Optimal Case Assignment

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1. Introduction

Notoriously, there happen to exist languages in which subjects of intransitive verbs bear the same case as objects of transitive verbs, the so-called ergative languages. In nominative/accusative languages, on the other hand, subjects of intransitives bear the same case as subjects of transitives. Thirdly, in split-ergative languages, some subjects of intransitive verbs bear the same case as subjects of transitives, others bear the same case as objects of transitives. An example of the case distribution in an ergative language is given below:

(1) a. Angutem tangrr-aa arnaq. [Yup'ik]
man.ERG sees woman.ABS
'The man sees the woman.'
b. Arnaq yruar-tuq.
woman.ABS dances
'The woman dances.'

In this paper I develop an Optimality Theoretic (OT) analysis of differences in case distribution in the above mentioned three types of languages. I will argue that languages may differ with respect to the relative strength of certain semantic or structural features that determine whether an argument has to be characterized as strong or as weak. Once the strength or weakness of an argument is determined (this happens at a hidden level in the system, a level which is in fact not indispensable) the relations between the arguments and the type of case they receive can be established, using only a small number of simple and plausible constraints to account for cross-linguistic variation.

In the next section I will point out some problematic aspects of an earlier OT account of the relation between argument strength and case assignment. In the subsequent sections I will develop my proposal along the lines sketched above.

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2. An OT syntactic analysis of case assignment

In generative syntactic literature we find different hypotheses on the difference between nominative and ergative languages. More traditional analyses equate the subject case of nominative languages with the object case of ergative languages, as both are available in transitive as well as intransitive finite sentences, and usually both are morphologically unmarked. Recent analyses, on the other hand, equate the subject case of nominative languages with the transitive subject case of ergative languages, arguing that both cases are the highest case in the syntactic structure and behave alike with respect to binding (cf. Bobaljik 1992, Chomsky 1992, Laka 1993). This is also the view taken in the OT analysis of case assignment by Legendre, Raymond en Smolensky (1993).

In traditional generative syntax, structures are freely generated. Not all of them are grammatical, however. Those which are not, are assumed to be filtered out by constraints. The constraints apply simultaneously, but they are hard. That means that when those constraints (like the Case Filter or the Theta-Criterion) appear to be violated, either the constraints themselves are adapted and further specified, or empty material or different levels of representation are assumed to ensure the satisfaction of the constraints involved.

In OT syntax, structures are also freely generated, and constraints also apply simultaneously. The crucial difference is that the constraints are soft, so that they can be violated, yet only when this is required for the satisfaction of other, stronger constraints. In OT syntax, the input is usually considered to be a semantic structure of a certain kind (e.g., a predicate-argument structure), which gives rise to an in principle infinite number of syntactic structures (the so-called candidate set) of which the most harmonic or optimal one is eventually realized as the grammatical structure that syntactically expresses the semantic input.

The study by Legendre *et al.* (1993) is in fact the very first application of OT within the domain of syntax. Legendre *et al.* (1993) use three constraints to formally account for the difference in case distribution between nominative and ergative languages. These constraints govern the mapping of an input that is labeled for type of argument to surface morphosyntactic case. Legendre *et al.* only consider agent and patient roles as input and label the arguments furthermore in terms of prominence in the discourse (X = high-prominent; x = low-prominent). In the output, they call nominative (subject) case and ergative (transitive subject) case C_1, and accusative (object) case and absolutive (transitive object) case C_2. They use another type of abstract Case, C_4, to refer to the (inherent or lexical) case of oblique arguments as well as to implicit arguments. The constraints they propose are given in (2).

(2) a. $\alpha \rightarrow C_2$: Some argument is case-marked C_2

b. $X \rightarrow C_1$: High-prominence arguments receive C_1

c. $x \not\rightarrow C_{12}$: Low-prominence arguments are not case-marked C_1 or C_2

According to Legendre *et al.*, intransitives are always *A* or *P* in the input, ordinary transitives *AP*, passives *aP*, and antipassives *Ap*. In other words, if a predicate has only one argument, this argument is always high-prominent in the discourse. Furthermore, if one of the two arguments of a two-place predicate is low-prominent, this should lead to a passive or antipassive construction instead of an ordinary transitive sentence. An extra assumption or extra constraint is introduced to exclude the occurrence of two arguments of one predicate bearing the same structural case: $*A_1P_1$, $*A_2P_2$.

