

# Argument linking types - approached from the perspective of LDG

Dieter Wunderlich (Düsseldorf)

## 1. Introduction

Predicates can have one or more arguments. For nouns, one can distinguish between absolute nouns such as *tree* or *stick*, which have a single argument, and relational nouns such as *head* and *father*, which have two arguments that are strictly ordered: *head* refers to the head of someone, and it is this lower argument that can be realized by an inalienable possessor. Moreover, most absolute nouns can undergo a possessor extension, as shown in (1c), thus becoming relational with an alienable possessor as the lower argument. In the notation used here, a sequence of  $\lambda$ -abstractors precedes the open proposition which is formed by the predicate and the argument variables, and it reflects the ordering of arguments: the lower argument role is to the left and the higher argument role to the right. Note that the higher argument of a noun is a referential argument, which is realized as a complement only in predicative use; otherwise it is bound by functional categories such as articles or quantifiers.

### (1) Classification of nouns

- a. absolute:  $\lambda x$  TREE(x)  
 $\lambda x$  STICK(x)
- b. relational:  $\lambda y \lambda x$  HEAD(x,y)  
 $\lambda y \lambda x$  FATHER(x,y)
- c. possessed nouns:  $\lambda y \lambda x$  [N(x) & POSS(y,x)]

The classification of verbs is more intricate: static verbs denoting states have an additional time variable  $t$ , while dynamic verbs denoting events have an additional situation variable  $s$ . Intransitive verbs thus have  $t$  or  $s$  as the referential argument (to be bound by tense) and a further argument to be realized as a complement, while relational verbs have two complements. Static intransitives such as *sit* or *dead* (whose counterpart is an adjective in some languages) can be compared with static relationals such as *surround*. For dynamic verbs, two classificatory factors play a role: inherent aspect and inherent control. According to their inherent aspect, verbs can be telic (such as *return* or *die*) or atelic (such as *sing* or *boil*). Inherent control distinguishes whether the verb is agentive (such as *return* or *sing*) or non-agentive (such as *die* or *boil*). (2b) illustrates the resulting cross-classification for dynamic intransitives.

### (2) Classification of intransitive verbs according to their semantic type.

- a. static ( $t$ )  
 $\lambda x \lambda t$  SIT(x)(t)  
 $\lambda x \lambda t$  DEAD(x)(t)

b. dynamic (s)

		inherent aspect	
		telic	atelic
inherent control	agentive	$\lambda x \lambda s \text{ RETURN}(x)(s)$	$\lambda x \lambda s \text{ SING}(x)(s)$
	non-agentive	$\lambda x \lambda s \text{ DIE}(x)(s)$	$\lambda x \lambda s \text{ BOIL}(x)(s)$

Relational verbs can also be telic (such as *kill*) or atelic (such as *to boil something*), a property which is mostly determined with respect to the lower argument. In (3b), these verbs are decomposed, and the inherent aspect is a property of the second predicate; the predicate ACT, which is taken as the first predicate, is a general atelic activity predicate. Canonical transitive verbs have a patient (which is affected by the event) and an agent (which controls the event); thus, the inherent control properties are distributed among the two predicates in (3b). There are other transitive verbs (such as *hit*) that cannot as easily be decomposed into two predicates, but nevertheless show the same semantic properties.

(3) Classification of relational verbs

a. static (t)

$\lambda y \lambda x \lambda t \text{ SURROUND}(x,y)(t)$

b. dynamic (s)

		inherent aspect	
		telic	atelic
inherent control	agentive	$\lambda y \lambda x \lambda s [\text{ACT}(x) \& \text{ DIE}(y)](s)$	$\lambda y \lambda x \lambda s [\text{ACT}(x) \& \text{ BOIL}(y)](s)$
	non-agentive		

Ditransitive verbs nearly always can be decomposed and have a telic second predicate. In the ‘give’ type verbs, denoting possession transactions, the second predicate is BECOME POSS, while in the ‘speech’ type verbs, denoting communicative transactions, the second predicate is BECOME KNOW.

(4) Ditransitive predicates

‘give’ type:  $\lambda z \lambda y \lambda x \lambda s [\text{ACT}(x) \& \text{ BECOME POSS}(y,z)](s)$

‘speech’ type:  $\lambda z \lambda y \lambda x \lambda s [\text{ACT}(x) \& \text{ BECOME KNOW}(y,z)](s)$

We are now in the position to define the notions ‘argument hierarchy’ and ‘argument linking’ more precisely. Argument hierarchy means that the arguments of a predicate are strictly ordered (as shown in the  $\lambda$ -sequences in the examples above), partly in virtue of their semantic role (agents are always highest), partly for arbitrary reasons. This ordering plays an important role for the morphosyntactic realization of arguments. Even arguments of semantically symmetric predicates such as MEET(x,y) are ordered; the same is true if such a predicate is part of a ditransitive verb, for instance, *introduce* can be decomposed as follows: ACT(x) & MEET(y,z).

Argument linking means the way in which the arguments of a predicate are specified within a clause by either morphological or syntactic means. Morphological means include those that are specified on the head (the predicate expression itself),

such as pronominal affixes, clitics, or agreement morphemes, as well as those that are specified on the dependent, namely morphological case on complements. Argument linking is syntactic if the argument role is only specified by the position with respect to the head.

In the literature, the notion of abstract case has been introduced for determining the morpho-syntactic realization of arguments. In Lexical Decomposition Grammar (LDG), abstract case is identified with argument hierarchy. The  $\lambda$ -abstractors for argument variables constitute the theta-roles; their ordering expresses the argument hierarchy (with the lowest argument to the left and the highest argument to the right). Abstract case, then, is encoded by means of two relational features associated with theta-roles ([+hr] ‘there is a higher role’, [+lr] ‘there is a lower role’).

In this paper I will show, however, that abstract case is too a specific device for characterizing argument linking in general. Contrary to what many theorists believe, there seems to be no universal argument linking device. I will claim that Universal Grammar (UG) only incorporates the idea of relational predicates whose arguments are ordered, as well as the semantic factors which can be chosen as the determining factors. More specifically, I will claim that all argument linking types are invented on the basis of mainly three factors:

- Semantic roles (agent vs. non-agent)
- Salience of arguments
- Argument hierarchy

A choice for salience can be made in terms of person (1, 2 > 3), number (sg > pl), animacy (+anim > -anim), or specificity (+spec > -spec), however, I will restrict myself in this paper to the role of person.

