominative case in German – should also lead to the assignment of nominative case to this argument. As overtly marked nominative case is, in turn, preferably associated with an Actor interpretation (cf. the discussion of (1), above), one should expect an ambiguously case marked first argument such as *Amanda* in (2) to also be interpreted as Actor in German. As discussed in the previous two sections, this is not the case. Rather, an ambiguously case marked argument only gives rise to a preference for agreement with the finite verb, but does not engender any interpretive consequences in terms of generalised semantic roles. It therefore appears that the existence of morphological case, and hence its "interpretive force", should not be viewed as stemming from the association with particular syntactic positions – at least not cross-linguistically. Under the assumption that language comprehension as described by the ADM should correspond as closely as possible to general linguistic competence, the comprehension data call for a grammatical theory in which morphological case – and, consequently, its interpretive properties – are logically independent from syntactic structure.

A grammatical theory that fulfils the requirements of the ADM's processing architecture by allowing for a distinction between phrase structure, formal relational properties and a generalised role hierarchy is Role and Reference Grammar (RRG; Foley and Van Valin 1984; Van Valin 1993; Van Valin and LaPolla 1997; see also Van Valin *this volume*). Here, the "privileged syntactic argument" (PSA) is selected via a hierarchy distinct from that governing macrorole assignment.[3] From the point of view of language comprehension, PSA assignment in German is possible on the basis of overt (nominative) case marking, but also via a structural position. Macrorole assignment, by contrast, relies exclusively on the availability of morphological case marking (cf. Van Valin *this volume*).[4] Of course, the concept of linking between morphological case and interpretive hierarchies has also been proposed in the context of other grammatical frameworks, for example in Lexical Decomposition Grammar (LDG; Wunderlich 1997, 2003, *this volume*).

A further interesting aspect of RRG is that it assumes syntactic structuring to proceed on the basis of an inventory of syntactic templates, rather than in terms of structure-building rules. As described above, templates in the sense assumed here are pre-compiled syntactic structures encoding linear order and word category information. In this way, the template inventory serves to specify possible phrase structures in a given language on the basis of a very basic set of syntactic properties. The importance of this aspect of the theory from the perspective of the ADM is

that it allows for a separation between the surface ordering of constituents and their interpretation. Thus, the interpretation of an argument is not determined by its position within a template, but rather by an independent linking algorithm. The relationship between syntactic position as encoded templatically and argument interpretation as determined by the linking algorithm is shown in Figure 3 for sentences with a subject- and an object-initial order, respectively.

A. direct linking	B. inverse linking

CORE
ARG   ARG   NUC
NP   NP   V
der Arzt   den Kritiker   überzeugt
[the doctor]$_{NOM}$ [the critic]$_{ACC}$ convinces

Actor · · · · · Undergoer

CORE
ARG   ARG   NUC
NP   NP   V
den Kritiker   der Arzt   überzeugt
[the critic]$_{ACC}$ [the doctor]$_{NOM}$ convinces

Actor · · · · · Undergoer
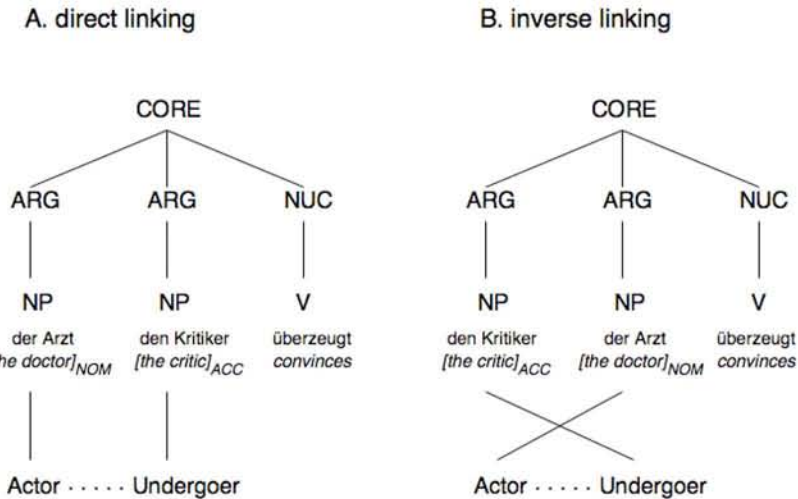
Figure 3.   A schematic depiction of the relationship between syntactic templates and linking properties for nominative-accusative (A) and accusative-nominative (B) sentences. A is a case of direct and B a case of inverse linking. Note that the syntactic templates are identical in both cases.