The constraint rankings for nominative and ergative languages are then argued to be as in (3). Actually, Legendre *et al.* propose other constraints, viz., $A \rightarrow C_1$ and $P \rightarrow C_2$, to make sure that under all possible rankings the output A_1P_2 is more harmonic than A_2P_1. For reasons of space, I will not provide the OT-tableaux that illustrate that the rankings in (3) will lead to the optimal outputs as given in (4).

(3) a. Constraint ranking for nominative languages:
X→C1 >> x↛C12 >> α→C2

b. Constraint ranking for ergative languages:
x↛C12 >> α→C2 >> X→C1

(4) a. Optimal outputs in nominative languages:

Input	Optimal output
A or P	A1, P1 (intransitives)
AP	A1P2 (transitives)
aP	a4P1 (passives)
Ap	A1p4 (antipassives)

b. Optimal outputs in ergative languages:

Input	Optimal output
A or P	A2, P2 (intransitives)
AP	A1P2 (transitives)
aP	a4P2 (passives)
Ap	A2p4 (antipassives)

Natural language examples illustrate the optimal passive ((5)–(6)) and antipassive outputs ((7)–(8)) for *aP* and *Ap* inputs in nominative and ergative languages:

(5) He_1 was bitten (by $her_4)_4$.

(6) $Kivgak_2$ $(kingminut_4)_4$ kee-jau-vok. [*Labrador Inuit*]
servant dogs bitten
'The servant is bitten (by the dogs).'

(7) Zij_1 eet (van de $pizza_4)_4$. [*Dutch*]
she eats of the pizza
'She is eating (of the pizza).'

(8) a. $Hansi_2$ $inun\text{-}nik_4$ tuqut-si-vuq. [*West-Greenlandic*]
Hansi people killed
'Hansi has killed people.'

b. Tuqut-si-vuq.
killed
'He killed.'

Let me point out some problematic aspects of the approach taken by Legendre *et al.* (1993). First of all, in languages that have morphological case, subject and object case are known to be structurally assigned, i.e., partly independent of the thematic roles and the discourse status of arguments. The approach by Legendre *et al.*, however, suggests that some independent mechanism of determining discourse prominence will in fact trigger the occurrence of passive and antipassive constructions. This cannot be maintained in my view. Even in the case of ordinary transitive and intransitive sentences, it is certainly not true that the arguments of these predicates are always high-prominent in the discourse. Consider the following counterexamples to that latter claim:

(9) a. She's drinking wine [Ap]
b. Then someone hit Robert with a stick [aP]
c. Somebody cried [a]

I claim that in the sentences in (9) (one of) the argument(s) is low-prominent in the discourse. Evidently, this does not lead to the use of a passive or antipassive construction in (9a,b).

In this paper, I will assume that passive and antipassive structures do not compete with ordinary transitive constructions. That is, I consider the input of transitives to be two-place semantic predicates, whereas the input of morphological passives and antipassives must be different (presumably, a complex or incorporating one-place semantic predicate) (see also Ackema and Neeleman, 1998). The remainder of this paper is limited to an analysis of the case distribution in ordinary transitive and intransitive constructions.

Apart from the empirical problem of the dissociation of discourse prominence and structural case, there is another, more theoretical problem for Legendre *et al.*'s analysis, and that concerns the shaky status of the constraint formulated in (2a), repeated below for convenience:

(2) a. $\alpha \rightarrow C_2$: Some argument is case-marked C_2

In OT, constraints are mostly assumed to be universal, but the constraint in (2a) looks highly stipulative and as such quite different from the other constraints used in the analysis. Yet, this stipulative constraint is in fact crucial in explaining the differences between nominative and ergative types of languages. The use of this constraint as part of the analysis seems to be not only ill motivated (i.e., not independently motivated from a linguistic point of view), but also counterintuitive and unattractive.

Finally, as a last point of discussion, it is well-known that most ergative languages are in fact split-ergative languages. Legendre *et al.* do not account for that, but hint at a solution by proposing to replace the constraint in (2a) in split-ergative languages by a constraint such as formulated below (a constraint which seems to be even less attractive and independently motivated than (2a)):

(10) [–An] $\rightarrow C_2$: Some low-animacy argument should receive C_2

A similar treatment would be possible for aspect- or tense-based split languages, according to Legendre *et al.* Note that such a solution suggests a variety of constraints mapping arguments to case on the basis of certain individual, temporal or aspectual properties.