In general I will not refer to grammatical relations such as ‘subject’ and ‘object’, except these terms are related to the highest or a non-highest argument, respectively. Besides for semantic purposes, the term ‘subject’ is also used for morpho-syntactic purposes: then, ‘subject’ either relates to the nominative argument (morphologically) or to the argument designated for a syntactic position (such as SpecI). Because of this ambiguity, an undifferentiated use of ‘subject’ is problematic for typological needs. The problem with the term ‘object’ is that the specification ‘direct’ vs. ‘indirect object’ often does not meet their grammatical relevance; I will turn to this problem below.

Let us assume that a grammar imposes a number of constraints for the realization of arguments. Besides other, quite plausible constraints (such as ‘Mark person’, ‘Mark number’), the following seems to be play a crucial role in argument linking:

(5) Avoid converse settings to be identically marked.

Obviously, this is an important subcase of ‘Avoid ambiguity’. (6) illustrates two of the settings that are subject to (5), that is, should be expressed differently. In general,

the higher argument is more salient in a direct setting, while the lower argument is more salient in an inverse setting.<sup>1</sup>

(6) Converse settings with 1st and 3rd person

‘direct’ setting			‘inverse’ setting		
$\lambda y$	$\lambda x$	VERB(x,y)	$\lambda y$	$\lambda x$	VERB(x,y)
3	1		1	3	

2. The argument linking types

Six different types of argument linking will be discussed. The active type mainly uses semantic role, while the salience type uses salience. The positional type realizes argument hierarchy in the syntax. The inverse type maps salience hierarchy onto argument hierarchy. The generalized case type introduces structural case, but can also use salience (split systems) and semantic roles (lexical case). The portmanteau type simply lists the possible combinations of argument features. Some of these types can be mixed in individual languages.

2.1. Portmanteau type: Affixes on the verb specify more than one argument simultaneously. Single portmanteau affixes can be found in many languages, as the examples in (7) illustrate. The notation ‘A→B’ means that the form specifies A for the higher argument and B for the lower argument of a transitive verb, for example, the Hungarian suffix *-lak/-lek* is used with 1sg subject and 2nd person object.

(7) Single portmanteau-suffixes

Hungarian	-lak/-lek	1sg→2
Ayacucho and Cuzco Quechua	-yki	1→2
Dumi (Kiranti language in Nepal)	-n	1sg→2
[van Driem 1993]	-u	1sg→3

It is quite rare that pronominal affixes in general are of the portmanteau type. One can easily see that this way of argument marking is rather uneconomical because the speakers have to memorize a large number of morphological items, and it is difficult to make any generalizations. One example is Kiowa, spoken in the Tanoan pueblos of New Mexico and Arizona, illustrated by a few examples in (8). Watkins (1984) tries to derive the prefix forms from more minimal underlying features, however, the rules and exceptions he states are quite numerous, so that it is questionable whether such an analysis meets what speakers really know about their language. I simply assume here that they have memorized the prefixes with portmanteau information, which in fact is often very complex, including alternative specifications for either the higher or the lower argument.

---

<sup>1</sup> Some predicates already determine a certain sortal selection for their arguments, for instance, the higher argument of *see* must be animate, while the lower argument of *cut* must be inanimate. Hence, predicates of the latter kind will never show an inverse setting of the kind illustrated in (6).

- (8) Portmanteau-prefixes in Kiowa [Watkins 1984]: one prefix bears information about 2 or 3 arguments.

a. transitive verbs (góp ‘hit’)

èm-góp	é-góp	dó-góp	gḍ-góp
I hit you/him	you/he hit me	you/he/they hit us	we/he/they hit you
èm: 1sg → 2 ∨ 3sg	é: 2 ∨ 3sg → 1sg	dó: 2 ∨ 3 → 1pl	gḍ: 1pl ∨ 3 → 2sg

b. ditransitive verbs (ṵ ‘give’, kut ‘book’)

kút né-ṵ	kút nén-ṵ	kút bédê-ṵ	kút gyâ-ṵ
you/he gave me two books	I gave you/him two books	you (pl) gave me/us/him two books	they gave me/us/him some books
né: 2∨3sg / 1sg/ dl	nén: 1sg/ 2∨3sg/ dl	bédê: 2pl/ 1∨3sg/ dl	gyâ: 3pl/ 1∨3sg/ pl

Note that the prefixes in (8b) not only specify person and number for the agent and the recipient, but also number (here, the dual or plural) for the theme argument.

2.1 Active type: Affixes on the verb specify for the more salient argument (or for each argument) whether it is active (agent-like) or inactive (patient-like); the same affixes are used for intransitive verbs. (9) shows that the Carib language Dekwana distinguishes the 1st person prefixes *w-* and *y-*, which both can be used with transitive and intransitive verbs.

- (9) Dekwana [Derbyshire 1999:34/35]:

- |  |  |
|--|--|
| a. <i>w</i> -edant(ö)-a.<br>1.ACT-meet-PRES<br>‘I meet him/her.’ | b. <i>y</i> -edant(ö)-a.<br>1.INACT-meet-PRES<br>‘He/she meets me’ |
| c. <i>w</i> -amo-a.<br>1.ACT-cry-PRES<br>‘I am crying.’          | d. <i>y</i> -a:wo-a.<br>1.INACT-swell-PRES<br>‘I am swelling.’     |

Obviously, *w-* is the active and *y-* the inactive morpheme, and they realize the direct vs. inverse setting of transitive verbs. Simultaneously, they also specify of whether an intransitive verb is inherently agentive or non-agentive.

- |  |  |   |
|--|--|---|
| (10) Transitive verbs                    |  | Intransitive verbs                                |
| <i>direct setting</i>                    | <i>inverse setting</i>                   |   |
| $\lambda y \quad \lambda x \quad V(x,y)$ | $\lambda y \quad \lambda x \quad V(x,y)$ | $\lambda x \quad V(x) \quad \lambda y \quad V(y)$ |
| 3      1                                 | 1      3                                 | 1      1  |
| ACT                                      | INACT                                    | ACT      INACT                                    |

The prefix-verb combination does not show by itself whether the verb is transitive or intransitive. Moreover, all intransitive verbs must be classified semantically. That is, this type of argument linking heavily hinges on semantic classification and does not allow the kind of generalizations that are possible in other types.

