Current Issues in Linguistic Theory

Morphology 2000

EDITED BY

S. Bendjaballah

W.U. Dressler

O.E. Pfeiffer

M.D. Voeikova

MORPHOLOGY 2000

AMSTERDAM STUDIES IN THE THEORY AND HISTORY OF LINGUISTIC SCIENCE

General Editor

E. F. KONRAD KOERNER
(University of Ottawa)

Series IV – CURRENT ISSUES IN LINGUISTIC THEORY

Volume 218

S. Bendjaballah, W.U. Dressler, O.E. Pfeiffer and M.D. Voeikova (eds)

Morphology 2000.
Selected papers from the 9th Morphology Meeting,
Vienna, 24–28 February 2000.

MORPHOLOGY 2000

SELECTED PAPERS FROM THE 9TH MORPHOLOGY MEETING, VIENNA, 24–28 FEBRUARY 2000

Edited by

S. BENDJABALLAH
W.U. DRESSLER
O.E. PFEIFFER
M.D. VOEIKOVA

University of Vienna

JOHN BENJAMINS PUBLISHING COMPANY
AMSTERDAM/PHILADELPHIA

∞ TM

The paper used in this publication meets the minimum requirements of American National Standard for Information Sciences — Permanence of Paper for Printed Library Materials, ANSI Z39.48-1984.

Library of Congress Cataloging-in-Publication Data

International Morphology Meeting (9th : 2000 : Vienna, Austria)
Morphology 2000 : selected papers from the 9th Morphology Meeting, Vienna, 24–28 February 2000 / edited by Sabrina Bendjaballah... [et al.]
p. cm. -- (Amsterdam studies in the theory and history of linguistic science. Series IV, Current issues in linguistic theory, ISSN 0304-0763 ; v. 218)
1. Grammar, Comparative and general--Morphology--Congresses. I. Bendjaballah, Sabrina. II. Title.
P241.I58 2001
415--dc21 2001035800
ISBN 90 272 3725 5 (Eur.) / 1 58811 080 X (US) (Hb; alk. paper) CIP

John Benjamins Publishing Co. • P.O.Box 36224 • 1020 ME Amsterdam • The Netherlands
John Benjamins North America • P.O.Box 27519 • Philadelphia PA 19118-0519 • USA

Contents

Introduction

This volume presents selected papers from the Ninth International Morphology Meeting held in Vienna, Austria, from the 24th to the 28th of February 2000.[1] The meeting continued the series of biennial meetings held alternately in Austria and Hungary. The meeting consisted of a main section, several poster sessions and workshops. In the spirit of the meeting, this volume focuses on the main topic "comparative morphology" (that is, cross-linguistic analysis, including typology, dialectology and diachrony) and on the minor topic "psycholinguistics".[2]

Accordingly we begin our brief characterization of the contributions to this volume with the general chapter by **Carstairs-McCarthy** on stem alternation from the descriptive and explanatory perspective of affix-stem interactions, whereby the author accounts for allowed and disallowed distribution patterns. The chapter by **Corbett**, **Brown** and **Evans** argues for the use of computational methods in typological studies of morphology, with particular emphasis on the relations between gender and inflectional class. **Albright**'s chapter shows how computational modeling can measure gradient morphological well-formedness in correspondence to frequency measures and ratings by native speakers. In his contribution on Alutor, **Kibrik** provides a detailed analysis of cross-reference marking in this Chukotko-Kamchatkan language. He shows that the whole system may only be described as a complex interaction of formal rules which go beyond direct reference to person and number. In her chapter on the syntax-morphology interface, **Julien** elaborates on the assumption that inflectional markers directly represent functional syntactic heads, with specific illustrations of the order of verb root, tense and aspect markers. The chapter by **Kalinina** deals with lack of distinction between predicate forms and NP forms in a number of languages. Since this concerns rather phrases than just words, the standard analyses of syncretism of word classes are inadequate. Fixing the borderline between syntactic and morphological processes is also the main concern in **Rood**'s contribution on noun incorporation in Wichita (from the perspective of other Amerindian languages and of psycholinguistic models). **Mel′čuk** gives a theoretical overview of morphological "zero signs", including general principles for their acceptability and a hierarchy of zero-marked phenomena.

Contrastive morphology is represented by the following three contributions which find great similarities in typologically divergent languages: **Dressler** and **Ladányi** compare dimensions of morphosemantic opacity in German and Hungarian. **Hallman** shows that participle forms have to be decomposed into an argument-changing process and a category-changing process both in Lebanese Arabic and in English. **Cetnarowska** studies adjectival past participle formation from the point of view of the "intransitivity split" hypothesis in Polish and in Germanic languages.

Diachrony is covered by four contributions: in probing Welsh mutations and Italian as well as Maltese initial gemination, **Comrie** concludes that, similar to affixation, morphophonological alternations cannot wander from one morphological context to another. **Loporcaro**'s chapter is devoted to explanation in diachronic dialectology and discusses the respective roles of internal vs. external explanation of language change, drawing his examples from Southern Italian dialects. **Menzel** describes the system of case marking of nouns, pronouns and adjectives in Slavic languages from the point of view of natural preferences and with special attention to constructional iconicity. **Nesset** and **Enger** elaborate on principles that govern the distribution of markers in morphological splits and propose an Optimality-Theory account of their mostly Norwegian (but also Danish and Swedish) cases.

Derivational morphology is the focus of three contributions: **Roché** deals with gender assignment in Romance derivatives of the Latin suffix *-arius*. **Baker** provides an account of gaps in derivational patterns within the framework of a theory of lexical categories (based on a small number of discrete, privative features), whereby his cross-linguistic exemplification starts from English. **Bauer** tackles, in his cross-linguistic analysis, the problem of which major derivational meaning categories recur and which of them are commonly expressed by the same derivational rule.

The second main topic of *psycholinguistics* can be divided into several subtopics: *On-line processing* is dealt with by several authors: **Libben** and **de Almeida** give an overview on morphological parsing and provide experimental results which distinguish between pre-lexical and post-lexical parsing. From a distributed connectionist perspective, **Gonnerman** and **Andersen** explain their experimental findings with semantic, phonological and orthographic factors, without recourse to an autonomous morphological module. **Jetchev** and **Bertinetto** investigate three Bulgarian verb classes in regard to compositionality vs. non-compositionality in processing. Their main focus is on morphological complexity.

Off-line experiments with Russian adults and children are interpreted by **Roussakova** and her coauthors as showing a close connection of the two members of an "aspectual pair" of verbs in the mental lexicon.

Last not least, two chapters deal exclusively with *child language*: **Gillis** and **Ravid** contrast, with transversal experiments, the acquisition of written Hebrew and Dutch whose morphological and orthographic systems diverge widely. As a consequence learning strategies are language-specific as well, for example, in regard to the great importance of morphophonology for Hebrew children as opposed to Flemish children. **Elsen**'s study of dense longitudinal diary data concludes that German plurals are acquired by pattern associations of plural schemata rather than by rule learning.

The psycholinguistic chapters of this volume consistently refer to issues of grammatical theory. Many contributions on morphological theory consider psycholinguistic questions. And, on the empirical side, this volume spans a broader set of languages of the world than any predecessor volume. May this widening scope and increasing integration of theoretical and empirical perspectives be a good omen for a new millennium of morphological research!

Sabrina Bendjaballah — Wolfgang U. Dressler —
Oskar E. Pfeiffer — Maria D. Voeikova

Notes

1. The organizers would like to thank the Bundesministerium für Wissenschaft und Verkehr, the Erste Bank, the Magistrat der Stadt Wien, the Österreichische Forschungsgemeinschaft, and the Wiener Tourismusverband for their financial support, the University of Vienna and the Austrian Academy of Sciences for their patronage, and the co-organizer of the meeting, Dieter Kastovsky, head of the Institute of Translation and Interpreting of the University of Vienna, for putting the premises at our disposal. Our special thanks are due to the local and international reviewers of the contributions to this volume.

2. The papers by Lluïza Gracia and Miren Azkarate, Alissa Melinger, Sylvain Neuvel and Rajendra Singh, Martina Penke and Marion Krause, Angela Ralli, Sergej Tatevosov and Svetlana Toldova are scheduled to appear in Folia Linguistica. The papers of the workshop "Compound Processing" will be guest-edited by Gonia Jarema, Eva Kehayia and Gary Libben as a separate issue of Folia Linguistica. The papers of the "Crosslinguistic Project on Pre- and Protomorphology in Language Acquisition" will appear in the volume "Pre- and Protomorphology: early phases of morphological development in nouns and verbs", edited by Maria Voeikova and Wolfgang U. Dressler with the publisher Lincom Europa, Munich.

Chapter 1

The lexical bases of morphological well-formedness

Adam Albright
University of California, Los Angeles

1. Introduction

Not all words, real or novel, are created equal — some sound better than others, either for phonological or for morphological reasons. That is, well-formedness is a gradient notion. One simple way to measure gradient well-formedness is through acceptability ratings. For example, native English speakers generally agree that there are several conceivable past tenses for the made-up verb *spling*, but not all of these competing possibilities are equally plausible or well-formed:

(1) "How good is _______ as the past tense of *spling*?"

*_sploof_ *?_splought_ ??_splang_ ?_splung_ √_splinged_

① awful ② ③ pretty bad ④ ⑤ questionable ⑥ ⑦ perfect

Gradient well-formedness has been documented in a number of different domains, and for a number of different languages. Within morphology, several studies have shown that novel English irregular past tenses are more acceptable when they resemble existing irregulars (Bybee and Moder 1983, Bybee and Slobin 1982, Prasada and Pinker 1993). Ullman (1999) found further that the acceptability of *existing* irregular English past tense forms depends on the behavior of similar verbs in the lexicon. Albright (1999) showed that the acceptability of both regular and irregular conjugation classes in Italian depends on similar existing verbs. These are just a few results from a large and growing body of evidence suggesting that gradient well-formedness is a product of statistical patterns within the lexicon.

A more controversial issue is *how* exactly gradient well-formedness is derived from the lexicon. Bybee (1995) argues that the strength of a morphological pattern is related to its type frequency — that is, the number of words which take the pattern. In the case of the hypothetical verb *spling*, we would look to the English lexicon and find that there are ten other *ing* ~ *ung* verbs, making the pattern a relatively robust one. Connectionist models, on the other hand, are influenced by both type and token frequency of similar words. For a connectionist network, then, *splung* is a plausible past tense of *spling* not only because there are ten other *ing* ~ *ung* verbs, but because in addition, some of them are quite common.

Do type and token frequency really both play a role in shaping morphological well-formedness intuitions? In spite of the intensity of the debate between proponents of connectionist vs. symbolic models, few studies have actually taken on this question directly. Bybee (1995) reviews some arguments that type frequency is the most important consideration. Additional support for this view comes from the fact that individual high-frequency words do not seem to improve the productivity of isolated irregular patterns — for example, English has a high frequency verb *say* ~ *said*, but the novel verb *shay* could not have a past tense **shed*.