Figure 3 schematically depicts the relationship between syntactic templates and the linking algorithm for subject- and object-initial sentences. As is evident from the figure, both nominative- and accusative-initial word orders draw upon the same transitive template. However, the two word orders differ in that only nominative-initial sentences allow for a 'direct' linking. Accusative-initial orders, by contrast, require an 'inverse' linking in the sense that syntactic and interpretive prominence of an argument diverge. In this way, the templates described here differ markedly from the representations assumed in other template-based approaches to language comprehension (e.g. Vosse and Kempen 2000; Hagoort 2003). These models assume that templates encode a rich variety of different

information types, including not only word category and linear order, but also relational notions such as grammatical functions. Thus, in contrast to the present approach, they again assume a very tight coupling between an argument's position and its interpretation.

Incremental argument processing within the framework of a grammatical model assuming templates plus a linking algorithm may therefore be envisaged as follows. In an unambiguously case marked, object-initial sentence such as (3), two independent processes apply at the position of the first argument *den Jungen* ('[the boy]$_{ACC}$'). On the one hand, a suitable template is selected and, on the other, the argument is assigned an Undergoer interpretation on the basis of its accusative case marking.

(3)   ... *dass den Jungen das Mädchen besucht.*
      ... that [the boy]$_{ACC}$ [the girl]$_{NOM}$ visits
      '... that the girl visits the boy.'

In a sentence with ambiguously case marked arguments (e.g. 4), however, only the first of these two steps can take place at the position of the first argument, since the morphological case marking is not informative enough to allow for linking to a generalised semantic role. Linking is thus delayed until the clause-final verb is encountered and generalised roles may be assigned on the basis of the verb's logical structure (LS).

(4)   ... *dass Dietmar Mädchen begehren.*
      ... that Dietmar$_{NOM/ACC/DAT}$ girls$_{NOM/ACC/DAT}$ desire
      '... that girls find Dietmar desirable.'

In summary, the language processing architecture sketched out in this section assumes two levels of representation: generalised semantic roles and syntactic templates. Both types of representation may be assigned incrementally during language comprehension, but each is associated with its own assignment mechanism: a linking algorithm vs. template selection. The data outlined so far strongly implicate that generalised semantic roles should indeed be assumed as a distinct, psychologically real level of representation in a cognitive model of language. By contrast, the assumption of templates is somewhat more conceptually driven at present and still requires empirical underpinning. The following sections of this paper will therefore be concerned with motivating templates from a psycho-/neurolinguistic perspective.

4.   Evidence for syntactic templates vs. linking via generalised semantic roles

4.1.   Template selection

On the basis of existing language processing models and especially with regard to the neurocognitive model of language comprehension proposed by Friederici (2002), one would expect template selection (a) to feature as a rather elementary process of constituent structuring and (b) to apply independently of other syntactic operations. Within Friederici's model, the first phase of language comprehension is assumed to involve the assignment of basic syntactic structure by the application of word category information (cf. also Phase 1 of the ADM in Figure 1). The failure of this assignment engenders a characteristic signature of processing cost in terms of neurophysiological measures. Specifically, consider the following examples (from Hahne and Friederici 1999).

(5)   a. *Das Eis wurde gegessen.*
        the ice-cream was eaten
        'The ice-cream was eaten.'

    b. * *Das Eis wurde im gegessen.*
        the ice-cream was in-the eaten

Whereas (5a) is a grammatical sentence of German, syntactic structure assignment fails at the position of the participle *gegessen* ('eaten') in (5b). Here, the preposition-determiner complex *im* ('in the') requires a nominal complement, but a participle is encountered instead. In terms of event-related brain potential (ERP) measures[5], the clause-final participle in (5b) elicits an early left anterior negativity (ELAN) in comparison to its grammatical counterpart (5a) (Hahne and Friederici 1999). This effect has traditionally been interpreted as signalling a local violation between a subcategorising head and its complement on a word category level. Specifically, in example (5b), the preposition-determiner complex *im* subcategorises for an NP, but this requirement is violated when the word category of the next incoming word (the participle) is accessed.