2.3 Saliency type: Affixes on the verb specify the more salient argument; some affixes also specify whether a more salient argument is added to the verb. The examples are taken from Arizona Tewa, another Tanoan language, which, however, is quite different from Kiowa in the way arguments are specified. Arizona Tewa exhibits six distinct sets of person prefixes, listed in (11), but only one prefix is possible at a time. It is always the most salient argument that is marked.

Intransitive verbs only have one argument, marked by a stative prefix, but if the argument has a possessor, the latter counts as more salient and is marked by a separate prefix. With transitive verbs, prefixes from four different sets are possible. Agents are marked if they are more salient than the patient (3rd person), while patients are marked (in particular those being 1st or 2nd person) if they are more salient than the agent; in the latter case, the less salient syntactic argument must be marked oblique. Thus, the direct and the inverse setting are distinguished by AGT vs. PAT marking, in this respect the saliency type is similar to the active type. For reflexives, a separate marker exists. Finally, if a beneficiary is introduced, it counts as the most salient argument, and only this argument is specified.

- (11) Arizona Tewa: the six sets of person prefixes [Kroskrity 1985]
- a. STAT with intransitive verbs
  - b. POSS with intransitive verbs
  - c. AGT with transitive verbs
  - d. PAT with transitive verbs
  - e. REFL with transitive verbs
  - f. BEN with transitive verbs

The examples in (12) illustrate some of the prefixes from the POSS, AGT and PAT set. Note that (12b) realizes a direct setting, and (12c) an inverse setting. (12d) shows an example with an inverse setting because the more proximate (more salient) demonstrative appears with the lower argument. With ditransitive verbs, the theme argument can be incorporated so that a transitive pattern results, and the recipient in (12e) is marked with the PAT prefix because it is higher on the person scale. If both arguments are 1st or 2nd person, a portmanteau prefix is used, as shown in (12f).

- (12) Arizona Tewa [Kroskrity 1985]
- a. semele **dín**-han  
 pot 1sg.POSS-break  
 'My pot broke'
  - b. he'i-n sen-en **dó**-k<sup>hw</sup>édi  
 this-pl man-pl 1sg.AGT-hit  
 'I hit these men'
  - c. he'i-n sen-en-di **dí**-k<sup>hw</sup>édi  
 this-pl man-pl-OBL 1sg.PAT-hit  
 'These men hit me'

- d. né'i-n 'ayú-n 'o:'i-n 'enú-n-di 'ó:bé- k<sup>hw</sup>édi  
 this-pl girl-pl that-pl boy-pl-OBL 3pl.PAT-hit  
 'Those boys hit these girls'
- e. na:'in dí-k'ú:wá-mégí  
 we 1.PAT-sheep-give  
 'we were given sheep (by you or some third person)
- f. 'u-n na:di wí-k'ú:wá-mégí  
 you-pl I-obl 1.AGT/2.PAT-sheep-give  
 'You (pl.) were given sheep (by me)

Prefixes from the AGT set cannot be said to be ergative, and those from the PAT set are not accusative, because these prefixes never contrast with an unmarked item nominative. Hence, the Saliency type is, like the Active type, purely semantically determined and should not be confounded with argument linking using case.

At the other extreme one can find a purely structural argument linking type, where the role of an argument correlates with its position in the syntax.

**2.4 Positional type:** The argument hierarchy is mapped to syntactic positions, with the highest argument to the first and the lowest argument to the last position. This type is also the last resort under other circumstances; for instance, if two arguments bear the same case they usually are distinguished by their position. The mapping to syntax is illustrated in (13) for a ditransitive verb of the 'give' type. Under the assumption that 'give' can be decomposed as shown in (4), the argument ranking clearly is  $x$  (agent)  $>$   $y$  (recipient)  $>$   $z$  (theme). In a verbfinal language such as German or Japanese (which both also have case), the default order is

NP- $x$  (nominative) – NP- $y$  (dative) – NP- $z$  (accusative).

In a verbsecond language such as English or Chinese (which do not have case in full nominals), the default order is

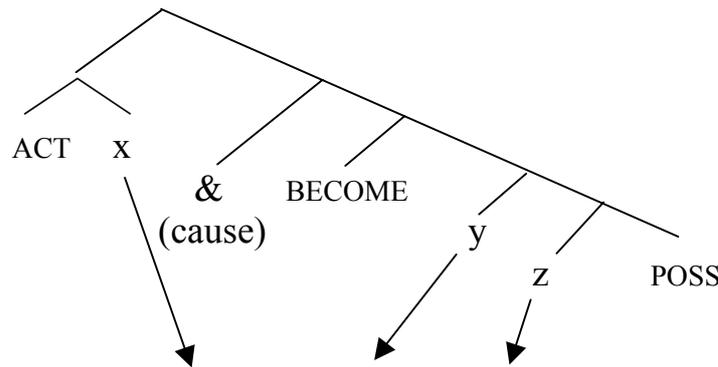
NP- $x$  – V – NP- $y$  – NP- $z$ ,

which is also known as double object construction. Such a construction is also found in Creole languages and especially in the Bantu languages.

(13) Illustration of the mapping from argument structure to syntax:

‘give’: ACT(x) & BECOME POSS(y,z)

a.



b. Verbfinal: NP-x NP-y NP-z V  
 (weil) sie ihm etwas gab (German, Japanese)  
 she.NOM he.DAT sth.ACC gave

c. Verbsecond: NP-x V NP-y NP-z  
 (because) she gave him something (English, Chinese)

The argument hierarchy can be encoded by the features [+hr] ‘there is a higher argument, and (optionally) [+ho] ‘there is a higher object’; the same features can be used to specify the positions with respect to the verb: arguments specified as [+hr] are realized to the right of the verb, while the highest argument ([–hr]) is realized to the left of the verb, possibly in a Spec-position. This enables us to speak of a ‘subject position’. [+ho] is a more specific feature, which implies [+hr]; the highest object ([–ho]) usually is realized next to the verb – it is called the ‘primary object’, while all other objects are ‘secondary objects’. This terminology differs from that for case languages, where the lowest argument is designated as ‘direct object’ (see below).