The goal of the current study is to provide a more rigorous comparison of type and token frequency, through computational modeling of experimentally obtained morphological well-formedness ratings. It is organized as follows: first, I will present an assortment of lexical statistics which could plausibly form the basis of morphological well-formedness ratings. I will then describe an automated procedure for collecting these statistics from the lexicon, and producing predicted acceptability ratings. Finally, I will compare the relative effectiveness of these different statistics in modeling experimentally obtained acceptability ratings for two different morphological processes: past tense formation in English, and verbal conjugation class assignment in Italian. For both of these languages, I will show that a model based on type frequency provides the closest match to human intuitions, and employing token frequency does not improve the performance of the model.

2. Predicting well-formedness from lexical statistics

2.1 An assortment of lexical statistics

What kinds of statistics can be computed from lexicon? Consider, for example, the morphological change from [ɪ] → [æ] in the structural phonological environment /X [–syl, +cont] __ŋ# (where X is an unrestricted variable, standing for any amount of phonological material). There are a variety of statistics which we can collect for each such morphological change in a given phonological environment:

(2) Possible lexical statistics

a. *Scope*(*types*): the number of words that meet the structural description of the rule.
   - Ten English verbs contain the environment X[–syll, +cont]__ŋ# (*bring*, *cling*, *fling*, *ring*, *sling*, *spring*, *string*, *swing*, *wing*, and *wring*)

b. *Scope*(*tokens*): the combined token frequency of all words that meet the structural description.
   - The ten verbs listed in (a) have a combined lemma count of 561 in Francis and Kučera (1982).

c. *Hits* (*types*): the number of words that meet the structural description of the rule and also participate in the same morphological change.
   - Six verbs containing the environment X[–syll, +cont]__ŋ# actually form their past tense by the change [ɪ] → [æ] (*swing*, *fling*, *wring*, *cling*, *sling*, and *string*).

d. *Hits* (*tokens*): the combined token frequency of the "hits" for the environment
   - The six verbs in (c) have a lemma count of 43.

e. *Raw reliability* (*types*): the ratio of the *Hits*(*types*) to the *Scope*(*types*) — that is, the reliability of the change in this particular environment
   - Six out of ten verbs containing environment X[–syll, +cont]__ŋ# form past tenses by the change [ɪ] → [æ], so the reliability of [ɪ] → [æ] in this environment is 0.6

f. *Raw reliability* (*tokens*): the ratio of *Hits*(*tokens*) to *Scope*(*tokens*).
   - for [ɪ] → [æ] / X[–syll, +cont]__ŋ#, 43/561 = 0.0766

g. *Adjusted reliability*: the statistical lower confidence limit of the reliability ratios (type and token), as suggested by Mikheev (1997). (Rationale: we are more confidence about generalizations when there is more data — that is, when an environment contains more words)
   - the 75% confidence adjustment of 0.6 = 0.4825

h. *Type × token*: a measure taking both type and token frequency into account by multiplying them (*Adjusted type reliability* × *Adjusted token reliability*)
   - for [ɪ] → [æ] /X[–syll, +cont]__ŋ#, 0.6 × 0.766 = 0.04596

i. *Reward for length*: reward generalizations with more segments fully specified, by multiplying *Adjusted type reliability* × 1.2^n, for *n* shared segments. (Rationale: shared segments make the similarity between words more salient, and could help to increase the productivity of a pattern by inducing analogy to existing forms.)

• X[–syll, +cont]__ŋ# has one full segment specified; 0.6 × 1.2 = .72

The measures in (2) are clearly only a small fraction of the possible ways to compute lexical statistics about the morphological behavior of words within a phonological environment; however this list provides a reasonable starting point.

But what environments should we collect lexical statistics for? In order to answer this, it is useful to consider what types of phonological environments can condition morphological alternations. The most restricted morphological process is suppletion, in which the environment for the change is limited to just one word. Morphological alternations may also be conditioned by more general phonological environments. For example, in English, null-marking for past tenses occurs only in [t]-final roots (*cut*~*cut*, *quit*~*quit*, etc.); in Toba Batak, *-um-* is prefixed only before vowels, labial consonants, and nasals (Crowhurst 1998). Morphological alternations can also be conditioned by rather general phonological environments, such as the alternation of the Korean nominative marker: *-ka* after vowel-final stems and *-i* after consonant-final stems. Finally, morphological processes can be completely insensitive to the phonological environment, as is the case for the invariant Hungarian accusative marker *-t*.

Thus it seems that if we want to find the correct generalization about the phonological environment where a morphological process occurs, we must consider environments at *all* levels of generality, from word-specific to context-free. There are several ways we could do this. We could, for instance, start by listing all logically possible structural descriptions for the language, and then see which ones are actually instantiated by members of each inflectional class. A more efficient way, however, is to use an automated discovery procedure to construct the list of relevant environments directly from the lexicon; I turn next to the description of one such procedure.

2.2 An algorithm for exploring environments

One algorithm for exploring the phonological environments surrounding a morphological alternation is the 'minimal generalization' algorithm of

Albright and Hayes (1998). The algorithm takes as its input pairs of morphologically related words. It starts by considering each word as a very specific environment for a morphological rule. For example, given the English (present, past) pair (*sip*, *sipped*), it posits a morphological rule which suffixes [t] in the phonological environment /sɪp__#:

(3) ∅ _ t / sɪp__#

It then generalizes by seeking pairs of words that involve the same morphological change (in this case ∅ → [t]). When it finds such a pair, it compares the phonological environments to discover what material they share, and what material is unique to just one of the forms. It then posits a new rule with the shared material as its environment, converting the residue to a variable. For example, comparing (*sip*, *sipped*) and (*grip*, *gripped*), it would hypothesize that the morphological change ∅ → [t] can occur not just after *sip* and *grip*, but after any word ending in a coronal continuant + [ɪp]:

(4)

	Change	Residue	Shared features	Shared segments	Change location
Comparing:	∅ → [t] /		s	ɪp	___
with:	∅ → [t] /	g	r	ɪp	___
yields:	∅ → [t] /	X	[+cons, +cor, . . .]	ɪp	___

The example in (4) shows that when we consider pairs of similar words, the resulting generalizations will be quite specific. When we consider pairs of dissimilar words, however, the shared material is minimal, and we can arrive at quite general — even context-free — generalizations. When the process of pairwise comparison is iterated across the entire lexicon, the result is a comprehensive list of thousands of phonological environments where each morphological process may occur in existing words.

Once the relevant phonological environments have been collected, we can calculate for each one the statistics described in Section 2.1. The last remaining step, then, is to use these statistics to predict the well-formedness of novel words, in order to model human intuitions.

2.3 Predicting well-formedness from lexical statistics

The statistics described above in (2) pertain to phonological environments, not to particular words. When we gather well-formedness intuitions from people, however, we typically ask them about entire words. Unfortunately, each word contains many environments simultaneously — for instance, *glip* is [glɪp]-final, [lɪp]-final, [ɪp]-final, [p]-final, bilabial-final, stop-final, etc. Which environment do we look at for lexical statistics to predict the acceptability of *glipped*? What I will assume here is that we should try all applicable environments, and let the one with the highest score determine the predicted well-formedness. Example (5) shows four phonological environments contained within the novel verb *glip*, along with hypothetical reliability values. In this case, we would use the second environment (5b), to predict an acceptability value of 95 per cent for the outcome *glipped*.

(5) a. ∅___[t] / X lɪp__# .89
b. ∅___[t] / X ɪp__# .95 ← use this one
c. ∅___[t] / X p__# .67
d. ∅___[t] / X [+LAB] __# .65

This "best foot forward" convention provides a mechanism for predicting the well-formedness of novel words the score of the form is the score of the best rule that can derive it. Note that any of the lexical statistics described above in (2) could be used in this way as the basis for predicted well-formedness ratings. In the remainder of this chapter, I will compare the fit between predictions based on different lexical statistics and experimentally obtained well-formedness ratings from human speakers.

3. English past tenses

Prasada and Pinker (1993) presented 60 novel verbs to English speakers in a present context (*John likes to* cleef). Participants then rated the acceptability of potential past forms, on a scale of one to seven:

(6) Yesterday, John *cleefed* 1 2 3 4 5 6 7
Yesterday, John *cleft* 1 2 3 4 5 6 7

Prasada and Pinker claim that ratings of novel irregular past tense forms like *cleft* were influenced by the phonological form of the word, while ratings of regular past tense forms like *cleefed* showed no such effect. If this is true, then we should be able to predict the ratings of novel irregulars using some version of the lexical statistics described above, while the ratings of novel regulars should not be predictable based on lexical statistics.

In order to test this hypothesis, I applied the automatic environment-exploring algorithm to a database of 2,181 (present, past) pairs of English verbs, in phonetic transcription. This database was based on a file taken from Brian MacWhinney's web site,[1] augmented slightly to include all of the irregular verbs of English. The database also included the token frequency for each verb, as listed in Francis and Kučera (1982). The result was a comprehensive list of all of the phonological environments surrounding each change used to express the present/past distinction in English (including both the regular and irregular patterns). Statistics were then calculated for each environment, using both type and token frequency. Finally, each of the novel verbs from Prasada and Pinker's study was submitted to the system, in order to determine their predicted ratings under each of the different bases for well-formedness proposed in (2).

The first result was that there were highly significant correlations between the actual well-formedness ratings and *all* versions of the predicted well-formedness ratings which are based on ratios ($p < 10^{-11}$ in all cases, much more significant for some measures).[2]

(7) Correlation of predicted to actual acceptability ratings

Basis of predictions	*Correlation* (Pearson's *r*) (*d.f.* = 58)
Raw reliability (type)	0.6109
Raw reliability (token)	0.5950
Adjusted reliability	0.7319
Type × token	0.7230
Reward for length	0.7321

As can be seen, predictions based on type and token frequency both do well in modeling the actual acceptability ratings, with type frequency slightly ahead of token frequency; adjustments based on confidence limits, or the specificity of the phonological environment, also help the model considerably.

Prasada and Pinker (1993) mention a possible confound in their data, however. They point out that when subjects are asked to rate morphological well-formedness, they may have difficulty factoring out the independent effect of phonological well-formedness. Therefore, they also collected ratings of phonological well-formedness, which can be used to correct for this confounding influence. In particular, we can perform partial correlations, factoring out the phonological well-formedness ratings to leave what should be a purely morphological effect.