    Alternatively, however, the ELAN may also be interpreted as a reflection of template selection failure. When the language processing system encounters the participle in (5b), the template currently under consideration is no longer appropriate. Even more gravely, however, there

is no other template in the inventory that fits the input string, thereby giving rise to a template selection failure. Consequently, the entire comprehension process fails at a very early stage of processing (phase 1 in Friederici's neurocognitive model).

Whereas a rule-based and a template-based interpretation of the ELAN appear equally plausible and therefore cannot be called upon as evidence to favour one account over the other, further empirical findings provide clear support for a template-based perspective. In an experiment using functional magnetic resonance imaging (fMRI) to examine the neural basis of language comprehension, Fiebach, Schlesewsky, Bornkessel and Friederici (2004) examined sentences such as (6).

(6)   a.   *Vielleicht hat der Gärtner dem Lehrer den Spaten geliehen.*
            perhaps has [the gardener]$_{NOM}$ [the teacher]$_{DAT}$ [the spade]$_{ACC}$ lent
            'Perhaps the gardener lent the spade to the teacher.'

      b.   *Vielleicht hat dem Gärtner der Lehrer den Spaten geliehen.*
            perhaps has [the gardener]$_{DAT}$ [the teacher]$_{NOM}$ [the spade]$_{ACC}$ lent
            'Perhaps the teacher lent the spade to the gardener.'

      c.   *Vielleicht hat dem Gärtner den Spaten der Lehrer geliehen.*
            perhaps has [the gardener]$_{DAT}$ [the spade]$_{ACC}$ [the teacher]$_{NOM}$ lent
            'Perhaps the teacher lent the spade to the gardener.'

      d.   * *Vielleicht hat der Gärtner geliehen dem Lehrer den Spaten.*
            perhaps has [the gardener]$_{NOM}$ lent [the teacher]$_{DAT}$ [the spade]$_{ACC}$

The sentences in (6) involve two critical manipulations. On the one hand, the three grammatical sentences (6a)–(6c) encode a continuous increase in complexity: (6a) is a canonical German sentence with the ordering nominative-dative-accusative; in (6b) the dative has been scrambled to the left of the subject; (6c) involves two scrambling operations as both objects precede the subject. The second manipulation is one of ungrammaticality vs. grammaticality, which was achieved by creating sentences such as (6d), in which the participle is infelicitously positioned between the subject and the indirect object. Both manipulations gave rise to distinct activation patterns using the fMRI method as shown in Figure 4.
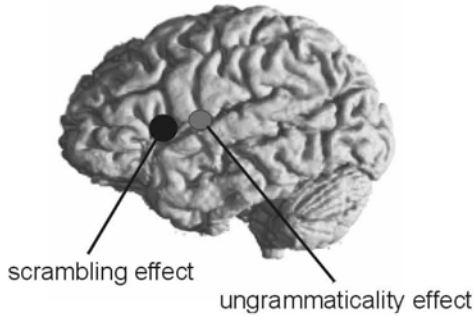
Figure 4. A schematic depiction of the brain regions activated in response to the complexity (scrambling) and grammaticality manipulations.