(14) Possible features for encoding the positions in the positional type (verbsecond):

$\lambda_z$	$\lambda_y$	$\lambda_x$	$\lambda_s$	VERB(x,y,z)(s)
(theme)	(rec, ben)	(agent)		
+hr	+hr	–hr		
to the right of V		to the left of V		
+ho	–ho			
	right-adjacent to V			

Note that these features are similar to those proposed in Lexical Mapping Theory by Bresnan and collaborators: [+hr] corresponds to [+o], and [+ho] corresponds to [+r]. However, in my account the more specific feature [+ho] is only used in the positional type, in contrast to [+r], which is meant to be universally applicable.

## (15) Features in Lexical Mapping Theory (Bresnan &amp; Zaenen 1990)

[+r] 'restricted', [+o] 'object'

$\lambda z$	$\lambda y$	$\lambda x$
+o	+o	-o
+r	-r	-r

As many researchers have shown (Bresnan & Moshi 1990, among others), the Bantu languages suggest an interesting subtypology of the positional type: some languages (such as Sesotho, Kichaga, Kinyarwanda, Marathi) exhibit so-called symmetrical objects, while other languages (such as Kikuyu, Chicheŵa, Swahili) exhibit asymmetrical objects. One can capture this difference by the assumption that the former subtype lacks the feature [+ho], while the latter subtype conforms to this feature.

In the symmetrical object languages the positions to the right of V are equally good for both objects (only salience plays some role: animates usually precede inanimates): consider (16), where both distributions allow for two interpretations.

## (16) Symmetrical objects in Sesotho [Lee 2000]

Sello o-shap-el-a Lineo bashanyana. / bashanyana Lineo.

Sello I.SBJ-beat-APPL-FV Lineo boys

i. 'Sello beats the boys for Lineo.'

ii. 'Sello beats Lineo for the boys.'

Furthermore, both objects can become subject under passive (still with two interpretations), and also can be marked with object affixes on the verb (not shown here).

(17) illustrates this again with examples from Sesotho.

## (17) Passive in Sesotho [Lee 2000]

a. Morena ó-bítsel-íts-o-é baná.

chief I.SBJ-call-APPL-PASS-PAST children

b. Baná ba-bítsel-íts-o-é morena.

children II.SBJ-call-APPL-PASS-PAST chief

i. 'The children benefitted from haven the chief called.'

ii. 'The chief benefitted from having the children called.'

In contrast, asymmetrical object languages have a fixed position of their objects, only depending on their ranking, and salience does not play any role. Thus, only one interpretation is possible. This is shown by the following examples from Kikuyu; if the NPs following the verbs are switched in their position, the interpretation is shifted too. Thus, Kikuyu conforms to the notion of 'primary' vs. 'secondary object'.

## (18) Asymmetrical objects in Kikuyu (Lee 2000)

a. Karioki ɔ:n-ε-ire gari dereba.

Karioki SBJ.find-APPL-PAST car driver

'Karioki found a driver for the car.'

- b. Karioki    ɔ:n-ε-ire                      dereba    gari.  
 Karioki    SBJ.find-APPL-PAST    driver    car  
 ‘Karioki found a car for the driver.’

However, Kikuyu is special in that it allows alternating passive if the semantic roles of the participants can be uniquely determined.

(19) Alternating passive in Kikuyu (Lee 2000)

- a. Moarimo    ne-a-hε-ir-uɔ                      ihoa    ne mo:do.  
 teacher    FOC-SBJ-give-PAST-PASS    flower    by man  
 ‘The teacher was given the flower by the man.’
- b. Ihoa    ne-re-hε-ir-uɔ                      moarimo    ne mo:do.  
 flower    FOC-SBJ-give-PAST-PASS    teacher    by man  
 ‘The flower was given to the teacher by the man.’

The majority of asymmetrical object languages (e.g., Chicheŵa and Swahili) are non-alternating in that only the argument next to the verb (the primary object) can become subject under passive. Note that in the Bantu languages the subject usually is co-indexed with the verb, and that also object affixes are possible under special circumstances; these languages thus have some additional means to support argument linking. There is nothing that reflects direct and inverse settings directly, however, the existence of passive makes it possible to realize a more salient object in the designated position of subject.<sup>2</sup>

The positional type of argument linking requires a syntax with rather fixed word order; it does not need morphological means, notwithstanding that languages of this type often exhibit those means, such as additional subject agreement. Next I discuss the inverse type, which is only possible with morphology.

<sup>2</sup> Besides sortal salience, also discourse prominence (such as topicality) plays a role in the choice of passive. Some Bantu languages even allow discourse prominence to play a significant role in argument linking: Under the condition that the semantic roles of the arguments are obvious, the positions of the higher and lower argument can be reversed if the latter is topic. In such a case, the ‘subject’ agreement on the verb turns out to be in fact topic agreement. Consider the following examples from Kinyarwanda (Morimoto 2000).

- (i) b. Umuhuŵngu    ki-som-a    igitabo.  
 1.boy                      1.TOP-PRES-read-ASP    7.book  
 ‘The boy is reading the book.’
- b. Igitabo    ki-som-a                      umuhuŵngu.  
 7.book    7.TOP-read-ASP    1.boy  
 ‘The book is being read by the boy.’

Here, the feature [–hr] ‘there is no higher role’ is reinterpreted as [–hp] ‘there is no argument that is more prominent’.

2.5 Inverse type: Affixes on the verb (the direct or inverse marker, often also called ‘voice marker’) encode whether the higher or the lower argument is more salient; in other words, these voice markers assign relative salience in the context of argument hierarchy (Wunderlich 1996). Computationally, this is the most complex type of argument linking because two hierarchies are mapped onto each other. In its pure form, this type is only known from the Algonquian languages, although there are more languages that have an inverse marker, at least in some of their constructions. An illustration is given by the examples in (20) from Plains Cree, which are identical except the markers that immediately follow the verb stem.