In the next section, I will formulate a different proposal that accounts for split-

ergativity and at the same time deals with the other problematic aspects of Legendre *et al.*'s original account.

3. The proposal: a three-layer system

When we consider an overall picture of what features trigger the mapping to certain types of case for arguments, we find a wide variety of factors, indeed (cf. Silverstein 1976, Hopper and Thompson, 1980, Dowty, 1991). Hopper and Thompson (1980) provided a scale of parameters, according to which clauses could be ranked with respect to what they called *Transitivity*, parameters which involved not only the number of arguments but also different properties of arguments (agent/patient properties, 1st/2nd/3rd person, animacy, referentiality, mass/count, indefinite/definite, plural/singular, etc.) and predicates (telicity, volitionality, punctuality, etc.).

In nominative languages, subjects always get nominative case, independent of their thematic role or their prominence (or strength) in the discourse. One might say that the structural position or function (the first argument of a semantic predicate in the input) suffices for the assignment of a certain type of case. There are nominative languages, such as Finnish and Turkish, e.g., that we might refer to as *split-accusative* languages, because objects of transitives can get two types of case.

In Finnish, objects of negative and atelic predicates as well as indefinite plural or mass objects of telic predicates get partitive case, whereas other objects get accusative case. We might label the objects that get partitive case in Finnish *weak* objects, and the accusative ones *strong*. In Turkish, telicity does not influence the choice of case, but certain properties of the objects do. Certain (referential or partitive) objects get an accusative case marker, whereas other (indefinite) objects do not. Again, we might label the objects that get accusative case in Turkish *strong* and the others *weak*. Note that different properties of elements in the input determine whether an object is to be labeled *strong* or *weak* in the two languages. Once these labels are available, however, they determine the proper case assignment similarly in the two languages.

In ergative languages, objects usually get one type of case, but for subjects two cases are available. Again, different properties may be responsible for the determination of whether a subject is characterized as *strong* or *weak* in ergative and split-ergative languages, which means that we find different triggers for two types of subject case (e.g., personal features, agentivity, specificity, etc.).

Finally, Hindi/Urdu is a language that seems to exhibit a combination of split-

ergativity and split-accusativity, where strong agent properties make a subject argument strong (with a concomitant ergative-split for subjects), whereas non-specificity makes an object weak (which results in an accusative-split for objects) (cf. Butt and King, 1991, 1993, 1998).

I propose a uniform three-layer model to canalize the overwhelming variety of features that trigger case assignment. In the first step, constraint interaction governs the mapping of input arguments to a hidden level in the system where the *strength* of these arguments is determined. Languages may differ in which constraints are crucial here: for example, in some languages, agents will always get the label strong, whereas in other languages only 1st person humans will be labeled strong. Ideally, the labels *strong* and *weak* correspond to certain semantic types in semantic type-logical derivations, but I will not elaborate on that correspondence here (cf. De Hoop 1992, Van Geenhoven 1996, Van der Does and De Hoop, to appear).

In the second step, the hidden units that represent strong and weak arguments constitute the input for mappings to certain syntactic reflexes in language, one of them being morphological case assignment. This three-layer model is illustrated in the figure in (11):

(11)

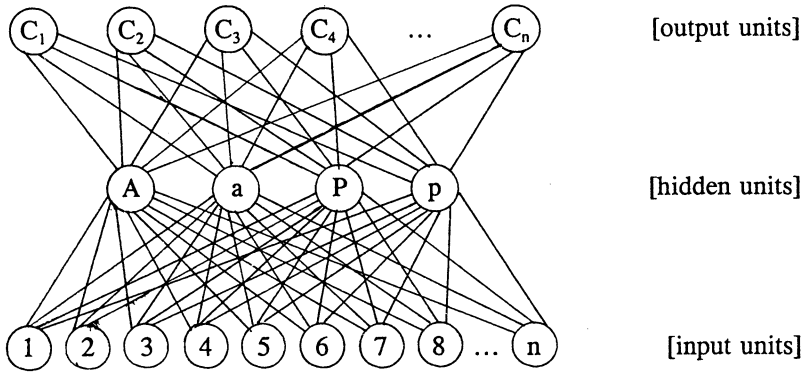

Figure of a three-layer system from argument properties to strength to case

As Rumelhart *et al.* (1996) note, the key to the effectiveness of a multilayer network in general is that the hidden units represent the input variables in a task-dependent way. Here, they fulfil this function with respect to case-assignment. In the first layer, the appropriate combinations of constraints trigger a low-order