When phonological well-formedness is factored out in this way, the correlations between the predicted ratings and the observed ratings actually go up slightly. As before, type frequency is a slightly (but non-significantly) better predictor than token frequency. Furthermore, a significant correlation is observed even when regular and irregular forms are considered separately:

(8) Partial correlations, factoring out phonological well-formedness

Basis of predictions	*Correlation (all forms)*	*Correlation (regs only)*	*Correlation (irregs only)*
raw reliability (type)	0.6310	0.4798	0.3526
raw reliability (token)	0.6141	0.4170	0.3971
adjusted reliability	0.7443	0.3904	0.5729
type × token	0.7455	0.4033	0.5516
reward for length	0.7401	0.2583	0.5741

Thus, *contra* Prasada and Pinker, even novel regulars show a significant effect of lexical statistics. Note that this could *not* emerge if ratings for novel regulars were uniform for all words, as is predicted by the dual mechanism hypothesis, since significant correlations can only be achieved when there is adequate variance in the data. In fact, it seems that when phonological well-formedness is factored out in a partial correlation, there is *more* variance between the items, and this variance is captured well by the predictions of lexical statistics.

The evidence from English can thus be summarized as follows: all bases for lexical statistics perform relatively well, with type frequency slightly better than token frequency. Furthermore, lexical statistics can account for differences not only between novel irregulars, but also between novel regulars.

4. Italian conjugation classes

Italian has four conjugation classes, differing in theme vowel and stress in the infinitive:

(9)

Vowel	*Stress*	*Infinitive suffix*	*Sample root*	*Sample infinitive*	*Gloss*
[a]	*suffix*	-are	sed-	se'dare	‘sedate’
[e]	*root*	-ere	led-	'ledere	‘harm’
[e]	*suffix*	-ere	sed-	se'dere	‘sit’
[i]	*suffix*	-ire	sped-	spe'dire	‘send’

Although the four classes are distinct in the infinitive, the distinction is neutralized in various ways in other inflections; the 1sg form, in particular, is ambiguous between all four conjugation classes.

Albright (1999) presented novel verbs to consultants in the 1sg form, and asked them to rate the acceptability of potential infinitives:

(10) a. *Oggi* rabado *con mio fratello.*
today *rabad.*1SG with my brother

b. *Mi piace* rabadare 1 2 3 4 5 6 7
Mi piace rabadere 1 2 3 4 5 6 7
Mi piace rabadère 1 2 3 4 5 6 7
Mi piace rabadire 1 2 3 4 5 6 7
"I like to *rabad*"

As in Prasada and Pinker's study, participants also rated the phonological well-formedness of the verb, in this case in its 1sg form.

In order to model well-formedness of different conjugation class assignments, I created a database of 2,900 Italian verbs in the first person singular present and infinitive, with phonetic transcriptions and token frequencies (de Mauro *et al.* 1993). This database contained all of the verbs contained in a 500,000 word spoken corpus, plus all verbs in the Ispell electronic dictionary (Kuenning 1996). As before, predicted ratings were calculated for each novel item in each conjugation class, using the lexical statistics described above.

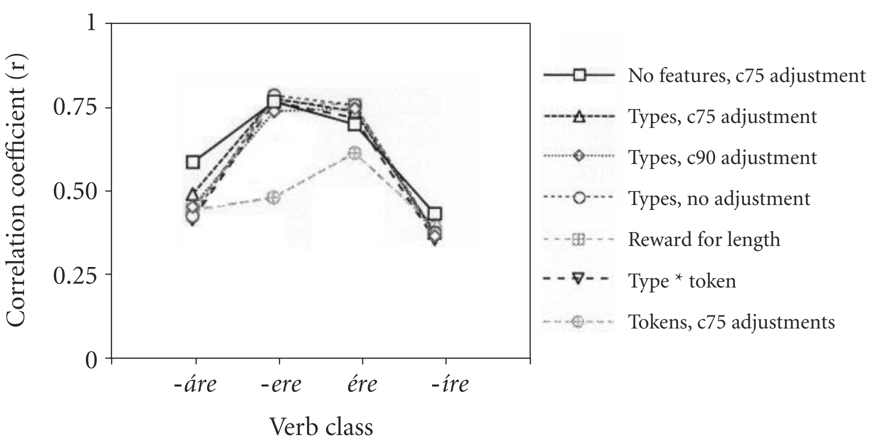


Figure 1. Comparison of different metrics

As with English, the results show similar performance from all metrics, with moderately strong correlations for all conjugation classes; see Figure 1.

Metrics based on token frequency perform a bit worse than those from type frequency, especially for the -*ere* and -*ère* classes. The explanation for this is probably that these classes contain relatively few verb types, but they have high token frequency. Therefore, it is in these classes that type and token frequency diverge most radically — and in this case, it is type frequency that seems to model human intuitions most closely.

5. Discussion

In both Italian and in English, type frequency and token frequency both do quite well at explaining human ratings. In fact, the similarity is not mysterious; predictions based on type frequency are themselves highly correlated with the predictions based on token frequency. The reason for this is that most words in a corpus have a token frequency of one. Therefore, predictions based on token frequency differ from type frequency only for those few neighborhoods that contain high-frequency verbs. Thus, we expect that using token frequency should only make a small difference — and to the extent that it makes a difference at all, it seems to make the predictions worse. It should also be noted that neither experiment actually included novel forms like *shay*, which would tease apart the predictions the most. In addition, the use of log frequencies would not help here, because the lexical statistics employed here are all ratios, so it would be pointless to take the log of both the numerator and the denominator of the ratio. The fact that human intuitions are best modeled by type frequency may suggest that the statistics are calculated at the symbolic level — that is, abstracted away from tokens. Furthermore, the fact that confidence statistics improved the accuracy of the predictions could possibly reflect reasoning behavior, and not simply the neuronal activation from similar words.

More generally, the method of computing lexical statistics described in Section 2 was found to provide a good match to human ratings in both English and Italian. In both languages, this was true not only for irregular patterns, but also for the default/regular pattern. Taken together, these results support the view that morphological well-formedness intuitions for all patterns can be derived by a single, probabilistic model.

Notes

1. http://psyling.psy.cmu.edu/Brian/papers.html

2. Measures such as *Hits*(*tokens*) that are not based on ratios predict the same well-formedness rating for all items — namely, the score of the largest, context-free generalization. Therefore, they can not be compared using correlations, because there is no variance in the values.

References

Albright, Adam. 1999. "Phonological subregularities in inflectional classes: Evidence from Italian". *UCLA Working Papers in Linguistics 1*, *Papers in Phonology 2*, ed. by Matthew Gordon, 1–47. http: //www.humnet.ucla.edu/people/aalbrigh/papers.html

——and Bruce Hayes. 1998. "An automated learner for phonology and morphology". Ms., UCLA ms. Available at: http: //www.humnet.ucla.edu/humnet/ linguistics/ people/hayes/learning/learning.htm

Bybee, Joan L. 1995. "Regular morphology and the lexicon". *Language and Cognitive Processes* 10:5.425–455.

——and Carol Lynn Moder. 1983. "Morphological classes as natural categories". *Language* 59:2.251–70.

——and Dan I. Slobin. 1982. "Rules and schemas in the development and use of the English past tense". *Language* 58:2.265–89.

Crowhurst, Megan J. 1998. "*Um* infixation and prefixation in Toba Batak". *Language* 74:3. 590–604.

de Mauro, Tullio, F. Mancini, M. Vedovelli and M. Voghera. 1993. *Lessico di frequenza dell'italiano parlato*. Milan: Etaslibri.

Francis W. Nelson and Henry Kučera. 1982. *Frequency Analysis of English Usage*. New York: Houghton Mifflin.

Kuenning, Geoff. 1996. "International Ispell". http: //ficus-www.cs.ucla.edu/ficus-members/geoff/ispell.html

Mikheev, Andrei. 1997. "Automatic rule induction for unknown-word guessing". *Computational Linguistics* 23:3.405–23.

Prasada, Sandeep and Steven Pinker. 1993. "Generalization of regular and irregular morphological patterns". *Language and Cognitive Processes* 8.1–56.

Ullman, Michael T. 1999. "Acceptability ratings of regular and irregular past-tense forms: Evidence for a dual-system model of language from word frequency and phonological neighborhood effects". *Language and Cognitive Processes* 14:1.47–67.

CHAPTER 2

On category asymmetries in derivational morphology

Mark Baker
Rutgers University

Without a substantive theory of the lexical category distinctions, one might expect that any category could in principle be derived from any other category. Superficially, this seems to be true: verbs can be derived from nouns (*crystallize*) or adjectives (*legalize*), nouns can be derived from verbs (*division*) or adjectives (*completeness*), and adjectives can be derived from nouns (*penniless*) or verbs (*breakable*). However, these derivations are not all the same in terms of their productivity, semantic transparency, and frequency across languages. In particular, I will show that the verbalization of nouns is marked compared to the verbalization of adjectives or the nominalization of verbs. Then I will show how this gap in the pattern of derivations, which is not expected by most theories, gets a natural explanation within the theory of lexical categories proposed in Baker (1996b, to appear) and Baker and Stewart (1996).

1. A derivational gap in English

The empirical generalization that I have in mind and the basic issues that it raises can be conveniently illustrated in English. English nouns and adjectives are similar in that they can both be used as predicates, as shown in (1). In particular, they both form stative sentences when they appear in construction with the ordinary copula *be* ((1a)). They both form inchoative sentences when they appear with an eventive linking verb like *become* ((1b)). Finally, they can both appear as complements of *make*, in which case they are predicated of the direct object to form a causative construction ((1c)).

(1) a. John is a man. a.′ John is hungry.
b. John became a man. b.′ The sky became clear.
c. The battle made John a man. c.′ The wind made the sky clear.

With respect to these features of external syntax, predicate nouns and predicate adjectives seem identical. They also usually receive parallel semantic treatments. Nevertheless, from the point of view of morphology there is a significant difference. The periphrastic combinations of a linking verb plus a predicate adjective can often be replaced with a single, morphologically complex word consisting of a verb that is derivationally related to the adjective. However, English does not typically have stative, inchoative, or causative verbs that are derivationally related to nouns in this way. This contrast is illustrated in (2).

(2) a. *John mans. a.′ John hungers.
b. *John manned. b.′ The sky cleared.
c. *The battle manned John. c.′ The wind cleared the sky.

Of course, English does have many noun roots that can be used as verbs. This is even possible for *man*, as shown in (3).

(3) Man the torpedoes!

But this is crucially different from the adjective-verb correspondences in (2), because *man* in (3) does not have a predicative reading. Manhood is not being attributed to any of the arguments; (3) is not a command to cause the torpedoes to become men, for example. Rather, the natural gloss of (3) is something like "put men at the torpedoes", in which men are understood as being additional participants in the action.

The examples in (2b, c) illustrate the conversion of adjectives into verbs by zero-derivation. However, the same asymmetry can be found for the various other verb-forming devices in English as well. (4) illustrates this for the prefix *en–*. This can attach to adjectives to create a verb with a simple inchoative or causative meaning. However, it cannot attach to nouns to give the same kind of meaning. When it can attach to a noun at all, the noun is again understood as some kind of argument, not as a predicate.