(20) Inverse morphology in Plains Cree [Wolfart & Carroll 1981, Fabri 1996]

- a. Ni-seekih-**aa**-naan atim.  
1-scare-DIRECT-1pl dog  
‘We scare the dog’
- b. Ni-seekih-**iko**-naan atim.  
1-scare-INVERSE-1pl dog  
‘The dog scares us’

The introduction of a direct vs. inverse marker seems to be an ingenious invention to solve the problem raised in the beginning, namely to mark an inverse setting differently from a direct setting. However, this invention brings also some disadvantages, as well as other complexities for computation.

First, salience must be made explicit in every transitive setting, which might be seen as a disadvantage. In the settings 1→2 and 2→1 both persons, being speech act participants, are salient. Some languages, as we have seen above, use portmanteau morphemes under this condition. The Algonquian languages have arbitrarily set the 2nd person to be more salient than the 1st person, and a further pair of direct/inverse voice markers dealing with 1,2-settings has been introduced. Furthermore, in the setting 3→3 (where both arguments are human or animate), one argument must be more salient than the other one, for instance in terms of discourse prominence. Here, the less salient argument is marked by obviative, so that 3→3obv and 3obv→3 can be distinguished. (21) illustrates the marking of local person in Plains Cree, and (22) the marking of 3→3 settings.

(21) Local person in Plains Cree

- a. ki-waapam-**i**-naan ‘We see you (sg/pl)’  
2-see-DIRECT-1pl
- b. ki-waapam-**u**-naan ‘You (sg/pl) see us’  
2-see-INVERSE-1pl

(22) Obviative in Plains Cree [Wolfart & Carroll 1981:30]

- a. waapam-**ee**w naapeew siisiip-**a** ‘The man sees the duck (obv)’  
see-DIRECT man duck-OBV

- b. **waapam-ik**    naapeew    siisiip-**a**    ‘The duck (obv) sees the man’  
                   see-INVERSE    man            duck-OBV    (= ‘The man is seen by the duck’)
- c. **waapam-ew**    naapeew-**a**    siisiip            ‘The duck sees the man (obv)’  
                   see-DIRECT    man-OBV    duck
- d. **waapam-ik**    naapeew-**a**    siisiip            ‘The man (obv) sees the duck’  
                   see-INVERSE    man-OBV    duck            (= ‘The duck is seen by the man’)

Note that with obviative marking on the dependent noun, either the higher or the lower argument can be marked as obviative, given that both arguments are animate. This raises the number of possible forms to four rather than two, which reminds at the situation in a language with passive.

In (23) the two settings  $3 \rightarrow 3\text{obv}$  and  $3\text{obv} \rightarrow 3$  are illustrated, the former realized by the direct marker, and the latter by the inverse marker.

- (23)
- |                                   |                                   |
|-----------------------------------|-----------------------------------|
| <i>direct setting</i>             | <i>inverse setting</i>            |
| $\lambda y$ $\lambda x$ VERB(x,y) | $\lambda y$ $\lambda x$ VERB(x,y) |
| +hr    +lr                        | +hr    +lr                        |
| 3obv    3                         | 3    3obv                         |
| +hs                               | +hs                               |
| DIRECT                            | INVERSE                           |

The reference to person (rather than abstract case) also has computational advantages beyond argument linking; it allows reference-tracking across clause boundaries (especially when obviative marking is involved). Consider the examples in (24), where the dependent verb in the conjunct mood can be marked for obviative; in this case it is interpreted as coindexed with the less salient (obviative) argument in the main clause, otherwise it is coindexed with the more salient (proximate) argument.<sup>3</sup> (Such a device could be reinterpreted as ‘same subject’ vs. ‘different subject’.)

<sup>3</sup> Similar devices for the marking of discourse prominence have been developed in other languages, too. Navajo (an Athabaskan language exhibiting accusative in pronominal affixes) not only can mark a so-called 4th person as the least prominent 3rd person, but also distinguishes whether a 3rd person object (including possessors) is less prominent than a 3rd person subject (marked by the prefix *yi-*) or more prominent (marked by *bi-*) (Thompson 1996, Willie 2000).

- (i) a. líí        dzaanééz    yi-ztał.  
           horse    mule        3OBJ.LESS.PROM-kicked  
           ‘The horse kicked the mule.’
- b. dzaanééz    líí        bi-ztał.  
           mule        horse    3OBJ.MORE.PROM-kicked  
           ‘The mule kicked the horse.’

Here, the reversal of setting is also expressed by different positions of the corresponding nouns in the syntax (see footnote 2), but this is not necessary for Navajo because the affixes on the verb already satisfy the arguments. The *yi-/bi-* prefixes can also be used for reference tracking, similarly to the obviative suffixes in Plains Cree.

(24) Coreference with an argument of the matrix clause in Plains Cree [Wolfart & Carroll 1981: 26]

- a. naapeew    atimw-a    waapam-eew    ee-sipweehte-t  
 man        dog-OBV    see-DIRECT    CONJUNCT-leave-3  
 ‘The man<sub>prox</sub> saw the dog as he<sub>prox</sub> left’
- b. naapeew    atimw-a    waapam-eew    ee-sipweehte-yit  
 man        dog-OBV    see-DIRECT    CONJUNCT-leave-3OBV  
 ‘The man saw the dog<sub>obv</sub> as it<sub>obv</sub> left’

It is still an open question why the inverse type of argument linking, as demonstrated by the Algonquian languages, is only rarely found among the languages of the world. It might be computationally too a complex type, which is disfavored because of inherent problems, or the invention of an inverse morpheme might be very improbable so that the chance that it happens is quite low.

I turn now to the last type of argument linking to be discussed here, which is by far the most dominant type among the languages of the world, and allows for a large amount of variation. It is therefore not a surprise that many linguists believe it to be the universal type of argument linking (which I think is wrong).

**2.6 Generalized case type:** Affixes on the verb, as well as morphological cases on the complement, encode argument hierarchy. It is also possible to encode argument hierarchy in the context of salience values (split case). This type might be seen as the most effective type because it is structurally determined but does not need to map hierarchies onto each other, as in the inverse type. The notion ‘generalized case’ subsumes morphological case and pronominal affixes (as well as agreement morphemes), which in many respects behave similarly, under one concept.