As is apparent from Figure 4, the complexity manipulation was reflected in an activation increase in the opercular part of the left inferior frontal gyrus (BA 44), while the grammaticality manipulation engendered increased activation for ungrammatical sentences in the posterior deep frontal operculum. Importantly, note that the ungrammatical sentence condition did not elicit a higher level of activation in BA 44 than even the least complex (canonical) grammatical condition. The data therefore show a double dissociation between complexity and grammaticality, which is not straightforwardly derivable in models of grammar and language comprehension assuming that language is parsed from left to right on the basis of rule application. From such a perspective, both of the critical manipulations arise from the application of rules or the failure thereof, i.e. from qualitatively similar processes. Whereas the ungrammatical condition initiates a search process ending in a rule application failure – as there is no rule to derive the structure in (6d) – the complex (scrambled) grammatical conditions (6b,c) involve more rule applications than the canonical structure (6a). In each case, however, aspects of rule application are involved in generating the increased processing cost. Therefore, from a rule-based perspective, one should expect to see an activation pattern in the complexity-sensitive brain region BA 44, in which the ungrammatical condition (6d) elicits a higher degree of neuronal activity than the canonical grammatical condition (6a).

From a template-based perspective, however, the observed pattern of results falls out naturally. Structures such as (6d) give rise to processing difficulty because they require a syntactic template that does not exist in the

template inventory of German, thereby giving rise to a template selection failure. As a consequence, increased activation in the deep frontal operculum for this condition results in comparison to the canonical grammatical condition (6a). In contrast to the grammaticality manipulation, the complexity manipulation does not result from a template selection problem, since all of the structures in (6a) to (6c) may be straightforwardly associated with the same active ditransitive template. Rather, the three conditions differ with regard to the complexity of the linking mechanisms involved. In (6a), linking is straightforward, since the surface realisation of the arguments hierarchically corresponds to the generalised role hierarchy and to the hierarchy of arguments in the verb's LS. By contrast, the linking requirements of (6b) and (6c) are successively more complex, as they involve crossed dependencies between these different levels of representation. The parametric increase in activation in Broca's area (BA 44) as a result of the complexity manipulation can therefore be interpreted as a response to the continually increasing complexity of linking requirements. In this way, the qualitative distinction between grammaticality and complexity apparent in these results may be straightforwardly derived in a grammatical framework assuming a distinction between syntactic templates and syntax-to-semantics linking via a generalised role hierarchy.

The association between template selection and the deep frontal operculum on the one hand and linking complexity and BA 44 on the other is supported by independent evidence. On the basis of the account sketched out above, one should expect to observe a correspondence between the ELAN as a temporal expression of template selection failure and the deep frontal operculum as a spatial expression of the same process. Indeed, Friederici, Rueschemeyer, Hahne and Fiebach (2003) showed that sentences such as (5b), which induce an ELAN, also engender enhanced activation in the deep frontal operculum in comparison to grammatical control sentences (5a). Similarly, conducive evidence for the assumed connection between BA 44 and linking complexity stems from an experiment by Röder, Stock, Neville, Bien, and Rösler (2002), in which a complexity manipulation identical to that in the Fiebach et al. (2004) study was undertaken for sentences such as (6a)–(6c) as well as for sentences with pseudo-words. Example (7) shows a pseudo-word condition structurally analogous to (6a).

(7) *Jetzt wird der Trosanaut dem Schorfer den Rond bebreuschen.*
     now will the$_{NOM}$ trosanaut the$_{DAT}$ schorfer the$_{ACC}$ rond bebreuschen

As the example in (7) shows, the case marking of the arguments was preserved, while the semantically contentful nouns and the participle were replaced by pseudo-words. Röder et al. (2002) observed a complexity effect in BA 44 that was apparent for sentences without pseudo-words (as in the Fiebach et al. study) but also for sentences with pseudo-words. This finding may been seen as an indication that the morphological case marking that was retained in the pseudo-word conditions was sufficient to initiate the linking mechanisms. Interestingly, the complexity effect was stronger for sentences without pseudo-words, thereby supporting the idea that the BA 44 activation in question should not be viewed as reflecting a purely structural process – as an account based solely on rules might lead one to expect – but crucially also makes reference to interpretive properties of the arguments. These interpretive properties may, in part, be viewed as implicatures pertaining to argument interpretation and role specification, for example that an Actor that is animate and marked with nominative will typically be interpreted as an Agent (Holisky 1987; Primus 1999; Van Valin and Wilkins 1996).[6]

4.2.   Templates, linking and reanalysis

A further prediction derivable from a separation between syntactic templates and linking via a generalised role hierarchy is that many of the effects in language comprehension traditionally explained in terms of syntactic complexity (cf. Just and Carpenter 1992; Caplan and Waters 1999) should rather be viewed as resulting from linking complexity. This is the case because, as described above, word order variations such as scrambling in German do not affect template selection: all transitive structures, for example, will require selection of the identical syntactic template, irrespective of word order.[7] From such a perspective, both of the sentences in (8) utilise the same template, although their argument orders differ.