(4) a. enlarge 'to become large, to make something large'
b. *enking 'to become king, to make someone king'
c. enthrone 'to put someone on a throne' (*not* 'to make x a throne')

The same pattern of facts is found with *-ize*:

(5) a. legalize 'to become legal, to make something legal'
b. *principalize 'to become a principal, to make someone a principal'
c. hospitalize 'to put someone in a hospital' (*not* 'to make something a hospital')

Thus, this pattern is not merely a quirk of one particular derivational morpheme in English. The basic contrast is summarized schematically in (6).

(6) X: A → V common, transparent, productive
X: N → V more rare, idiosyncratic, unproductive

(6) must be interpreted as a very general tendency, rather than as an exceptionless generalization. There are a few sporadic exceptions to it: for example, *crystalize* means roughly 'to become a crystal' and *to knight* is to make someone become a knight. However, these are unusual enough that they should not distract us from the general pattern. I will come back to how such exceptions fit into the picture in Section 4.

The main question is, why should this peculiar asymmetry exist? If one takes A, N, and V to be arbitrary syntactic labels, there is no reason why some mappings from one category to another should be favored over others. In fact, generative grammar usually assigns slightly more structure to the categories than this. Since Chomsky (1970) it has been common to decompose the lexical category labels into two binary features, as shown in (7).

(7)

Categories	+N	–N
+V	Adjectives	Verbs
–V	Nouns	Adpositions

One might consider this to be progress, because in the table in (7) adjectives are taken to be more similar to verbs than nouns are. Adjectives differ from verbs in only one feature value (±N), whereas nouns are different from verbs in both feature values. Thus, one might contemplate a condition like (8), which would account for the asymmetry in (6).

(8) Productive derivational processes can only change one feature value.

However, this approach is not very satisfying as it stands. On empirical grounds, it predicts that it should be equally hard for verbs to be transformed into nouns, since that too would involve changing the values of two features. But in fact, deverbal nominalization is one of the most common derivational processes. (9) illustrates one type of nominalization in English.

(9) *–ing*: V → N common, transparent, productive
a. build – building
b. clothe – clothing
c. cut – cutting
d. cook – cooking, etc.

Moreover, from a conceptual perspective, the actual theoretical insight expressed by the feature system in (7) is slight. The natural classes of categories expressed in (7) are not very well motivated, for example. Also, it is striking that internal to Chomskyan theory, there are almost no principles that make use of these features. Thus, this system is not to be taken too seriously as it stands. (See Baker, to appear, among others, for a fuller critique of (7).) Even if there is a suggestive grain of truth in (7) and (8), we need a fuller understanding of the lexical categories before the interesting asymmetry in (6) can be said to have been explained.

2. Crosslinguistic evidence

Before attempting this deeper understanding, however, it is important to evaluate (6) crosslinguistically. If this generalization holds only in English, then it is only of minor theoretical interest, because we do not necessarily expect all languages to have a complete set of derivational processes. There could perfectly well be accidental gaps in particular languages, even if it is possible in principle to derive any category from any other category.

In fact, when we turn to other languages, we often see the gap in (6) even more clearly. For example, Heath (1984) describes the Australian language Nunggubuyu as having little or no difference between the category of adjectives and the category of nouns. For example, both types of roots can take the same gender prefixes and case suffixes, as shown in (10a). However, adjectival roots can alternatively take a verbal agreement prefix, in which case it acts like the predicate of a clause. In contrast, nouns cannot be zero-derived into stative verbs in this way, as shown in (10b). Heath also states that Nunggubuyu has two overt verbalizing affixes, inchoative -*ma* and causative (factitive) -*wa*. Both of these can attach to adjectival roots like "big", but not to nominal roots like "pond" ((10c,d)).

(10)	a.	*a–wur̲ugu-wuy* NCL-pond-DAT 'to the pond'	a.′	*a–r̲unggal-wuy* NCL-big-DAT 'to the big one'
	b.	**wu-wurugu* 3sS-pond 'It is/was a pond.'	b.′	*wu-runggal* 3sS-big 'It is/was big.'

c. **wu-wurugu-ma-ny*
3sS-pond-INCH-TENS
'It is/has become a pond.'

c.′ *wu-runggal-ma-ny*
3sS-big-INCH-TENS
'It is/has become big.'

d. (**niwu-wurugu-wa-ny*)
3sS/3sO-pond-CAUS-TENS
'He made it into a pond.'

d.′ *niwu-runggal-wa-ny*.
3sS/3sO-big-CAUS-TENS
'He made it big."

These contrasts replicate what we saw in (2) in English.

Another case in point is Imbabura Quechua, as described by Cole (1985). In this language, too, adjectives are not clearly distinguished from nouns for many simple grammatical purposes: both can take the same case inflections, and both can be used predicatively in the same basic syntactic frame ((11a)). However, the inchoative affix -*ya* attaches productively to adjectival roots to make intransitive verbs, but it does not attach to noun roots ((11b)). Similarly, the suffix -*chi* derives transitive causative verbs from adjectives but not from nouns ((11c)).

(11) a. *Juan-ka mayistru-mi* (*ka-rka*).
Juan-TOP teacher-VAL be-PST/3
'Juan is/was a teacher.'

a.′ *Wasi-ka yuraj-mi* (*ka-rka*).
house-TOP white-VAL be-PST/3
'The house was white.'

b. **libru-ya-rka*
book-INCH-PST/3
'It became a book.'

b.′ *jatun-ya-rka*.
big-INCH-PST/3
'He became big.'

c. **libru-chi-rka-ni*
book-CAUS-PST-1
'I made it into a book.'

c.′ *ali-chi-rka-ni*.
good-CAUS-PST-1
'I caused it to become good'
'I repaired it.'

Cole (1985: 179) also points out that the ungrammaticality of (11b) and (11c) cannot simply be explained away by saying that their meanings are semantically deviant. The proof of this is that the intended meaning of (11b) can perfectly well be expressed by a periphrastic construction consisting of a predicate nominal and a syntactically separate linking verb that means 'become': *libru tuku-rka* ('book become'-PST/3) is fine, meaning 'It became a book.' This Quechua contrast is perfectly parallel to the contrast between (1) and (2) in English. Thus, we are dealing with a fact about derivational morphology in particular, not a fact about semantics in general.

Similar effects can be found in Mohawk, with a slight wrinkle. Mohawk has both adjectival roots like *hnir* 'hard' and nominal roots like *ahkwari* 'bear' ((12a)). Stative verbs can be derived from roots like *hnir* by suffixing the aspect marker *-u*, but *-u* cannot attach to noun roots ((12b)). Similarly inchoative and causative verbs can be derived from *hnir* but not from a noun root like *ahkwari* ((12c, d)).

(12) a. *Ohkwari thikv*
bear that
'That is a bear.'

a.′ **Hnir thikv*
hard that
'That is hard.'

b. **Thikv yo-hkwari(ht)-u.*
that NsO-beat-STAT
'That is a bear.'

b.′ *Thikv yo-hnir-u*
that NsO-hard-STAT
'That is hard.'

c. **Sak wa-ho-hkwari-(ha)' -ne'*
Sak FACT-MsO-bear-INCH-PC
'Sak became a bear.'

c.′ *wa'-o-hnir-ha-'*
FACT-NsO-hard-INCH-PC
'It became hard.'

d. **Sak wa-ho-hkwari-ht-e'.*
Sak FACT-MsO-bear-CAUS-PC
'It made Sak a bear.'

d.′ *Wa-ha-hnir-a-ht-e'.*
FACT-MsS-hard-CAUS-PC
'He made it hard.'

Again, this is not a simple semantic fact, because periphrastic constructions with predicate nominals are possible: one can say *Ohkwari wa-h-atu-'* (bear FACT-MsS-become-PC) 'he became a bear', for example. The interesting wrinkle in Mohawk is that inherently adjectival roots *must* become verbs by one or the other of these derivational processes. Thus, there is no simple predicate adjective form like (12a′) in Mohawk (Baker 1996b). Apart from this, we find the same asymmetry as in English and the other languages.

It is easy to find other languages that fit this basic pattern. Some others are illustrated briefly in (13).

(13) a. *lif* 'clean' (A) → *lif-* 'to become clean' — Mapuche
aling 'fever' (N) → *#aling* 'to get a fever' — (Smeets 1989)
(*not* 'to become a fever')

b. *pè̱rhè̱* 'flat' (A) → *pè̱rhé̱* 'to be/become flat' — Edo
èkítà 'dog' (N) → *(*e*)*kìtá* 'to be/become a dog' — (Stewart, p.c.)

c. *lakw* 'loose, untied' (A) → *la-7-kw* 'to get loose' — Salish
s-qaycw 'man' (N) → **qá-7-y'ecw* 'become a man' — (Davis 1999)

d. *hazur* 'ready' (A) → *hazur-un* 'to make ready' — Lezgian
k'walax 'job' (N) → *#k'walax-un* 'to work' — (Haspelmath 1993)

e. *suuri* 'big' (A) → *suure-nta-a* 'to make bigger' — Finnish
kirja 'book' (N) → **kirja-nta-a* 'to make into a book' — (Laalo, p.c.)

f. *lavan* 'white' (A) → *hilbin* 'to whiten' Hebrew
'*avaq* 'dust' (N) → #'*ibeq* 'to remove dust from'
(*not* 'to make into dust')

In contrast, languages in which predicate nouns can be fully verbalized are rare and those constructions that exist often have other peculiarities.[1] Thus, the derivational asymmetry in (6) is crosslinguistically robust. Indeed, it reveals a difference between inherently adjectival roots and inherently nominal roots even in languages like Nunggubuyu and Quechua, in which there is no obvious difference with respect to inflectional morphology and gross syntactic distribution. Thus, it is worthwhile to reexamine the basic theory of the lexical categories to see why this asymmetry should exist.

3. Sketch of a theory of categories

Perhaps the most basic fault of the standard generative system of lexical categories summarized in (7) is its arbitrariness. It is based upon features that are meaningless in themselves and that play little role in the syntactic theory as a whole. As a result, it does not matter much which features one assigns to a particular root in a particular language, because those feature values have no empirical or theoretical consequences. The system thus provides a way of labeling the lexical categories, but no substantive theory of their behavior. In terms of such an arbitrary system, the derivational asymmetry in (6) will inevitably look arbitrary as well.

In contrast to this system, Baker (to appear) develops a more substantive formal theory of the lexical categories. Its leading ideas are summarized in the table in (14).