In Lexical Decomposition Grammar (LDG), argument hierarchy is encoded by means of two relational features associated with the theta-roles: [+hr] ‘there is a higher role’, and [+lr] ‘there is a lower role’. These features are either based on the semantic hierarchy of arguments (in the unmarked case, corresponding to the canonical realization of arguments), or they are assigned lexically (‘lexical case’). (Wunderlich 1997, Stiebels 2000b.)

Pronominal affixes or clitics as well as morphological case are specified by the same type of features:

- (25) Linker features in LDG
- |           |  |
|-----------|--|
| [+hr,+lr] | dative (DAT)                           |
| [+hr]     | accusative (ACC) (genitive with nouns) |
| [+lr]     | ergative (ERG)                         |
| [ ]       | nominative (NOM)                       |

These four linkers together form a complete lattice. Therefore, the prediction is that no other structural linkers can exist, except those that have additional semantic features (such as partitive). The main difference to the way in which the positional type is

characterized comes from the feature [+lr], which encodes the argument hierarchy under a reversed perspective: while the feature value [-hr] singles out the highest argument as a designated argument ('subject'), the feature value [-lr] singles out the lowest argument as designated ('direct object'), in contrast to the positional type, where the second-to-highest argument is designated ('primary object'). Moreover, the fact that both the underlying argument roles and the morphological items are specified by the same features makes a correspondence-theoretic analysis promising (Wunderlich 2001a,b).

Generalized case is a purely structural device, independent of semantic role. (26) shows that canonical argument linking makes no difference between agentive and non-agentive verbs; only the number of arguments is relevant. All intransitive verbs have a NOM argument, whereas transitive verbs show either the NOM-ACC pattern or the ERG-NOM pattern (depending on typological parameters). Under certain circumstances, ERG-ACC is possible, but in this case a direct contrast to the default case (NOM) is lacking. Similarly, ditransitive verbs show either the NOM-DAT-ACC pattern or the ERG-DAT-NOM pattern.

(26) Canonical argument linking

a. Intransitive verbs

$\lambda x$  DANCE(x) agentive  
 $\lambda x$  FALL(x) non-agentive  
 -hr  
 -lr  
 NOM  
 NOM

b. Transitive verbs

$\lambda y \lambda x$  HIT(x,y) agentive  
 $\lambda y \lambda x$  LIKE(x,y) non-agentive  
 +hr -hr  
 -lr +lr  
 ACC NOM  
 NOM ERG

c. Ditransitive verbs

$\lambda z \lambda y \lambda x$  {ACT(x) & BEC POSS(y,z)}  
 $\lambda z \lambda y \lambda x$  {ACT(x) & SEE(y,z)}  
 +hr +hr -hr  
 -lr +lr +lr  
 ACC DAT NOM  
 NOM DAT ERG

As already indicated, the generalized case type allows some typological variation: some languages exhibit ACC, others ERG, some have an ACC-ERG split; languages that lack DAT may vary in respect of how they realize the medial argument, if at all (Stiebels 2000a,b). Particularly interesting is the possibility of an ACC or ERG split, which allows to encode salience. For instance, ACC is often lacking for 3rd person, while ERG is lacking for 1st and 2nd person (as in Dyrbal, Dixon 1994). Similarly, ERG is sometimes restricted to the perfect, while ACC occurs in the imperfect (as in Hindi/Urdu, Mohanan 1994). I will demonstrate here that the relevant constraints follow from the harmonic alignment of scales (Prince & Smolensky 1993, Stiebels 2000a,b; see Aissen 1999 for a different account).

There is a fundamental semantic asymmetry between the arguments of a transitive verb: The direct setting is more natural than the inverse setting because local persons (1st or 2nd) tend to be agent. Similarly, the highest argument (the logical subject) ranks above the lower arguments (logical objects) because agents, who control the event denoted by a verb, are mostly in highest position. These asymmetries influence morphological realization: what has to be marked is the more unnatural situation rather than the more natural one. Therefore, the inverse setting is more likely to be marked morphologically than the direct setting. Similarly, highest arguments that are not agents or not 1st or 2nd person are more likely to be marked than those that are agents or 1st or 2nd person.

Following Stiebels (2000a,b), I assume the two scales in (27a); the first concerns the relation between meaning and morphosyntax, while the second is a pure semantic relation. Harmonic alignment then yields the contextualized preferences expressed in (27b), which in turn give the markedness hierarchies expressed in (27c).

(27) Harmonic alignment for generalized case

a.  $+hr > +lr$  Morphological marking by [+hr] is more effective than that by [+lr].

$+loc > -loc$  Person hierarchy (1,2 > 3)

b. Case in the context of person values

$+hr/+loc > +hr/-loc$

$+lr/-loc > +lr/+loc$

c. Markedness hierarchies

$*(+hr)/-loc \gg *(+hr)/+loc$  ACC for a 3rd person is more marked (less likely) than ACC for the 1st person.

$*(+lr)/+loc \gg *(+lr)/-loc$  ERG for the 1st person is more marked (less likely) than ERG for a 3rd person.

These markedness hierarchies explain the phenomenon of split case, depending on salience in terms of person. The split case type thus reflects the fact that only inverse settings must be marked.

(28) Split case

<i>direct setting</i>		<i>inverse setting</i>		<i>intransitives</i>	
$\lambda y$	$\lambda x$ VERB(x,y)	$\lambda y$	$\lambda x$ VERB(x,y)	$\lambda x$	VERB(x)
+hr	+lr	+hr	+lr	-hr,-lr	
3	1	1	3	1	
	NOM	ACC	ERG	NOM	

Straits Salish is rather near to this ideal type of split case; the table in (29) shows that ACC suffixes exist only for the 1st or 2nd person (as well as for reflexives), while there is only one ERG suffix for the 3rd person (homonymous with a possessive suffix).

(29) Morpheme repertoire in Straits Salish [Jelinek & Demers 1994]

NOM clitics		ACC suffixes		ERG suffixes		POSS affixes	
1sg	=sən	local	-oŋəs	3	-(ə)s	1sg	nə-
2sg	=sx <sup>w</sup>	1pl	-oŋəʔ			2sg	‘ən-
1pl	=t	refl	-oŋət			1pl	-t
2pl	=sx <sup>w</sup> helə					others	-(ə)s

The use of these morphemes is illustrated by the examples in (30). (30a) shows an example with ACC, and (30) one with ERG. However, ACC and ERG cannot be combined in one verb form, maybe because only one personal suffix can follow the verb: (30d) is ungrammatical, instead the passive form in (30e) has to be used. More general, all inverse settings with a local person must be expressed in the passive.