(8)   a. *Vielleicht besuchte der Minister den Botschafter.*
        perhaps visited [the minister]$_{NOM}$ [the ambassador]$_{ACC}$
        'Perhaps the minister visited the ambassador.'

      b. *Vielleicht besuchte den Minister der Botschafter.*
        perhaps visited [the minister]$_{ACC}$ [the ambassador]$_{NOM}$
        'Perhaps the ambassador visited the minister.'

In contrast to their identical template selection requirements, (8a) and (8b) differ in terms of linking to the generalised role hierarchy and to the LS of the verb. Whereas the linking process is straightforward in (8a) because argument order, generalised role hierarchy and LS all correspond in terms of hierarchical dependencies (NOM > ACC), inverse linking is required in (8b). Here, the order of arguments in the syntactic structure (ACC > NOM) is exactly the opposite of that in the generalised role hierarchy (NOM-Actor > ACC-Undergoer). Thus, linking is more complex in (8b) than in (8a), despite the fact that template selection is identical in both cases.

With regard to dative-initial word orders, matters are a little more complex. Following the assumptions of traditional German grammarians (cf. Helbig and Buscha 1996), RRG posits that dative verbs are macrorole-intransitive (see Van Valin and LaPolla 1997, for extensive discussion). Thus, these verbs are thought to assign a macrorole (either Actor or Undergoer, depending on the type of verb) only to the nominative argument, while the dative marks a non-macrorole argument. From this perspective, dative verbs should never engender processing costs associated with an inverse linking from the syntax to the macrorole hierarchy, because they only link to a single macrorole on this hierarchy. By contrast, other generalised role accounts, in which the dative may also mark an Actor (Proto-Agent) or Undergoer (Proto-Patient), predict that dative sentences should also engender an inverse linking when the surface word order does not correspond to the lexical argument hierarchy. Interestingly, both accounts converge on the prediction that non-nominative-initial word orders in German need not always engender additional linking costs. Consider example (9).

(9)   *Vielleicht gefiel dem Minister der Botschafter.*
      perhaps pleased [the minister]$_{DAT}$ [the ambassador]$_{NOM}$
      'Perhaps the ambassador appealed to the minister.'

In (9), the dative-nominative word order corresponds to the basic argument order from a linking perspective, because the dative object-experiencer verb *gefallen* ('to be appealing to') projects an argument hierarchy in which the dative-marked Experiencer is higher-ranking than the nominative-marked Stimulus (Wunderlich 1997; Primus 1999; Fanselow 2000; Haider and Rosengren 2003). Thus, even under the assumption of two generalised roles, linking to the GSR hierarchy should be just as straightforward here as in (8a).

These assumptions with regard to direct vs. inverse linking constellations receive strong converging support from experimental findings regarding grammatical function reanalysis in German sentences such as (10).

(10)   a.   ... *dass Richard Dirigenten besucht.*
        ... that Richard$_{NOM/ACC/DAT.SG}$ conductors$_{NOM/ACC/DAT.PL}$ visits$_{SG}$
        '... that Richard visits conductors.'

      b.   ... *dass Richard Dirigenten besuchen.*
        ... that Richard$_{NOM/ACC/DAT.SG}$ conductors$_{NOM/ACC/DAT.PL}$ visit$_{PL}$
        '... that conductors visit Richard.'

      c.   ... *dass Richard Dirigenten auffällt.*
        ... that Richard$_{NOM/ACC/DAT.SG}$ conductors$_{NOM/ACC/DAT.PL}$ is-striking-to$_{SG}$
        '... that conductors find Richard striking.'

      d.   ... *dass Richard Dirigenten auffallen.*
        ... that Richard$_{NOM/ACC/DAT.SG}$ conductors$_{NOM/ACC/DAT.PL}$ is-striking-to$_{PL}$
        '... that Richard finds conductors striking.'