(14) The typology of lexical categories

	Has a referential index	*No referential index*
θ-marks a specifier	***	Verbs
No specifier	Nouns	Adjectives

Like (7), this system is based on a small number of discrete features that are either present or absent. This system is also like (7) in that there is no special adjectival feature; rather adjectives emerge as a distinctive combination of the same features that are used to define nouns and verbs. However, instead of the meaningless features ±N and ±V, this system uses features that are designed to feed into the major principles of grammar. As a result, they have clear syntactic consequences. Rather than +V, I take the distinctive property of verbs to be that they assign a particular kind of theta role. More precisely, they are different from the other categories in that they take a subject, to which they typically assign a theta role (generally either agent or theme). In place of +N, I take the distinctive property of nouns to be that they bear a referential index. As such, they can be used to track sameness of reference through a discourse. All this is made possible by the fact that nouns inherently supply standards of sameness by which one can judge whether one entity counts as the same as another or not (Geach 1962; Gupta 1980). Adjectives are simply the lexical category that has neither of these special properties.

The principles of syntax that these features play into are summarized in (15).

(15) a. All the θ-roles of a head must be coindexed with a maximal projection immediately dominated by a projection of the head.
b. A referential index must be coindexed with something else in the structure (a theta-role, or a bound pronoun, or a trace of movement, or the subject of a predicate nominal).
c. No syntactic node can bear both a referential index and a theta role.

(15a) is basically one half of Chomsky's (1981) Theta Criterion; it says that theta roles must be assigned within the relevant structural configuration. Since the defining property of verbs is that they have a particular kind of theta role, (15a) applies to them in a distinctive way. (15b) is a generalization of the second half of the Theta Criterion, the part that says that all argument-type expressions must receive a theta role. (15b) is more general in that it says only that things with a referential index must be coindexed with something else. This condition can be satisfied by coindexing the phrase with a theta role in the argument structure of a nearby head, which is a formal representation of the theta-marking relation. But there are also certain other ways of fulfilling the requirement as well: a dislocated phrase can be coindexed with a resumptive pronoun or a trace, and a predicative phrase can be coindexed with the subject of the predication. Since nouns are the only lexical category that bears a referential index, (15b) applies to them in a distinctive way. Adjectives are special in that they will not be subject to (15a) or (15b), so they will have neither the special opportunities nor the special responsibilities of nouns or verbs. Finally, (15c) says that there can be no such thing as a noun-verb, a single category that has the distinctive properties of both nouns and verbs.[2] I see this as being related to observations in the logical literature to the effect that nothing could be simultaneously a predicate and a referring expression (see, for example, Geach 1962).

Consider first the claim that only verbs take a subject, which they typically assign a theta role. The fact that verbal projections always have subjects is well known; it is expressed, for example, in the Extended Projection Principle of Chomsky (1981). However, when adjectives and nominals are used predicatively, they seem to have a subject as well. The claim that underlies (14) is that this is an illusion: these nonverbal categories never take a subject *directly*. Rather, they must be connected to a subject by an additional functional category (or a verb). Following Bowers (1993), I call this functional category 'Pred'. Technically, the NP is not the subject of the noun or adjective itself, but rather it is the subject of a Pred Phrase that properly contains the noun or adjective. This is shown in (16c).

(16) a. [$_{VP}$ The keys [$_{V''}$ fall (to Rina)]]
b. *[$_{AP/NP}$ The child [$_{A'/N'}$ sick/genius (to Rina)]]
c. [$_{PredP}$ The child Pred [$_{AP/NP}$ sick/genius (to Rina)]]

In some languages, this difference in structure shows up overtly. For example, in the Nigerian language Edo verbs can take subjects directly ((17a)), but adjectives and nouns can only take a subject when they are preceded by a copular particle, *yé* or *rè*. I analyze these particles to be overt manifestations of the Pred shown in (16c) (Baker and Stewart 1996).

(17) a. *Òzó zùró̱.*
Ozo be.lazy(V)
'Ozo is lazy/foolish.'
b. *Òzó *(yé) zùrò̱zùrò̱.*
Ozo be foolish(A)
'Ozo is foolish.'
c. *Òzó *(rè) òkpìá.*
Ozo be man(N)
'Ozo is a man.'

In other languages — maybe the majority — this Pred element may be phonologically null. For example, in Hebrew present tense sentences there is no need for a copular element with an adjectival predication like (18b).

(18) a. *Ha-maftexot naflu (le-Rina).*
the-keys fell to Rina
'The (Rina's) keys fell.'

b. *Ha-bat* *xola* (**le-Rina*).
the-daughter sick (to Rina)
'The (*Rina's) daughter is sick.'

However, syntactic tests still reveal that (18b) is different in structure from (18a). For example, a dative expression that follows the predicate can be interpreted as the possessor of the subject if and only if it c-commands that subject (Borer and Grodzinsky 1986). With the verbal predicate in (18a), this possessive interpretation is possible, but with the adjectival predication in (18b) it is not. This confirms the structures in (16), in which a PP that is sister to the verbal predicate is in the same maximal phrase as the subject, but a PP that is sister to the adjective is not (the PP is in AP and the subject in PredP; see (16c)). Data like this show that the distinction between verbs and other categories in terms of their ability to take a subject is valid crosslinguistically, surface appearances not withstanding.

The defining property of nouns in this system is that they and their projections can bear a referential index. As such, they may be coindexed with other elements in the structure (and must be, given (15b)). The most obvious reflex of this is that noun phrases alone among the lexical categories can be the antecedents of pronouns in discourse, as shown in (19).

(19) a. Chris has a disease$_k$. It$_k$ (the disease) also made Pat miss work.
b. Chris is sick. #It$_k$ (sickness) also made Pat miss work.
c. I made John sing against his will. #It$_k$ (singing) also embarrasses Bill.

The first sentences in (19a) and (19b) are almost synonymous: to be sick is to have a disease. Nevertheless, a pronoun in the continuation can refer back to the disease in (19a), but not in (19b). (This sentence is interpretable only if *it* refers to the fact that Chris was sick — that is, to the first clause as a whole — not to the abstract property of being sick.) (19c) shows that VPs are like APs and not like NPs in this regard.

The theory can be extended to explain what is perhaps the most salient difference between nouns and the other lexical categories: the fact that NPs alone can appear in canonical argument positions, such as subject, direct object, and object of preposition.

(20) a. I admire a good joke/women that stand up for themselves/fine wine.
b. *I admire sincere.
c. *I admire sing.

It is unlikely that this is a simple semantic fact, because *admire* is a verb that places very few selectional restrictions on its object. Indeed, *sincere* and *sing* can be the objects of this verb, but only if they are first nominalized to *sincerity* and *singing*. This asymmetry among the categories follows if one says that the theta roles of a verb (or a preposition) are really a kind of anaphor, and like other anaphors they must be coindexed with an antecedent (Williams 1989). If so, then the mechanism of theta-role assignment is coindexing, and an expression must have an index to participate in it. Nouns and their projections can do so, but adjectives cannot:

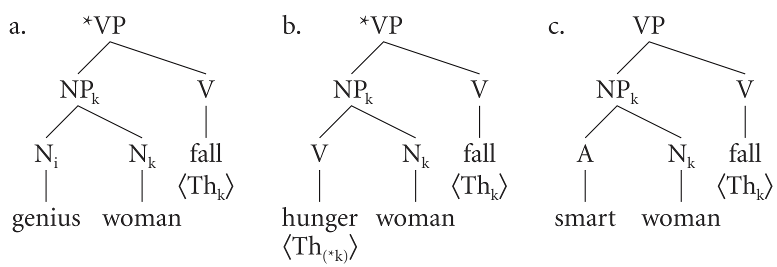
(21) a. John [$_{VP}$ admires women$_k$]
⟨Ag, Th$_k$⟩
b. *John [$_{VP}$ admires sincere]
⟨Ag, Th$_k$⟩

Technically, the representation in (21b) violates the Theta Criterion ((15a)), because *admire* has failed to assign its object theta role to anything.

Finally, the distinctive property of adjectives in this system is simply that they have neither a referential index nor the capacity to take a subject. Thus, neither of the conditions in (15a) and (15b) applies to them, and they naturally appear in environments where a verb would not be able to assign a theta role and a noun would not be able to receive one. One such environment that allows only adjectives is the attributive modifier position:

(22) a. a rich man, a shiny coin
b. *a wealth man, *a genius woman(vs. a man of wealth, boy-genius)
c. *A shine coin, *a hunger woman(vs. a coin that shines, a shining coin)

These examples have the structural representations in (23).

(23)


If a noun is adjoined as a modifier to another noun, as in (23a), it has its own distinct referential index. The NP as a whole can inherit one of these indexes, which will be licensed by coindexing with the theta role of the nearby verb. However, the second index is trapped inside the NP, unable to enter into any indexing relationship of its own. Therefore, the representation in (23a) violates (15b). On the other hand, if a verb is adjoined to a noun as a modifier, as in (23b), it has a thematic role that needs to be assigned — the role that would otherwise be assigned to the verb's subject. But there is no NP that is in the right structural configuration to receive this theta-role. The sister of *hunger* cannot be theta-marked, because it is not a complete maximal projection, and the NP as a whole cannot be theta-marked by *hunger* because it properly contains *hunger*. Thus, (23b) violates (15a). However, when an adjective adjoins to the noun as its modifier, as in (23c), it has neither a referential index nor a theta role to assign. Thus, the conditions in (15) do not apply, and the structure is allowed.

The last basic axiom of the system in (15) is particularly important for this chapter: it is the claim that no syntactic node can simultaneously have both a theta-role to assign and a referential index. In part, this is motivated by the simple fact that languages have no fourth lexical category, no "verb-noun". One can also see its effects in the fact that nouns do not take the same kinds of objects and other complements that verbs take. It is well known that nouns never take an NP object; rather their complements always have a preposition such as *of*.

(24) a. I bought a picture *(of) John.
b. I met the president *(of) the chess club.
c. I fixed the leg *(of) the chair.

This is consistent with the claim that the noun is not a theta-role assigner; rather the theta-role could come from the preposition in these examples (Rappaport 1983). Also, no underived noun in English requires a complement: the *of* phrase is always optional. In this way nouns contrast with many verbs and with a few adjectives which require the presence of a complement.

(25) a. I saw a picture/the president/the leg.
b. John is fond *(of Mary).

Other evidence that nouns are different from verbs and adjectives comes from the syntax of clauses. When a clausal complement follows a verb or an adjective the complementizer *that* can be omitted, and question words can be extracted from such clauses. In contrast, the complementizer following a noun is always obligatory, and extraction is impossible (Stowell 1981).

(26) a. I have the idea *(that) John will win.
??What did you hear the rumor that Mary saw?

b. It's likely (that) John will win.
What is it likely that Mary will buy?

c. I think (that) Mary will win.
What do you think that Mary will buy?

In these respects, the clauses associated with nouns behave like adjunct clauses associated with verbs, not like clauses that are complements to verbs:

(27) I cried *(when) Chris won the race.
??Which race did you cry when Chris won?

Thus, it seems that nouns are unable theta-mark phrases in the way that verbs and adjectives do. (15c) draws a crucial link between this and the fact that nouns are the only category that have a referential index.