(30) Case in Straits Salish [Jelinek & Demers 1994]

- a. k<sup>w</sup>əniŋ-t -oŋəs =lə =sən ‘I helped you’  
help-TRANS -loc.ACC =PAST =1.NOM
- b. k<sup>w</sup>əniŋ-t =lə =sən ‘I helped him’  
help-TRANS =PAST =1.NOM
- c. k<sup>w</sup>əniŋ-t -s =lə ‘He helped him’  
help-TRANS -3.ERG =PAST
- d. \*k<sup>w</sup>əniŋ-t -oŋəs -əs =lə ‘He helped me’  
help-TRANS -loc.ACC -3.ERG=PAST
- e. k<sup>w</sup>əniŋ-t -ŋ =lə =sən ‘I was helped’  
help-TRANS -PASS =PAST =1.NOM

We have just seen that the format of generalized case allows to account for the factor salience by means of split case. It can also account for the factor semantic role, this time by the use of lexical marking. Lexical case can indicate a semantic role that deviates from the prototypical role properties associated with positions in the argument hierarchy. Recall that in prototypical transitive verbs, the higher argument ([+lr]) is an agent (a controller entity), while the lower argument ([+hr]) is a patient (an affected entity). If these two features are lexically assigned to the ‘wrong’ role, they invite a different reading: [+lr] for the lowest argument invites the controller (or agentive) reading, whereas [+hr] for the highest argument invites the affectedness (or experiencer) reading.

(31) illustrates this with some examples from German and one example from Hindi. In (31a) the lower argument is exceptionally marked with [+lr], while in (31b) the higher argument is exceptionally marked with [+hr]. Together with the respective default features, a constellation results in which dative is the optimal case. The DAT-marking on the helpee in (31a) invites the reading that this is an argument with agent properties, while the DAT-marking in (31b) invites the reading of being affected, that

is, being an experiencer. (31c) is again an example with [+hr] marking, and (31d) an example with [+lr] marking, but here the cases ACC and ERG arise because the verbs only have one argument.

## (31) Lexical marking in German and Hindi

a. (weil) ich ihm helfe I.NOM he.DAT help 'I help him'	$\lambda y$ $\lambda x$ HELP(x,y)	lexical: +lr	(agentive)
		default: +lr	
		+hr -hr	
		DAT NOM	
b. (weil) er mir gefällt he.NOM I.DAT like 'I like him'	$\lambda y$ $\lambda x$ LIKE(x,y)	lexical: +hr	(affected)
		default: +hr	
		-lr +lr	
		NOM DAT	
c. Mich dürstet. I.ACC thirsty.is 'I am thirsty.'	$\lambda x$ BE.THIRSTY(x)	lexical: +hr	(affected)
		default: -lr	
d. Ila-nee nahaa-yaa. Ila-ERG bathe-PERF 'Ila bathes.' (Hindi)	$\lambda x$ BATHE(x)	lexical: +lr	(agentive)
		default: -hr	

Note that the four instances of lexical marking are described by just two features, which, moreover, are identical to the features independently used, but associated with (possible) semantic information. This account is enabled by the fact that dative is decomposed into two features ([+hr,+lr]); it is more general, and at the same time more explanative than simply stipulating 'dative' marking.

## (32) Lexical marking

- a. Lexical dative is induced by [+lr] or [+hr], depending on the position of the marked argument.
- b. Lexical marking by [+hr] leads to DAT or ACC, depending on the number of arguments.
- c. Lexical marking by [+lr] leads to DAT or ERG, depending on the number of arguments.

There is, of course, much more to say about generalized case. One point to be repeated here is the fact that languages belonging to this type, which clearly are the majority of languages, can identify the arguments on the head (by pronominal affixes, clitics or agreement morphemes) or on the complement (by morphological case), or on both. Morphological case is interesting because it presupposes a strong syntactic relation between head and complement. By contrast, coindexation by head-marking only requires the weaker adjunct relation between nominals and the verbal head.

Thus, the generalized case type is the only argument linking type which successfully bridges the gap between morphology and syntax.

Moreover, the possibility of having simultaneously head-marking and morphological case allows various kinds of split. For instance, head-marking can be of the accusative type, while morphological case is ergative-based (an example is Kalkatungu, see Blake 1994). Or, as one finds in Austronesian languages, head-marking can be based on argument hierarchy, while morphological case depends on discourse prominence. Consider the following examples from *Tukang Besi*, spoken on some islands of Indonesia (Donohue 1999); here, the accusative agreement morpheme is only realized on the verb if the object is the more prominent argument, to be marked by nominative case. (The less prominent argument is marked by the case particle *te*, which differs from oblique marking in adjuncts; the default syntactic ordering is VOS; only nominative arguments can be deleted in coordination.)

(33) Coreference with the most prominent argument of the first clause in *Tukang Besi* [Donohue 1999]

- a. No-kiki'i      te            ana      na      'obu      kene no-tode.  
     3-bite            LESS.PROM child      NOM dog      and 3-flee  
     'The dog bit the child, and fled.'
- b. No-kiki'i-ke    na      ana      te            'obu      kene no-tode.  
     3-bite-3.ACC    NOM child      LESS.PROM dog      and 3-flee  
     'The child was bitten by the dog, and fled.'

This shows that the resources of morphological case can be reinterpreted for purposes of discourse prominence, similarly to those of the positional type (see footnote 2).

### 3. Conclusions

I have argued in this paper that argument linking depends on three factors: semantic role (by which semantic classes of verbs can be distinguished), salience (by which semantic properties of the arguments themselves are taken into account), and argument hierarchy (which distinguishes positions in a complex predicate). Four of the types discussed here are mainly realized by morphological means: one type uses semantic role, another type uses salience, and a third type, the inverse type, encodes the difference between direct and inverse settings directly by mapping relative salience onto argument hierarchy. The fourth type, the portmanteau type, consists in the pure listing of combinations of salience and argument positions, and thus does not allow any generalizations. It would be interesting to speculate on how this type may have developed.