In all of the sentences in (10), both of the arguments are ambiguous between nominative, accusative and dative case marking before the clause-final verb is encountered. Thus, until this point, the sentence could either be disambiguated towards a subject-initial (10a/c) or an object-initial reading (10b/d) and the object could turn out to bear accusative (10a/b) or dative case (10c/d). In accordance with the well-established preference for subject-initiality manifest in the comprehension of German and many other languages (e.g. Frazier 1987; De Vincenzi 1991; Hemforth 1993; Schriefers, Friederici, and Kühn 1995; Bader and Meng 1999; Schlesewsky, Fanselow, Kliegl, and Krems 2000), all of the sentences should initially be assigned a subject-initial analysis, which must subsequently be revised when the clause-final verb does not agree in number with the supposed subject (10b/d). However, the reanalysis effect that is observable at this point differs qualitatively between (10b) and (10d) in that the former elicits a parietal positivity between approximately 600 and 900 ms post onset of the verb (P600), while the latter is associated with a centro-parietal negativity between approximately 400 and 600 ms post

onset of the verb (N400) in terms of ERP measures (Bornkessel et al. 2004). The two effects are shown in Figure 5.
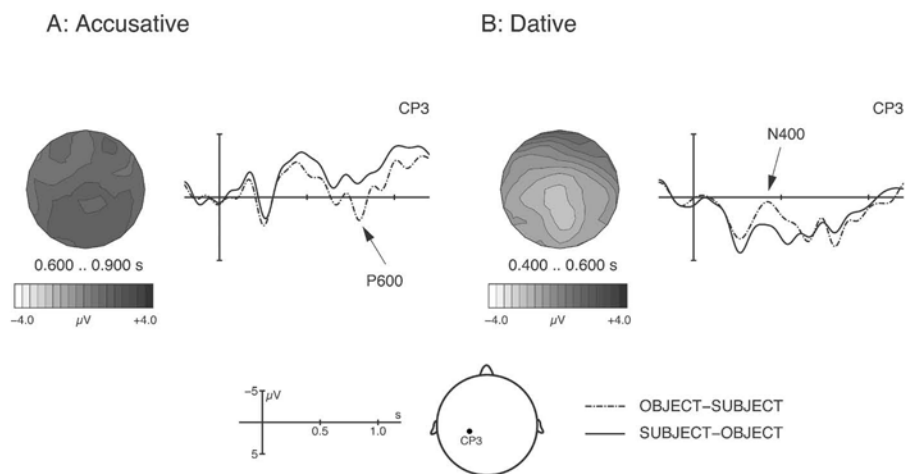
Figure 5. Grand average ERPs for object-initial (dash-dotted line) vs. subject-initial (solid line) sentences at the position of the disambiguating verb (onset at the vertical bar) for accusative (A) and dative (B) verbs. Negativity is plotted upwards. The topographical maps show the distribution of the effects (object-initial – subject-initial).

In this way, the qualitative difference between the two reanalysis processes exactly corresponds to the hypothesised linking differences between accusative-initial sentences (10b) and dative-initial sentences with object-experiencer verbs (10d). In the former, reanalysis involves not only a reassignment of grammatical functions (i.e. a reassignment of which argument agrees with the verb) but also the establishment of an inverse linking relation. The dative-initial structures with object-experiencer verbs, by contrast, only require a grammatical function (agreement) reassignment, because a straightforward linking relation still suffices for the computation of the correct interpretation. This result is compatible with an account assuming that the dative argument receives a GSR as well as with an RRG-style analysis of dative verbs as macrorole intransitive.

However, the two analyses of dative case marking in German do not always lead to identical predictions. They differ, for example, with regard to dative-initial sentences with dative active verbs, such as (11).

(11)   *... dass Richard Dirigenten danken.*
    ... that Richard$_{NOM/ACC/DAT.SG}$ conductors$_{NOM/ACC/DAT.PL}$ thank$_{PL}$
    '... that conductors thank Richard.'