4. Explaining the asymmetry

We are now in a position to explain the asymmetry that we observed back in (6) in terms of independently motivated principles. The basic empirical observation was that predicate adjectives often correspond derivationally to stative, inchoative, and causative verbs, but predicate nouns almost never do. In fact, the deduction is very simple. For an adjective to become a verb, all that is necessary is for a theta-role to be added to it. For a noun to become a verb, a theta-role would have to be added to it as well, because assigning a theta role to a subject position is what it is to be a verb, by definition. But nouns have a referential index, by definition. Therefore, simply adding a theta role to a noun would create a single syntactic node that has both a referential index and a theta role, in violation of principle (15c).

(28) a. Adjective + θ-role = Verb
b. Noun + θ-role = * by (15c).

Thus, adjectives can be transformed into verbs by the simple, monotonic process of adding a feature, but nouns cannot be. If a noun can be made into a verb at all, it must be by some other, less direct route.

This analysis presupposes that nouns used predicatively still have a referential index, just as other nouns do. This view is not entirely standard; researchers often tacitly assume that a nominal expression loses its referential nature when it is used predicatively. I clearly cannot take this position, however, because to not have a referential index would be tantamount to not being a nominal projection at all in my system. If predicate nominals had no index, then they should be categorically indistinguishable from adjectives. But this is not the case. For example, in English a singular count noun used predicatively still needs an overt determiner. In this respect, predicative NPs are identical to argument NPs and different from predicative APs or VPs.

(29) a. That is *(a) chair.
b. That is (*a) hard.
c. *(A) chair just arrived.

Similarly, predicate nominals in Edo require a different copular particle from predicative adjectives (see (17)). Therefore, the categorical distinction cannot be neutralized in that language either.

More direct evidence that predicate nominals bear a referential index comes from examples like (30a,b). These examples show that in some circumstances a pronoun can refer back to a predicate nominal rather than to the subject of the predication. (In many ordinary examples, it is hard to detect the difference.) This shows that the predicate nominal must have an index distinct from that of the subject. (30c) contrasts with (30b), showing that predicate adjectives do not constitute discourse referents, as expected.

(30) a. In the winter, Merlin is a wolf. It (the wolf) has a brown coat and sharp teeth.
In the summer, he is a bird. It (the bird) has red feathers.
b. We are a committee. It (the committee) meets every Friday . . .
c. We are industrious. #It (being industrious) helps John too.

Thus, predicate nominals still retain the property that prevents easy verbalization.

It would be too strong to say that a noun with a predicative meaning can never be derived into a verb under any circumstances. Nor does (28) imply this. Rather, the prediction is that a predicative noun could only be verbalized *if its referential index were somehow suppressed*. While this seems to be a marked process, it is sometimes possible. For example, *-ize* in English occasionally attaches to noun roots, rather than adjective roots, as in (31b).

(31) a. The solution became a crystal. It was two inches long . . .
b. The solution crystallized. #It (the crystal) was two inches long . . .

Similarly, there are a few verbs in English that are zero-derived from nouns that nevertheless have a relatively transparent causative meaning: *to knight*, *to* *beggar*, *to film* (thanks to an anonymous reviewer for these examples). But even when such examples are possible, there is still a clear difference between the derived verb and a comparable periphrastic construction such as (31a). In (31a), one can go on to refer to the crystal that the solution has become, but this is not possible in (31b). In the periphrastic construction, the verb *become* assigns the theta role to the subject, and the predicate noun is a distinct syntactic node. Thus, it can bear a referential index, providing an antecedent for a pronoun. However, in (31b) there is only a single syntactic node. It must assign a theta role; therefore any referential index must be suppressed, or (15c) would be violated. Similar contrasts are found in other languages. For example, (32) shows that when a predicate noun and a copular verb are separate words in Kiowa, the noun has its literal meaning. The two can also merge into a single word, as in (32b). However, the noun predictably loses its literal, referential meaning, and is interpreted more like an adjective.

(32) a. *K'yą:hį 0-dɔ* (Watkins 1984: 227)
man 3s-be
'He's/it's a man.'
b. . . . *kú:tò-gɔ-àl — á-k'yą:hį+ dɔ:-mè:-dé-ę.*
bird-INV-too 3p-man-be-HSY-NOM-when
'at that time when birds too were manlike.'

Example (33) shows a similar minimal pair from Mapuche.

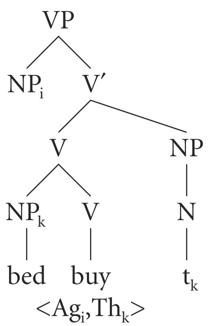
(33) a. *Nge-la-y chadi.* (Smeets 1989: 159–60)
be-NEG-IND-3 salt
'There is no salt.'
b. *Chadi-nge-la-y*
salt-be-NEG-IND-3
'It is not salty'

Matters are complicated somewhat by the fact that some languages allow noun incorporation in which the incorporated noun is still referential. (34) is a typical example of this from Mohawk (Baker 1996a):

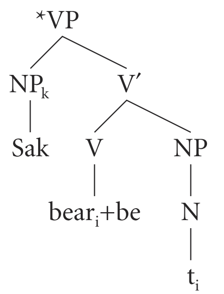
(34) *Wa'-ke-nakt-a-hninu-'. Í-k-ehr-e' v-ye-nuhwe'-ne'.*
FACT-1sS-bed-0-buy-PUNC 0-1sS-think-IMPF FUT-FsS-like-PUNC
'I bought a bed. I think she will like it (the bed).'

Crucially, in cases like this, the incorporation of a noun into the verb does not result in the suppression of that noun's referential index. On the contrary, a pronoun in a subsequent sentence can perfectly well refer back to the incorporated noun. I assume that this is compatible with principle (15c) because incorporation in Mohawk is a syntactic process. Therefore, the noun and the verb still count as distinct syntactic nodes, one of which has the referential index and the other the theta role, as shown in (35a).

(35) a. Incorporation into lexical V



b. Incorporation into copular V



The question is why can't a predicate noun be incorporated syntactically into a verbal node meaning 'be', 'become', or 'cause', and still preserve its referential index in the same way? If this were possible, there should be no meaning contrast in (32) or (33). Even Mohawk, which productively allows the incorporation of referential nouns into verbs, does not allow predicate nouns to incorporate into stative, inchoative, or causative verbal elements. This was shown in (12), one example of which is repeated as (36).

(36) **Sak wa-ho-hkwari-(ha)'-ne'.*
Sak FACT-MsO-bear-become-PUNC
'Sak became a bear.'

I suggest that the reason for this contrast comes from the fact that the verb root *hninu* 'buy' in (35) has lexical content distinct from the incorporated noun root. This is crucial for it to count as a distinct node for purposes of (15c) after incorporation. In contrast, predicates meaning "be", "become", or "cause" have little inherent meaning apart from the meaning of the noun. In this case, incorporation has the effect of fusing the noun and the semantically degenerate verbal operator into one node, to which (15c) applies. This distinction is represented graphically in (35b), which is a representation for (36). The extra principle is stated in (37).

(37) The target of incorporation counts as a distinct node if and only if it has its own lexical (semantic) content.

While I hope that the basic distinction I have in mind is relatively clear, I will leave open for further investigation exactly what "lexical content" means in (37). In some cases, phonological criteria may be relevant in addition to lexical semantic properties. Davis (1999) contrasts two inchoative processes in St'át'imcets Salish. One, expressed by the infixation of a glottal stop, applies to adjectival roots but not to nominal ones, in accordance with (6). This was illustrated in (13c) above. However, there is another inchoative morpheme that attaches productively to nouns, as shown in (38).

(38) a. *s-k'úk'wm'it*
'child' (N)
b. s-k'uk'mi7t-**wíl'c**
'to become a child' (V)

What is striking is the fact that this second inchoative marker is phonologically much heavier than the first one. In fact, it conforms to the CVC(C) template that is characteristic of lexical roots in St'át'imcets. It apparently counts as a distinct expression from the noun root in a phonological sense, so that principle (15c) does not rule the formation out.

5. Conclusion

In this chapter, I have shown that it is easier for verbs to be derived from predicate adjectives than from predicate nouns crosslinguistically. I have also shown how this asymmetry can be derived from an independently motivated theory of the nature of the lexical categories themselves.

Notes

1. For example, the copular suffixes -*u* 'be' and -*nngi* 'become' attach to all manners of nouns in Greenlandic, with semantically transparent predicative meanings. However the word order and case marking of these structures are unique within Greenlandic grammar, suggesting that there is more to their syntax than meets the eye (Sadock 1985). Some other languages allow verbal agreement morphology to attach directly to predicate nouns, including Abkhaz and Telugu. These languages seem not to have true denominal verbalization, but rather a prosodically weak copular particle attaches to a preceding predicate

nominal as a simple instance of encliticization. See also the discussion of (38) below for another type of apparent counterexample.

2. Many languages have what is traditionally called a 'verbal noun', but these are usually nouns that are derived from verbs, or perhaps an ambivalent category that can be used as either a noun or a verb. What one does not find is a category that has the properties of both nouns and verbs simultaneously.

One difference between (14) and (7) is that (14) does not include adpositions. In Baker (to appear), I argue that adpositions are really part of the functional category system. Derivational morphology supports this: there are no derivational processes that create adpositions, nor are there any that create other categories out of adpositions. This strongly suggests that adpositions are not part of the same system. Left for future research is the question of how various participial forms fit into this theory.

References

Baker, Mark. 1996a. *The Polysynthesis Parameter*. New York: Oxford University Press.

——1996b. "Unaccusativity and the Adjective/Verb Distinction: English and Mohawk Evidence". *Eastern States Conference on Linguistics.* Ithaca, New York: Cornell University Linguistics Department.

——To appear. *On the Differences among the Lexical Categories.* Cambridge: Cambridge University Press.

——and O.T. Stewart. 1996. "Unaccusativity and the adjective/verb distinction: Edo evidence". *North East Linguistics Society 27.* Amerst, Mass.: Graduate Student Linguistics Association.

Borer, Hagit and Yosef Grodzinsky. 1986. "Syntactic cliticization and lexical cliticization: the case of Hebrew dative clitics". *Syntax and Semantics 19: The Syntax of Pronominal Clitics* ed. by Hagit Borer, 175–217. San Diego: Academic Press.

Bowers, John. 1993. "The Syntax of Predication". *Linguistic Inquiry* 24.591–656.

Chomsky, Noam. 1970. "Remarks on Nominalization". *Readings in English Transformational Grammar* ed. by R. Jacobs and Peter Rosenbaum, 184–221. Waltham, Mass.: Ginn.

Chomsky, Noam. 1981. *Lectures on Government and Binding.* Dordrecht: Foris.

Cole, Peter. 1985. *Imbabura Quechua.* London: Croom Helm.

Davis, Henry. 1999. "On Nouns and Nominalization in Salish". Ms., University of British Columbia.

