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)

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-
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 core-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. Experiencees 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 (\(x \text{ gave } y \text{ something } z, x \text{ baked } y \text{ a cake } z\)) or a change in sentience (\(x \text{ told } y \text{ a story } z, x \text{ showed } y \text{ a picture } z\)). 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 \(\text{geben 'give'}\) 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 theProto-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: 193f.) 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. 17) 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

\[
\text{pred}(x,y) \\
\text{independent involvement of } x = \text{Proto-Agent}
\]

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:

\[
\begin{align*}
\text{ctrl}(x,s) \\
[\text{exp}(x,s)] \\
<\text{phys}(x,z)_{s1}^{s1}, \text{phys}(y,z)_{s2}^{s2}> \\
<\text{poss}(x,z)_{s1}^{s1}, \text{poss}(y,z)_{s2}^{s2}> \\
\text{exp}(y,z)_{s2}^{s2}
\end{align*}
\]

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 \(\text{exp}(x,s)\) is bracketed since it is redundant: Control of an event unilaterally implies awareness of that event and of the other participants.

The argument structure, \(\text{give}'(x,y,z)\), 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 \(\succ_{\text{dep}}\) Recipient \(\succ_{\text{dep}}\) 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 \(\text{ctrl}(x,s)\) 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. \(\text{ctrl}(x,s)\) with \(y\) in \(s\)) and Proto-Agent relative to \(z\) (cf. \(\text{phys}(y,z)\) and \(\text{poss}(y,z)\)). 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: \( \theta_{\text{max}} \succ_{\text{invol}} \theta_{\text{min}} \)
   b. Special cases:
   
   - \( \text{Agent} (A_{\text{max}}) \succ_{\text{invol}} \text{Recipient/Benefactive} (A_{\text{min}}) \)
   - \( \text{Agent} (A_{\text{max}}) \succ_{\text{invol}} \text{Experiencer} (A_{\text{min}}) \)
   - \( \text{Patient} (P_{\text{max}}) \succ_{\text{invol}} \text{Recipient/Benefactive} (P_{\text{min}}) \)
   - \( \text{Patient} (P_{\text{max}}) \succ_{\text{invol}} \text{Theme/Stimulus} (P_{\text{min}}) \)

\( \theta_{\text{max}} \) is an abbreviation for a role with a large number of consistent Proto-Role properties; \( \theta_{\text{min}} \) 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 $A_{\text{max}}$ and $P_{\text{max}}$ to the first two elements of a case markedness hierarchy $1C > 2C$. The ergative parameter links $1C$ to either $A_{\text{max}}$ or $P_{\text{max}}$, and correspondingly $2C$ to either $P_{\text{max}}$ or $A_{\text{max}}$ so that the ranking options (6) and (7) are obtained:

(6) Accusative Ranking ($n \neq 1; m \neq 2$)
   a. $A_{\text{max}}/1C >> A_{\text{max}}/nC$
   b. $P_{\text{max}}/2C >> P_{\text{max}}/mC$

(7) Ergative Ranking ($n \neq 1; m \neq 2$)
   a. $A_{\text{max}}/2C >> A_{\text{max}}/mC$
   b. $P_{\text{max}}/1C >> P_{\text{max}}/nC$

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) 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 absolutive 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 diáknaak 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\text{max} (Agent proper), y = A\text{min} and P\text{min} (Recipient), and z = P\text{max} (Patient proper). Given three cases, there are 27 candidates, though for illustrative purposes, Tab. 1 only shows the five most interesting candidates.

Table 1. Eval geben

<table>
<thead>
<tr>
<th>Input: see (4)</th>
<th>A\text{max}/NOM</th>
<th>A\text{max}/CASE#NOM</th>
<th>P\text{max}/ACC</th>
<th>P\text{max}/CASE#ACC</th>
<th>DISTINCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) acc\text{c}, dat\text{c}, nom\text{c}</td>
<td>*!</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) nom\text{c}, acc\text{c}, dat\text{c}</td>
<td>*</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) dat\text{c}, nom\text{c}, acc\text{c}</td>
<td>*!</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) nom\text{c}, acc\text{c}, acc\text{c}</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
<td>!</td>
</tr>
<tr>
<td>e) F\text{c} nom\text{c}, dat\text{c}, acc\text{c}</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

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 $\text{A}^\text{max}/\text{NOM}$, $\text{P}^\text{max}/\text{ACC}$, and $\text{DISTINCT}$ 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. $F$); all other candidates will be definitive losers (cf. $^*$! for a fatal violation). Since the evaluation in Tab. 1 is decided at the three dominating constraints, violations of the two lower constraints are irrelevant (cf. the shaded columns). $\text{DISTINCT}$, a constraint that penalizes case frames with non-distinct case functions, has been added to show that case selection for $\text{A}^\text{min}$ and $\text{P}^\text{min}$, the Recipient, may be constrained by additional constraints not included in (6)–(7).