Like accusative verbs, dative active verbs such as *danken* ('to thank') project a canonical argument hierarchy, in which the nominative-marked Agent outranks the dative-marked argument. Thus, these verbs are also associated with a nominative-initial basic word order. From the perspective of an account assuming that dative arguments receive a GSR, sentences such as (11) should therefore behave similarly to accusative-initial sentences such as (10b). The macrorole-intransitivity account for datives, by contrast, leads to the prediction that – if the observed "reanalysis" effects indeed reflect the effort of linking to a GSR-hierarchy – dative active verbs should behave similarly to dative object-experiencer verbs (e.g. 10d), because both only assign a single macrorole and thereby never call for an inverse linking.

Indeed, Bornkessel et al. (2004) observed an N400 rather than a P600 effect for sentences such as (11) in comparison to their nominative-initial counterparts. This common pattern for both dative verb classes in comparison to accusative verbs thus lends support to the assumption that transitive dative verbs indeed only assign a single GSR, namely to the nominative argument. Furthermore, this finding again attests to the independence of argument interpretation from argument position in German: because dative active verbs and accusative verbs are associated with similar basic word orders, they should involve identical processes of structural reanalysis. Nevertheless, fully complementary electrophysiological effects are observable. This strongly suggests that the increased processing costs observed are a function of interpretive (linking) processes, rather than syntactic complexity, and, consequently, that linking cannot be a function of syntactic position. Thus, the template plus linking algorithm perspective appears to capture the reanalysis data more straightforwardly than rule-based approaches to syntactic structure building assuming a direct link between syntactic positions and argument interpretation.

5.   Conclusions and outlook

In the previous sections, we have presented a number of results from language comprehension in support of a grammatical model assuming a distinction between syntactic templates and a linking system based on a

generalised semantic role hierarchy. In terms of the ADM, these observations give rise to the following implications for language comprehension architecture:

Template selection is accomplished during phase 1 of comprehension and draws solely on word category information.

Linking via generalised semantic roles takes place in phase 2 of comprehension and may – in languages such as German, at least – be achieved on the basis of morphological case marking or explicit verb information. Crucially, linking is not initiated on the basis of syntactic positions or linear order.

The "subject preference" apparent in studies of language comprehension in German and other languages also arises in processing phase 2. In the absence of unambiguous case marking, this preference to establish an agreement relation between the first argument of a clause and the verb arises from the endeavour of the comprehension system to build minimal structures. An analysis of the first argument as agreeing with the verb allows for this minimality (and, hence, intransitivity) preference to be upheld (Schlesewsky and Friederici 2003). Consequently, the "subject preference" is not a reflex of the processing or prediction of a particular syntactic position. When unambiguous morphological case marking is available, the agreement relation between the highest-ranking syntactic argument and the verb is established via nominative case.

While the separation between template selection in phase 1 and linking in phase 2 of comprehension may be assumed to be universal, the exact mechanisms determining generalised role selection will plausibly differ from language to language (see above). Furthermore, the relationship between syntactic and interpretive prominence as determined during language comprehension will most likely also be subject to cross-linguistic differences.

Most generally, German – which forms the basis for the original formulation of the ADM – appears to be a rather complex instantiation of the language comprehension architecture assumed here. Here, agreement requirements (determining syntactic prominence) and generalised role assignment requirements (determining interpretive prominence) apply independently of one another during phase 2 of processing. Thus, interpretive prominence is not derived from syntactic prominence and vice versa. In contrast to this type of system, in which minimality-based syntactic assignments yield different results from those derived via GSR assignment mechanisms, we should also expect to find languages in which the two information types coincide.