Geach, Peter. 1962. *Reference and Generality.* Ithaca, New York: Cornell University Press.

Gupta, Anil. 1980. *The Logic of Common Nouns.* New Haven: Yale University Press.

Haspelmath, Martin. 1993. *A Grammar of Lezgian.* Berlin: Mouton de Gruyter.

Heath, Jeffrey. 1984. *Functional Grammar of Nunggubuyu.* Canberra: Australian Institute of Aboriginal Studies.

Rappaport, Malka. 1983. "On the Nature of Derived Nominals". *Papers in Lexical Functional Grammar* ed. by Lori Levin and Malka Rappaport and Anne Zaenen. Bloomington, Ind.: Indiana University Linguistics Club.

Sadock, Jerrold. 1985. "Autolexical Syntax: A Proposal for the Treatment of Noun Incorporation and Similar Phenomena". *Natural Language and Linguistic Theory* 3.379–440.
Smeets, Ineke. 1989. *A Mapuche Grammar*. Ph.D. dissertation, University of Leidin.
Stowell, Timothy. 1981. *Origins of Phrase Structure*. Ph.D. dissertation, MIT.
Watkins, Laurel. 1984. *A Grammar of Kiowa*. Lincoln, Neb.: University of Nebraska Press.
Williams, Edwin. 1989. "The Anaphoric Nature of Theta-roles". *Linguistic Inquiry* 20. 425–56.

Chapter 3

What you can do with derivational morphology

Laurie Bauer
Victoria University of Wellington

1. Introduction

For some linguists (for example, Kilani-Schoch 1988: 73; Lockwood 1993: 71–89), inflection appears to be defined in terms of certain categories such as number, tense, person, etc. As far as I know, nobody has attempted to define derivation in terms of the categories involved — even though we might agree that some types of derivation are more canonical than others. This raises the question of whether there are any categories which we can view as derivational in the same way that tense is seen as being inflectional (not that I wish to be thought of as endorsing that approach to the definition of inflection and derivation).

At one end of the scale of things that are marked by derivational morphology, we know this cannot be true. There are languages which encode in derivational markers information which is highly idiosyncratic but nonetheless culturally important. If it remains true that nobody has found a language in which a derivational affix means "grasp NOUN in the left hand and shake vigorously while standing on the right foot in a 2.5 gallon galvanized pail of corn-meal-mush" (as predicted by Rose 1973: 516), it is nevertheless true that Polish is reported to have an affix which means "type of vodka made from NOUN" (Carstairs-McCarthy 1992: 187).

As well as looking for core derivational meanings, this chapter aims to look for categories which are common in one geographical area but rare outside that area, and categories which frequently tend to be equated in terms of their overt marking.

In order to answer these questions, a language sample was devised according to the principles set out by Dryer (1992). Dryer establishes six large geographical areas, and within those areas distinguishes a number of language families. Dryer himself works with a very large sample of languages, but my sample is comparatively small. For each of Dryer's six geographical areas, I have chosen seven languages, each from a different language family as listed by Dryer (1992: 133–5). The choice of languages is determined by the availability of descriptions to me, and cannot a priori be assumed to be representative of languages a whole, though it should provide more robust generalizations than any sample of "familiar" languages. The languages appearing in my sample, the language family that each belongs to, and the source of my material on that language is provided in Table 1.

The usual disclaimers about results from such sources, of course, apply: brief grammatical descriptions inevitably give brief descriptions of derivation; some grammarians consider derivational morphology as something of a side issue in grammatical description (particularly if they are attempting to provide a concise description), and thus give it little attention; it is frequently unclear

Table 1. Languages in data-base

Language Family	Language	Source
Africa		
Kwa	Ewe	Westermann 1930
Semitic	Hebrew	Glinert 1989
Saharan	Kanuri	Lukas 1937
Central Khoisan	Nama	Hagman 1977
Bantoid	Tswana	Cole 1955
Nilotic	Turkana	Dimmendaal 1983
Defoid	Yoruba	Rowlands 1969
Eurasia		
NW Caucasian	Abkhaz	Hewitt 1979
Basque	Basque	Saltarelli 1988
Chukchee-Kamchatkan	Chukchee	Spencer 1999
Germanic	Danish	Allan *et al.* 1995
Finnic	Finnish	Karlsson 1983; Sulkala and Karjalainen 1992
Kartvelian	Georgian	Hewitt 1995
Dravidian	Tamil	Asher 1982
South East Asia and Oceania		
Chinese	Cantonese	Matthews and Yip 1994
Khmer	Cambodian	Jacob 1968; Ehrman 1972
Bahnaric	Chrau	Thomas 1971
Central Eastern Malayo-Polynesian	Maori	W. Bauer 1993
Kam-Tai	Thai	Hudak 1987
Sundic	Toba-Batak	Nababan 1981
Viet-Muong	Vietnamese	Thompson 1965

to the reader of a description (possibly because the categories do not easily apply to the language in question) what is inflection and what is derivation; writers of descriptions (particularly descriptions of lesser-known languages) may not have all the information to answer questions which can be answered for other languages — accordingly descriptions are not strictly comparable. It is also worth noting that as a reader of the grammars concerned I might have missed some crucial evidence. However, within the constraints provided by the experimental method, some provisional conclusions can be drawn.

2. First approach: major categories of derivation

Although there were some languages which had derivational means of producing minor word-classes (e.g. Georgian derives postpositions from inflected

Table 1. (*Cont.*)

Language family	Language	Source
Australia-New Guinea		
Pama-Nyungan	Arabana-Wangkangurru	Hercus 1994
Eastern New Guinea Highlands	Kobon	Davies 1981
Mangarayi	Mangarayi	Merlan 1982
Maran	Mara	Heath 1981
Madang	Siroi	Wells 1979
Adelbert Ranges	Waskia	Ross and Paol 1978
Lower Sepik	Yimas	Foley 1991
North America		
Muskogean	Koasati	Kimball 1985
Tanoan	Kiowa	Watkins 1984
Takelma	Takelma	Sapir 1912
Numic	Tümpisa Shoshone	Dayley 1989
Iroquoian	Tuscarora	Williams 1974
Mayan	Tzutujil	Dayley 1985
Eskimo-Aleut	West Greenlandic	Fortescue 1984
South America		
Cayuvava	Cayuvava	Key 1967
Tupi-Guarani	Guarani	Gregores and Suárez 1967
Carib	Hixkaryana	Derbyshire 1979
Quechua	Imbabura Quechua	Cole 1982
Mura	Pirahã	Everett 1986
Arawan	Paumari	Chapman and Derbyshire 1991
Chapakuran	Wari'	Everett and Kern 1997

nouns and verbs), these were extremely rare. In what follows I shall consider only the most common ways of producing the major word-classes.

2.1 Derivation producing nouns

There are so many meanings that occur once only in the sample that it is difficult to be sure which are really rare. Among the rarest meanings for derivational markers in the sample are “length of a geophysical feature” (Chukchee), “payment for N” (Hixkaryana) and “previously owned” (West Greenlandic). However, the meaning “payment for” is also found in English in words like *postage*, so it is questionable how rare it really is. The commonest meanings are set out in Table 2, in order of their frequency in the 42 languages of the data-set. All meanings which recur more than 10/42 times are included in Table 2, with the number of languages in which they occur.

There are no implicational scales observable here. There are languages which appear to allow abstract nouns derived from adjectives without allowing abstract nouns derived from verbs (though the latter could be counted as inflectional, it must be recalled): Nama is one such. There are languages which appear to allow the creation of instrument nouns but not the creation of agent nouns (Chukchee is one such). While in this data sample it is true that no language has an augmentative that does not also have a diminutive, we know that this is a failure of the data, and that larger samples would show that the generalization does not hold (in the research which led to L. Bauer (1997), I discovered Ulithian (Sohn and Bender 1973) which has an apparent augmentative with no corresponding diminutive).

It might be expected that even if individual languages might break with expected patterns, there would nevertheless be a hierarchy of derivatives. Some hierarchy of thematic roles such as agent is more salient than instrument is more salient than patient is more salient than locative (Ryder 1999: 284–91) might be expected for verb-based nouns, for example. Now it is true that

Table 2. Most frequent nominal derivational categories

Abstract noun < verb	32
Personal or agentive noun < verb	24
Diminutive noun < noun	15
Abstract noun < adjective	14
Abstract noun < noun	12
Device or instrumental noun < verb	12

I find more agentive nouns derived from verbs than corresponding patient nouns (I find no patient nouns at all in my sample). But in my sample the hierarchy is agent is more frequent than instrument is more frequent than location, with patient nowhere and other thematic roles not easily identifiable (it is possible that some beneficiaries are included in the agents, for instance). Some thematic roles are marked on verbs rather than on nouns, and they are mentioned below.

Languages from Australia and New Guinea had very few markers deriving nouns except abstract nouns from verbs, though two of the Australian languages had markers for necronymics ("the person who died at N" where N is a toponym, used to avoid mentioning the name of a dead person).

2.2 Derivation producing verbs

The caveat on deciding what is really rare given above holds here as well. Rare categories in this class include "have a pain in N" (Tzutujil), "accidentally suffer from N" (Toba-Batak) and "pretend to V" (Siroi). The frequent categories here are apparently a lot less frequent than those discussed in Section 2.1, but this may be misleading. The principal reason for marking verbs derivationally is to modify transitivity, by creating transitives and intransitives, by creating causatives, by creating passives or antipassives, etc. In many languages, this is a matter of inflection rather than derivation, and in other languages (like causation/transitivity in English) it is simply not marked at all. The numbers given in Table 3 thus underestimate the amount of transitivity-modification that is carried out in languages. Because of the relatively low numbers, I have included categories which came up only 9/42 times in Table 3.

Again there are no implicational scales apparent here, although the relative frequency of causative marking tends to make it the first to show up in any language that marks such things by derivation. In the case of verbs (as opposed to the case with nouns) there is a relatively large set of categories which, while

Table 3. Most frequent verbal derivational categories

Causative < verb	21
Transitive < verb	12
Intensive < verb	11
Intransitive < verb (excluding passive)	9
Verb < noun	9

too infrequent to appear in Table 3, nevertheless appear frequently enough to be worthy of comment: inchoatives, reciprocals, reflexives, benefactives, for instance. In terms of the frequency of marking thematic roles in verbs, benefactive is more frequent than comitative is more frequent than allative is more frequent than ablative, but the numbers are quite low, with only three allative verbs and one ablative verb in the sample. Note the disjunction between roles marked in nouns and those marked in verbs.

2.3 Derivation producing adverbs and adjectives

The rare categories here include "N-sized" (Georgian) and Adv < Pronoun (Takelma), with the previous caveat still in operation. The common categories are largely — but perhaps not entirely — as one would expect. They are presented in Table 4.