representation (a few hidden units for *strong* and *weak* arguments), but that representation itself is a function of the input variables which allows for interaction of many semantic and structural features. Mathematically, the hidden layer is dispensable (since the product of two weight matrices — one for each mapping — is again a matrix). Yet, as Rumelhart *et al.* argue, this type of model can be of most value for the analysis of a problem relatively poor in theory and relatively rich in data, which is exactly what we seem to have encountered here. An earlier linguistic use of such a multilayer network is defined in Legendre *et al.* (1990a,b) to account for the classification and grammaticality of a variety of structures involving French unaccusative and unergative verbs. In Legendre *et al.* (1990a,b) two hidden units represent the structural property of being a D-structure subject or object. The paper is written within the framework of Harmonic Grammar, which is the predecessor of OT.

Let us now go into a slightly more detailed description of each of the two mappings in terms of the relevant constraints.

4. From argument properties to strength

When different languages are considered, it can be observed that some features trigger certain types of case in one language or linguistic configuration, while similar features trigger for example agreement or preposition insertion or word order variation in another language or configuration (cf. Silverstein, 1976, Hopper and Thompson, 1980). Palauan, as discussed by Woolford (1995), provides a nice example of such a pattern. As Woolford observes, in the context of a perfective predicate, object agreement emerges when the object argument is either [+human] or [+specific] and [+singular]. An example is given in (12):

(12) a. Te-'illebed-ii a bilis a rengalek. [*Palauan*]
3p-Pf-hit-3s dog children
'The kids hit the dog.'

b. Te-'illebed a bilis a rengalek.
3p-Pf-hit dog children
'The kids hit a dog / the/some dogs.'

When the predicate is imperfective, exactly the same (combination of) features (i.e., [+human] or [+specific] and [+singular]) trigger the insertion of a preposition, witness the examples in (13):

(13) a. Ng-milengelebed er a bilis. [*Palauan*]
3s-Im-hit PREP dog
'S/he hit the dog.'
b. Ng-milengelebed a bilis.
3s-Im-hit dog
'S/he hit a dog / the/some dogs.'

This is an example of a language where the crucial constraints that trigger the labeling of arguments as strong or weak involve the features *humanity*, *specificity*, and *number*. That is, object arguments that are specified in the input as either [+human] or [+singular] and [+specific] come out as strong arguments at the hidden level that in turn constitutes the input of the second level which governs syntactic reflexes of the strength of arguments (here, not case, but agreement and preposition insertion). The relevant constraints might be read as *[+ human]* → *X (If an argument is [+ human], it is strong)*, *[+plural]* → *x*, and *[–specific]* → *x*. Crucially, the first constraint outranks the latter two.

5. From strength to case assignment

The strength of arguments is not present in the input and it is not part of the output either. It is really "hidden" and it must be inferred by the network through harmony maximization (following Legendre *et al.* 1990a,b). The hidden units compete with each other and, as Legendre *et al.* (1990a,b) put it, the winner "takes it all". That means that which ever of the hidden units would give the greatest harmony if it were activated, will indeed be activated.

When the strength of arguments is determined at a hidden level in the system, a second mapping deals with the relation between strong and weak arguments and morphological case assignment. I propose the following constraints to hold universally:

(14) a. $X \rightarrow C_1$: Strong arguments receive C_1
b. $X \rightarrow C_2$: Strong arguments receive C_2
c. $x \rightarrow C_1$: Weak argumentes receive C_1
d. $x \rightarrow C_2$: Weak arguments receive C_2
e. $x \not\rightarrow C_{12}$: Weak arguments don't receive C_1 or C_2

Furthermore, the prohibition on twice the same case on two arguments of one predicate is maintained ($*A_1P_1$, $*A_2P_2$).