The winning candidate $\langle \text{nom}, \text{dat}, \text{acc} \rangle$ 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):

\[
\begin{array}{ll}
\text{aita-k} & \text{ama-ri} \\
\text{gorri-a} & \text{e rosi} \\
\text{dio} & \\
\end{array}
\]

father-ERG mother-DAT skirt red-NOM buy AUX

'Father bought mother a red skirt.'

(10) Laz (Hopa dialect, Harris 1985: 308f.):

\[
\begin{array}{ll}
\text{ba-ba-k} & \text{cxeni} \\
\text{me-cu} & \text{skiri-s} \\
\end{array}
\]

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.

Tab. 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-

<table>
<thead>
<tr>
<th>Input: see (4)</th>
<th>A^{max}/ERG</th>
<th>A^{max}/CASE #ERG</th>
<th>P^{max}/NOM</th>
<th>P^{max}/CASE#NOM</th>
<th>DISTINCT</th>
</tr>
</thead>
<tbody>
<tr>
<td>a) F\ erg^x, dat^y, nom^z</td>
<td>*</td>
<td>*</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>b) nom^x, erg^y, dat^z</td>
<td>*!</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>c) dat^x, nom^y, erg^z</td>
<td>*!</td>
<td></td>
<td>*!</td>
<td></td>
<td></td>
</tr>
<tr>
<td>d) erg^x, nom^y, nom^z</td>
<td>*</td>
<td></td>
<td>*</td>
<td></td>
<td>*!</td>
</tr>
</tbody>
</table>
| 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}. 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 croslinguistically more variable case selection. The case of the Proto-Recipient in the winning patterns in Tab. 1 and Tab. 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 Tab. 1 and Tab. 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)^{x1}, poss(x,z)^{x2}> 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 Tab. 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\(^5\), dat\(^3\), acc\(^2\)> 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 Experimenters 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 \(A_{\text{max}} >_{\text{vol}} A_{\text{min}}\): 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 sentence property of the referent is not caused by the Stimulus. The explanation for this case linking difference between Agents and Experimenters is their difference in involvement: while \(A^{\text{max}}/\text{NOM} \gg A^{\text{max}}/\text{CASE} \neq \text{NOM}\) corresponds to an invariant accusative ranking (cf. (6a) above), \(A^{\text{min}}\) does not participate in this ranking. The impact of the invariant ranking on the case linking options of an action verb is illustrated in Tab. 3 for the German verb arbeiten 'work':

| Input: ctrl(x), phys(x), ... \(A^{\text{max}}/\text{NOM}\) \(A^{\text{max}}/\text{CASE} \neq \text{NOM}\) | \(F\) ich (nom) arbeite | mich (acc) arbeitet | *
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Table 3. Eval action verb
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. Tsoga-Tush = Batsbi, Holisky 1987) that is due to the competition between A\textsubscript{nominative}/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. Bosson 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 >vol 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, 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 movement.

Adapting ideas put forward by Holmberg and Platzak (1995: 185f.) and Radford (1998: 198f.), 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*:

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: 38f.), 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 superordinate 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: 198f.). 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\textsubscript{2} herself\textsubscript{1} in the mirror.
    *I showed herself\textsubscript{1} Mary\textsubscript{2} in the mirror.

The rigid Recipient-Patient order\textsuperscript{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) \[
\begin{array}{c}
  \text{VP} \\
  \text{V} & \text{DP} & \text{DP} \\
  \text{show} & \text{Mary} & \text{a picture}
\end{array}
\]

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 \textit{prima facie}. Cf., for instance, Baker's (1996: 20) analysis shown in (17):
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 sentence 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 sentence 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 isomorphically, 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: 142f.). 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 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, we assume that 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. Although Dryer's (1986) sample of languages is too small for a firm conclusion, this bias is evident in his sample (cf. also the semantically equivalent ditransitive constructions in English and German in (15) and (19) above). 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: 816f.), e.g. Khasi (Mon-Khmer) and Lahu (Lolo-Burmese). These constructions use the same adposition for the Proto-Reci-
pient 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 ><sub>dep</sub> Patient and the implausibility of Patient ><sub>dep</sub> 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. 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: 138f.). Cf. the following data from Basque (Hualde and de Urbina 2003: 621–622):
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 (*libura* '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) \[ \text{ni-ri batez ere neure burua-k ematen dit beldurra} \]
I-DAT above-all REFL-ERG give AUX fear(ABS)
'Above all myself gives me fear.'