A case in point is English. In languages of this type, role selection (linking) in language comprehension takes place via syntactic positions, thereby converging with the output of the minimality principle. The opposite case, in which minimal well-formed structures are defined via semantic prominence, is found in languages such as Belhare (Bickel 2000, *this volume*). Here, the argument bearing the highest generalised role is also assigned syntactic prominence, irrespective of its case marking. Hence, in both of these language types, the two mechanisms (generalised roles, minimality) assumed to apply in phase 2 of comprehension coincide. Of course, the specific neurophysiological predictions arising from these cross-linguistic hypotheses require testing in future experimental work.[8]

To conclude, we have proposed a framework for language processing which integrates existing insights on the neurophysiological basis of com-prehension with the architectural assumptions of grammatical theories positing a distinction between syntactic templates and a linking algorithm involving generalised semantic roles. We have presented experimental evidence suggesting that generalised semantic roles are not just a theoretical construct, but should be viewed as psychologically real. This radically new approach accounts for a wide range of empirical findings and thereby constitutes a promising framework for the return to a cross-linguistically adequate, integrative view of linguistic competence and performance.

Notes

1. Primus states that "if one participant of a predicate is causally affected, the predicate necessarily selects a causer as another participant" (Primus 1999: 52). This is the defining characteristic of semantic-role dependencies: "lower-ranking" participants in terms of generalised semantic roles are dependent on "higher-ranking" participants.
2. Note, however, that a few authors have attempted to decouple morphological case marking from syntactic positions even in this grammatical framework (Neeleman and Weerman 1999; Bouchard 2001).
3. Under certain circumstances, the two hierarchies may coincide (cf. Bickel, *this volume*).
4. Note that this assumed necessity of morphological case marking for macrorole assignment arises from the perspective of language comprehension in verb-final constructions (see the introduction section). From the perspective of a competence model, macrorole assignment is, of course, also

possible via the lexical entry of the verb, specifically its logical structure (LS).

5. ERPs are small changes in the spontaneous electrical activity of the brain, which occur in response to certain sensory or cognitive stimuli and which may be recorded continuously and non-invasively by means of electrodes attached to the scalp. The recording of ERPs has proven particularly fruitful for the examination of complex linguistic phenomena, since this method not only provides a very high degree of temporal resolution, but also allows for qualitative differentiation in terms of various dimensions of the ERP signal, for example latency (onset/peak of an observed effect relative to critical stimulus onset), topography (electrode sites a which an effect is observable) and polarity (negativity or positivity of an observed effect relative to a control condition) (e.g. Kutas and Hillyard 1980; Neville, Nicol, Barss, Forster, and Garrett 1991; Osterhout and Holcomb 1992; Hagoort, Brown, and Groothusen 1993; Friederici 2002, among many others).

6. Holisky proposes the following principle: "You may interpret effectors which are human as agents" (Holisky 1987: 119), which is assumed to be pragmatic in nature. Experimental findings suggest that implicatures of this type are, indeed, psychologically real. For example, in German sentences with an initial accusative, the case marking of this argument triggers an immediate association with an Undergoer (Proto-Patient) generalised semantic role and, by way of thematic dependencies (cf. Fn. 1), gives rise to the prediction of an Actor (Proto-Agent). When a (nominative-marked) argument that may suitably fulfil the prediction is encountered during subsequent processing, an inanimate nominative gives rise to additional processing cost in comparison to an animate nominative (Schlesewsky and Bornkessel 2004). This suggests that an "ideal" Actor exercising maximal control over the event being described (i.e. an Agent) should be animate.

7. Note, however, that there are also word order variations (e.g. wh-movement) which require explanation in terms of differences at the templatic level. In RRG, for example, wh-movement is thought to target a position called the "pre-core slot", which lies outside of the scope of core templates. Indeed, these types of word order variations are associated with a different processing behaviour to those under examination here (Friederici, Schlesewsky, and Fiebach 2003; for experimental evidence cf. also Fiebach, Schlesewsky, and Friederici 2002; Matzke, Mai, Nager, Ruesseler, and Muente 2002).

8. A further open question arising from the perspective on language processing developed here concerns the acquisition of a comprehension system encompassing syntactic templates and a linking algorithm. While the two are logically independent in the adult comprehension system (cf. German), it may be the case that one is acquired via bootstrapping with regard to the other. Moreover, the question arises of how the internal mechanisms of each of the systems are established and which information sources are drawn upon in this process. Again, this constitutes an important domain for future research.

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