Finally, I assume some kind of hierarchy in thematic roles that independently

states that agents (or first arguments) are stronger than patients (or second arguments), (cf. Aissen 1998, a.o.):

(15) Thematic hierarchy: Agents > Patients

Using these constraints, I propose the following constraint rankings to account for the differences between nominative and ergative languages:

(16) a. Constraint ranking for nominative languages:
$X \rightarrow C_1 >> x \rightarrow C_1 >> X/x \rightarrow C_2$
b. Constraint ranking for ergative languages:
$x \rightarrow C_2 >> X \rightarrow C_2 >> X/x \rightarrow C_1$

The constraint ranking in (16a) accounts for the case distribution in nominative languages: if there is only one argument, this will always get nominative case, whether it is strong or weak (or agent or patient). If there are two arguments, by (15) the subject (agent) is always the stronger one, hence strong. Because of that, violating $X \rightarrow C_1$ is worse for a subject than for an object, even if the latter is strong as well. Therefore, the subject gets nominative case, and then the object must get a different type of case, i.e., accusative.

The case pattern observed in ergative languages is accounted for by the ranking in (16b): if there is only one argument, this will always get absolutive case; if there are two arguments, by (15) the object is always the weaker one and gets absolutive case, and subsequently the subject must get a different type of case, i.e., ergative.

Split-ergative languages are explained by the following constraint ranking:

(17) Constraint ranking for split-ergative languages:
$x \rightarrow C_2 >> X \rightarrow C_1 >> \{X \rightarrow C_2, x \rightarrow C_1\}$

In split-ergative languages, weak arguments get absolutive case. This implies that when there are two arguments, objects are weak and get absolutive case. As a consequence, subjects of transitives get ergative case. When there is only one argument, whether this argument gets absolutive or ergative case depends on its strength: if it is weak, it gets absolutive case, and if it is strong, ergative.

Finally, I propose a constraint ranking for split-accusative languages, briefly discussed in section 3 (instantiations are Finnish and Turkish):

(18) Constraint ranking for split-accusative languages:
$x \not\rightarrow C_{12} >> X \rightarrow C_1 >> X/x \rightarrow C_2$

In Finnish and Turkish, when there are two arguments and the object is weak, this does not get accusative (nor nominative) case (i.e., it gets partitive in Finnish). Subjects (by (15), agents are stronger than patients) get nominative case, and strong objects of transitives get accusative.

A remaining problem for the rankings discussed so far involves the characterization of the case distribution in a language like Hindi/Urdu. As I pointed out above, this seems to be a language that combines split-ergativity and split-accusativity (cf. Butt and King, 1993, 1999). I propose that the ranking provided for Finnish in (18) can also be maintained for Hindi/Urdu. As a consequence, the difference between Finnish and Hindi/Urdu must be sought in the first two layers of the model. Consider some relevant examples in (19) and (20) (taken from Butt and King, 1999).

(19) a. anjum-ne xat likh-naa hai. [*Urdu*]
Anjum-ERG letter-NOM write-INF is
'Anjum wants to write a letter.'

b. anjum-ko xat lik^{h}-naa hai.
Anjum-ACC letter-NOM write-INF is
'Anjum has to write a letter.'

(20) a. ra:m k^{h}ã:s-a:. [*Urdu*]
Ram-NOM coughed
'Ram coughed.'

b. ra:m=ne k^{h}ã:s-a:.
Ram-ERG coughed
'Ram coughed (purposefully).'

Weak arguments do not get C_1 or C_2, which results in the assignment of what is called *nominative* case in the examples (compare *partitive* case in Finnish). When a predicate has only one argument, this argument (the subject) can be weak (if it is not really an agent, having to do with an agency/volitionality constraint) which results in the assignment of nominative case in (20a). When the argument is a true agent (hence, strong) it gets ergative case instead (see (20b)). Subjects and objects of transitives can take an intermediate strength value, however: non-agentive subjects of transitives are stronger than the patient objects (hence, they are weak and strong simultaneously, or alternatively, not really weak nor really strong). Similarly, specific objects of transitives are strong and weak at the same time (strong because they are specific; weak because they are patient). This intermediate status results in accusative case as follows. There is a conflict between $x \not\rightarrow C_{12}$ and $X \rightarrow C_1$: if the hidden unit representing weakness would win, this would result in nominative case, whereas strength would result in ergative case. The effect of the

conflict is that these stronger constraints are not activated at all. Instead, the weaker constraints $X/x \rightarrow C_2$ apply, for which there is no conflict with respect to the output case, resulting in accusative case for weak subjects as well as strong objects of transitives in Hindi/Urdu.