In contrast, the positional type only uses syntactic means, and the generalized case type, although overwhelmingly also of morphological nature, in some of its subtypes presupposes a strong syntactic relation. Moreover, this type also has variants in which

semantic role and salience are encoded; so it turns out to be most effective type. (34) summarizes these findings in an overview.

(34) Overview of argument linking types

	Semantic role	Saliency	Argument hierarchy	Domain
1	Portmanteau type			Morphology
2	Active type			
3		Saliency type		
5	Inverse type			
6			Generalized case type	Morphology and Syntax
	Lexical marking	Case split		
4			Positional type	Syntax

Some of these types also developed means to encode discourse prominence in settings with 3rd persons that are sortally alike, and thus allow reference tracking across clause boundaries. It seems that, at least in some instances, these means are taken from the argument linking device and then reinterpreted. In particular, devices that use argument hierarchy can be reinterpreted with regard to prominence hierarchy. This indicates that the encoding of discourse prominence is a secondary purpose of grammar, interacting with an already existing system of argument linking. As illustrated above, the inverse type, the positional type and the generalized case type have incorporated effective means of encoding discourse prominence. However, this topic clearly deserves more detailed investigation.

One may speculate about what may have prompted the evolution of so many different types of argument linking. Why are the purely morphological types only found in languages of small populations and have never been created in other parts of the world? Are these types in any sense defective? Had the populations that speak these languages never the chance to incorporate the notion of abstract case? It has been shown that even the positional type and the generalized case type differ in one important aspect: they lead to different options for the designated object, which is either the second-to-highest argument ('primary object') or the lowest argument ('direct object'). This variety of types makes it difficult to assume that Universal Grammar (UG), created in the evolution of *homo sapiens*, already incorporated the idea of abstract case. However, what we can assume to be part of UG are the main factors outlined here (semantic role, saliency, and argument hierarchy), which are differently used in argument linking.

#### References

- Aissen, Judith. 1999. Markedness and subject choice in Optimality Theory. *Natural Language and Linguistic Theory* 17: 673-711.
- Blake, Barry J. 1994. *Case*. Cambridge University Press.
- Bresnan, Joan & Annie Zaenen. 1990. Deep unaccusativity in LFG. In Katarzyna Dziwirek, Patrick Farrell & Errapel Majias-Bikandi (eds.) *Grammatical relations: A cross-theoretical perspective*, 45-58. Stanford: CSLI publications.

- Bresnan, Joan & Lioba Moshi. 1990. Object asymmetries in comparative Bantu syntax. *Linguistic Inquiry* 21: 147-185.
- Derbyshire, Desmond C. 1999. Carib. In R.M.W. Dixon & Alexandra Y. Aikhenvald (eds.) *The Amazonian Languages*, 23-64. Cambridge Univ. Press.
- Dixon, R. M. W. 1994, *Ergativity*. Cambridge University Press.
- Donohue, Mark. 1999. *A Grammar of Tukang Besi*. Berlin/New York: Mouton de Gruyter.
- Fabri, Ray. 1996. The inverse morphology of Plains Cree (Algonquian). In Geert Booij & Jaap van Marle (eds.) *Yearbook of Morphology 1995*, 17-41. Dordrecht: Kluwer.
- Jelinek, Eloise & Richard A. Demers. 1994. Predicates and pronominal arguments in Straits Salish. *Language* 70: 697-736.
- Klaiman, M.H. 1993. The relationship of inverse voice and head-marking in Arizona Tewa and other Tanoan languages. *Studies in Language* 17: 343-370.
- Kroskrity, Paul. 1985. A holistic understanding of Arizona Tewa passives. *Language* 61:306-328.
- Lee, Hanjung. 2000. Bidirectional optimality and ambiguity in argument expression. Ms., Univ. Stanford.
- Mohanan, Tara, 1994. 1994. *Argument Structure in Hindi*. Stanford: CSLI publications.
- Morimoto, Yukiko. 2000. The role of animacy and associational harmony in Bantu. 31<sup>st</sup> Annual Conference on African Linguistics, Boston University.
- Prince, Alan & Paul Smolensky. 1993. Optimality Theory: constraint interaction in generative grammar. Ms. Rutgers Univ., New Brunswick, & Univ. of Colorado, Boulder.
- Stiebels, Barbara. 2000a. Linker inventories, linking splits and lexical economy. In Barbara Stiebels & Dieter Wunderlich (eds.) *Lexicon in Focus*, 211-245. Berlin: Akademie Verlag.
- Stiebels, Barbara. 2000b. *Typologie des Argumentlinkings: Ökonomie und Expressivität*. Habilitation thesis, University of Düsseldorf.
- Thompson, Chad. 1996. The history and function of the *yi-/bi-* alternation in Athabascan. In Eloise Jelinek et al. (eds.) *Athabascan Language Studies : Essays in Honor of Robert W. Young*. Albuquerque: Univ. of New Mexico Press.
- van Driem, George. 1993. *A grammar of Dumi*. Berlin: Mouton de Gruyter.
- Watkins, Laurel. 1984. *A grammar of Kiowa*. Lincoln: Univ. of Nebraska Press.
- Willie, Mary Ann. 2000. The inverse voice and possessive *yi-/bi-* in Navajo. *International Journal of American Linguistics* 66: 360-382.
- Wolfart, H. Christoph & Janet F. Carroll. 1981. *Meet Cree. A guide to the language*. Lincoln: Univ. of Nebraska Press.
- Wunderlich, Dieter. 1996. A minimalist model of inflectional morphology. In: Chris Wilder, Manfred Bierwisch & Hans-Martin Gärtner (eds.) *The Role of Economy Principles in Linguistic Theory*, 267-298. Berlin: Akademie Verlag.
- Wunderlich, Dieter. 1997. Cause and the structure of verbs. *Linguistic Inquiry* 28: 27-68.
- Wunderlich, Dieter. 2001a. How gaps and substitutions can become optimal: the pronominal affix paradigms on Yimas. *Transactions of the Philological Society*. In print.
- Wunderlich, Dieter. 2001b. Optimal case patterns. German and Icelandic compared. In: Ellen Brandner & Heike Zinsmeister (eds.) *New Perspectives on Case Theory*. CSLI publications. To appear.