(23) \[ \text{Jon-i asko gustatzen zaio bere burua} \]
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 pre-
diction 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: \(x \text{ likes } y, x \text{ fears } y, x \text{ believes } y\)
    b. Object-Experiencer: \(y \text{ pleases } x, y \text{ frightens } x, y \text{ strikes } x \text{ as } P\)

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 \(\text{happen}\) (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 >\textsubscript{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: 158f.). 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: 158f.) 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 >\textsubscript{dep} Proto-Patient. This dependency between the two Proto-Roles has at least three special cases, which were discussed here: Agent >\textsubscript{dep} Patient, Recipient >\textsubscript{dep} Patient, and Experiencer >\textsubscript{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 >\textsubscript{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 >\textsubscript{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 $A_{\text{max}}$ and $A_{\text{min}}$ on the one hand and $P_{\text{max}}$ and $P_{\text{min}}$ on the other hand can only be decided on a language specific basis. In the German example in Tab. 3, $A_{\text{max}}$ is established on the basis that $\text{ctrl}(x,s)$ entails $\text{exp}(x,s)$ and is reinforced by $\text{phys}(x)$, 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. 4 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).

References

Anderson, Stephen R.

Baker, Mark C.

Barss, Andrew and Lasnik, Howard

Bickel, Balthasar

Bisang, Walter
Bornkessel, Ina and Schlesewsky, Matthias

Bossong, Georg


Bossong, Georg
this volume Meaning, form and function in basic case roles. In Semantic role universals and argument linking: Theoretical, typological, and psycholinguistic perspectives, Ina Bornkessel, Matthias Schlesewsky, Bernard Comrie, and Angela D. Friederici (eds.), 241–269. Berlin: Mouton de Gruyter.

Burzio, Luigi

Chomsky, Noam

Comrie, Bernard and van den Berg, Helma

Croft, William


Dik, Simon C.

Dixon, Robert M. W.

Donohue, Mark and Brown, Lea
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<table>
<thead>
<tr>
<th>Author</th>
<th>Year</th>
<th>Title</th>
<th>Page/Volume</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dryer, Matthew S.</td>
<td>1986</td>
<td>Primary objects, secondary objects, and antidative.</td>
<td>Language 62: 808–845</td>
</tr>
<tr>
<td>Golston, Chris</td>
<td>1996</td>
<td>Direct optimality theory: representations as pure markedness.</td>
<td>Language 72: 713–748</td>
</tr>
<tr>
<td>Hammond, Michael</td>
<td>1995</td>
<td>There is no lexicon!</td>
<td><em>ROA</em> (Rutgers Optimality Archive).</td>
</tr>
</tbody>
</table>
Hualde, José Ignacio and de Urbina, Jon Ortiz

Iwata, Seizi

Jackendoff, Ray

Klein, Katarina and Kutscher, Silvia
2003 *Lexical economy and case selection of psych-verbs in German*. Submitted for publication.

Krifka, Manfred
2003 *Semantic and pragmatic conditions for the dative alternation*, http://amor.rz.hu-berlin.de/~h2816i3x

Lakoff, George and Johnson, Mark

Larson, Richard K.

Légendre, Géraldine, William, Raymond and Smolensky, Paul

Leslie, Alan M.

Lewis, David

Newmeyer, Frederick

Pesetsky, David
Piñango, Maria Mercedes


Pinker, Steven


Premack, David


Premack David and Premack, Ann James


Primus, Beatrice


Radford, Andrew


Saltarelli, Mario


Sasse, Hans-Jürgen


Searle, John


Shibatani, Masayoshi

Wunderlich, Dieter this volume *Argument hierarchy and other factors determining argument realization*. In *Semantic role universals and argument linking: Theoretical, typological, and psycholinguistic perspectives*, Ina Bornkessel, Matthias Schlesewsky, Bernard Comrie, and Angela D. Friederici (eds.), 15–52. Berlin: Mouton de Gruyter.