6. Conclusion

In this article I proposed a three-layer constraint model to describe the mapping from structural and semantic properties of a predicate-argument structure to case assignment, via a hidden level determining the strength of the arguments involved. I proposed constraint rankings to account for the differences between nominative, ergative, split-ergative, and split-accusative languages, and I hypothesized on the intermediate strength of certain arguments in Hindi/Urdu in order to account for the emergence of accusative case in this language.

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References

Ackema, P. and A. Neeleman (1998) 'Conflict Resolution in Passive Formation'. *Lingua* 104, 13–29.

Aissen, J. (1998) 'Markedness and Subject Choice in Optimality Theory'. Ms. UC Santa Cruz.

Bobaljik, J.D. (1992) 'Nominally Absolutive is not Absolutely Nominative'. *Proceedings of WCCFL XI*, CSLI, Stanford.

Butt, M. and T.H. King (1991) 'Semantic Case in Urdu'. *Papers from the 27th Regional Meeting of the Chicago Linguistic Society*, 31–45.

Butt, M. and T.H. King (1993) 'Object Specificity and Agreement in Hindi/Urdu'. *Papers from the 29th Regional Meeting of the Chicago Linguistic Society* 1, 80–103.

Butt, M. and T.H. King (1999) 'Licensing Semantic Case'. Ms. Konstanz/Stanford.

Chomsky, N. (1992) 'A Minimalist Program for Linguistic Theory'. *MIT Occasional Papers in Linguistics #1*. MITWPL, Cambridge, MA.

Does, J. van der and H. de Hoop (to appear) 'Type-Shifting and Scrambled Definites'. To appear in *Journal of Semantics*.

Dowty, D. (1991) 'Thematic Proto-Roles and Argument Selection'. *Language* 67, 547–619.

Geenhoven, V. Van (1996) *Semantic Incorporation and Indefinite Descriptions: Semantic and Syntactic Aspects of Noun Incorporation in West Greenlandic*. PhD dissertation, Tübingen.

Hoop, H. de (1992) *Case Configuration and Noun Phrase Interpretation*. PhD dissertation, Groningen (1996: Garland Publishing, New York).

Hopper, P.J. and S.A. Thompson (1980) 'Transitivity in Grammar and Discourse'. *Language* 56, 251–299.

Jelinek, E. (1993) 'Ergative "Splits" and Argument Type'. In J.D. Bobaljik and C. Philips (eds.), *Papers on Case and Agreement. MIT Working Papers in Linguistics* 18, MITWPL Cambridge, MA.

Laka, I. (1993) 'Unergatives that Assign Ergative, Unaccusatives that Assign Accusative'. In J.D. Bobaljik and C. Philips (eds.), *Papers on Case and Agreement. MIT Working Papers in Linguistics* 18, MITWPL Cambridge, MA.

Legendre, G., Y. Miyata, and P. Smolensky (1990a) 'Harmonic Grammar — A Formal Multi-Level Connectionist Theory of Linguistic Well-formedness: Theoretical Foundations'. *Proceedings of the Twelfth Annual Meeting of the Cognitive Science Society*, 388–395.

Legendre, G., Y. Miyata, and P. Smolensky (1990b) 'Harmonic Grammar — A Formal Multi-Level Connectionist Theory of Linguistic Well-formedness: An Application'. *Proceedings of the Twelfth Annual Meeting of the Cognitive Science Society*, 884–891.

Legendre, G., W. Raymond, and P. Smolensky (1993) 'An Optimality-Theoretic Typology of Case and Grammatical Voice Systems'. *Proceedings of the 19th Meeting of the Berkeley Linguistics Society*.

Rumelhart, D.E., R. Durbin, R. Golden, and Y. Chauvin (1996) 'Backpropagation: The Basic Theory'. In P. Smolensky, M.C. Mozer, and D.E. Rumelhart (eds.), *Mathematical Perspectives on Neural Networks*, Lawrence Erlbaum Associates, Mahwah, New Jersey, 533–566.

Silverstein, M. (1976) 'Hierarchies of Features and Ergativity: Grammatical Categories in Australian Languages'. R. Dixon (ed), *Ergativity: Towards a Study of Grammatical Relations*. Canberra: Australian Institute of Aboriginal Studies.

Woolford, E. (1995) 'Object Agreement in Palauan: Specificity, Humanness, Economy and Optimality'. In J.N. Beckman, L.W. Dickey and S. Urbanczyk (eds.), *Papers in Optimality Theory. University of Massachusetts Occasional Papers* 18, GLSA, Umass, Amherst.