The figures in Table 4 are perhaps particularly surprising given that I noted no creation of adverbs from any language in the samples from the regions of South East Asia and Oceania or North America.

3. Multifunctional categories

In any language there are likely to be categories which, though semantically distinguishable, are marked morphologically in the same way. In many instances it is an open question whether this is the result of polysemous affixes or the result of morphological homonymy (i.e. syncretism) between two different categories. Any arguments attempting to resolve such dilemmas have to be made in the framework of individual languages (see e.g. Plag 1998 for a study of the affix *-ize* in English, in which it is argued that the affix is polysemous rather than homonymous). In the context of this chapter, it is not possible to do more than point to some potential sites for multifunctionality by

Table 4. Most frequent adjectival and adverbial derivational categories

Adverb < noun	13
Adjective < verb	12
Adjective < noun	11
Adverb < adjective	9
Having N < noun	9
Attenuative < adjective (cf. English *-ish*)	9

Table 5. Agent and instrument in the database

No. of lgs marking agents < V	24
No. of lgs marking instruments < V	12
No. of lgs marking both	10
No. of lgs with the same markers	3
No. of lgs with distinct markers	7

showing which semantic categories tend to get marked in the same way. Even that may not be particularly significant. If two particular categories are marked homophonously in just one language, this might be random chance. The more languages that show the same pattern of marking, the more likely it seems that we are dealing with polysemy. But it is not clear what conclusion can or should be drawn on the basis of repeated but uncommon patterns.

3.1 Agent and instrument

Given the discussion in Dressler (1986) of the extension of agents to include instruments in a number of European languages, it would seem that these two categories are precisely of the type that we would expect to find marked with the same affix in a number of languages. As in all of the cases I considered here, I asked whether there was, in any given language, at least one marker which was used both for agents and instruments. Unfortunately, the results are not necessarily as clear as might be desired. From my own knowledge, I am aware that Danish does allow the *-er* marker for both categories, but this is not clear from the discussion in Allan *et al.* (1995). There may be other languages where the same thing holds true: in Danish the marker *-er* is prototypically a marker used to designate humans, and this prototypicality may well have hidden other potential uses from the grammarians' sight. Bearing these caveats in mind, the results from my data-base are given in Table 5.

The three languages with homophonous markers come from Africa and South East Asia. Note that while this does not deny the kinds of developments noted by Dressler (1986), it does suggest that they are not as widespread as Dressler's paper may have seemed to imply.

3.2 Instrument and locative

The same article, Dressler (1986), notes that in a language like English, the *-er* affix is found marking both instrumentals and locatives (such as *diner* "small restaurant, dining car”). Perhaps surprisingly, it turns out that instrumentals and locatives cooccur quite frequently, as shown in Table 6.

These figures may not look particularly impressive, but we should add Turkana which is described as having an “instrument–locative” marker (although the meaning is not always clearly derived from this complex), and we should also note that in Shoshone (Dayley 1989: 237–8), which is one of the languages given as having distinct markers in Table 6, the marker for a locative is *-ttüah* and the marker for the agent is *-ttü*(*a*).

Table 6. Instrument and locative in the database

No. of lgs marking instruments < V	12
No. of lgs marking locatives < V	8
No. of lgs marking both	7
No. of lgs with the same markers	3
No. of lgs with distinct markers	4

3.3 Reciprocal and reflexive

The difficulty in providing information about reciprocals and reflexives from this survey is that so many languages deal with such matters inflectionally, and I will not necessarily have collected the relevant information for such languages. Other languages mark these categories non-morphologically. Wari’ deals with both categories through clitics rather than through derivation (though this is included in Table 7). Accordingly, the figures given in Table 7 are likely to be a gross under-representation of both the number of languages that show the relevant categories and the number of languages in which the categories are syncretized.

3.4 Action and location

There are a number of languages which have identical or very similar markers for abstract nominals and locatives. The (not very impressive) figures for

Table 7. Reciprocal and reflexive in the database

No. of lgs marking reciprocals < V	8
No. of lgs marking reflexives < V	8
No. of lgs marking both	5
No. of lgs with the same markers	3
No. of lgs with distinct markers	2

Table 8. Abstract nominals and locatives in the database

No. of lgs marking abstract nominals < V	32
No. of lgs marking locatives < V	8
No. of lgs marking both	7
No. of lgs with the same markers	1
No. of lgs with distinct markers	6

identity are given in Table 8, but this hides the fact that in Abkhaz the appropriate markers are *-tra* and *-ra*, and that in Toba-Batak the appropriate markers are circumfixes of the form *par–an* and *par–On*.

3.5 Diminutive and female

One of the standard extensions of a diminutive marker is as a gender marker, as with English *-ette* (see Jurafsky 1993). This is reflected in the data-base, although the number of relevant languages is low.

Note that although eight languages in the data-base have derivational markers meaning 'female', only two have derivational markers meaning 'male', and only one language has both types.

Table 9. Diminutive and female in the database

No. of lgs marking diminutives < N	14
No. of lgs marking female < N	8
No. of lgs marking both	3
No. of lgs with the same markers	2
No. of lgs with distinct markers	1

3.6 Wider syncretisms

I am aware of two publications which consider rather more categories which may be syncretized across languages (Voskuil 1996; Enger and Nesset 1999). Although the same marker was frequently applied to more than two distinguishable semantic categories in the material in my data-base, there was always an obvious semantic generalization (e.g. the prefix *par-* in Toba Batak can be added to nouns, intransitive or transitive verbs, but always indicates a person with a connection to the base; the suffix *-ala* in Waskia can be used to derive adverbs either from nouns or from adjectives). There were no surprising cases of repeated multiple syncretism.

The one possible exception — which I did not record systematically — concerns the meanings of reduplication. In the data-base, reduplication can mean any of intensity, diminished intensity, plurality, repetitiveness, frequentativeness, iteration, transitivity, intransitivity, causation, distributiveness, emphasis, agentivity, adverbialization, adjectivalization, nominalization, verbalization, pretence, continuation, or characterization, and frequently more than one of these in any given language. I have not attempted to deal with such cases here, since much of this is discussed by Botha (1988).

4. Conclusion

My small sample of languages has given some broad hints as to what the major derivational categories are and where multifunctionality may be expected. The sample is too small to expect the rarer cases of multifunctionality, which may be the most interesting ones, to emerge. While it appears from my data that some of the categories are linked to particular geographical areas, rather more data would be required to confirm these tendencies. Even in this sample, the failure of firm implicational scales to emerge is striking, although some interesting patterns emerge in the form of tendencies.

References

Allan, Robin, Philip Holmes and Tom Lundskær-Nielsen 1995. *Danish: a comprehensive grammar*. London and New York: Routledge.

Asher, R. E. 1982. *Tamil*. Amsterdam: North Holland.

Bauer, Laurie 1997. "Evaluative morphology: in search of universals." *Studies in Language* 21: 533–75.

Bauer, Winifred 1993. *Maori*. London and New York: Routledge.

Botha, R. P. 1988. *Form and Meaning in Word Formation: a study of Afrikaans reduplication*. Cambridge: Cambridge University Press.

Carstairs-McCarthy, Andrew 1992. *Current Morphology*. London and New York: Routledge.

Chapman, S. and D. C. Derbyshire 1991. "Paumarí." *Handbook of Amazonian Languages*, eds D. C. Derbyshire and G. K. Pullum, 3.161–352. Berlin, etc.: Mouton de Gruyter.

Cole, D. T. 1955. *An Introduction to Tswana Grammar*. Cape Town: Longman.

Cole, Peter 1982. *Imbabura Quechua*. Amsterdam: North Holland.

Davies, John 1981. *Kobon*. Amsterdam: North Holland.

Dayley, Jon P. 1985. *Tzutujil Grammar*. Berkeley, etc.: University of California Press.

Dayley, Jon P. 1989. *Tümpisa Panamint Shoshone Grammar*. Berkeley, etc.: University of California Press.

Derbyshire, Desmond C. 1979. *Hixkaryana*. Amsterdam: North Holland.

Dimmendaal, Gerrit J. 1983. *The Turkana Language*. Dordrecht: Foris.

Dressler, Wolfgang U. 1986. "Explanation in natural morphology, illustrated with comparative and agent-noun formation." *Linguistics* 24: 519–48.

Dryer, Matthew S. 1992. "The Greenbergian word order correlations." *Language* 68.81–138.

Ehrman, Madeline E. 1972. *Contemporary Cambodian: Grammatical Sketch*. Washington DC: Dept of State.

Enger, Hans-Olav and Tore Nesset 1999. "The value of cognitive grammar in typological studies: the case of Norwegian and Russian passive, middle and reflexive." *Nordic Journal of Linguistics* 22: 27–60.

Everett, Daniel 1986. "Pirahã." *Handbook of Amazonian Languages*, eds D. C. Derbyshire and G. K. Pullum, 1. 200–325, Berlin, etc.: Mouton de Gruyter.

Everett, Daniel L. and Barbara Kern 1997. *Wari'*. London and New York: Routledge.

Foley, William A. 1991. *The Yimas Language of New Guinea*. Stanford: Stanford University Press.

Fortescue, Michael 1984. *West Greenlandic*. London, etc.: Croom Helm.

Glinert, Lewis 1989. *The Grammar of Modern Hebrew*. Cambridge, etc.: Cambridge University Press.

Gregores, E. and J. A. Suárez 1967. *A Description of Colloquial Guarani*. The Hague and Paris: Mouton.

Hagman, Roy Stephen 1977. *Nama Hottentot Grammar*. Bloomington: Research Centre for Language and Semiotic Studies, Indiana University.

Heath, Jeffrey 1981. *Basic Materials in Mara: Grammar, Texts and Dictionary*. Canberra, Pacific Linguistics Series C, No. 60.

Hercus, Luise A. 1994. *A Grammar of the Arabana-Wangkangurru Language, Lake Eyre Basin, South Australia*. Canberra, Pacific Linguistics, Series C, No 128.

Hewitt, B. G. 1979. *Abkhaz*. Amsterdam: North Holland.

——1995. *Georgian*. Amsterdam and Philadelphia: Benjamins.

Hudak, Thomas John 1987. "Thai." *The Major Languages of South-East Asia*, ed. B. Comrie, 29–47. London: Routledge.

Jacob, Judith M. 1968. *Introduction to Cambodian*. London, etc.: Oxford University Press.

Jurafsky, Dan 1993. "Universals in the semantics of the diminutive." *Berkeley Linguistic Society* 19: 423–36.

Karlsson, Fred 1983. *Finnish Grammar*. Porvoo, etc.: Werner Söderström.

Key, Harold H. 1967. *Morphology of Cayuvava*. The Hague and Paris: Mouton.

Kilani-Schoch, Marianne 1988. *Introduction à la morphologie naturelle*. Berne, etc.: Peter Lang.

Kimball, Geoffrey David 1985. *A Descriptive Grammar of Koasati*. Unpublished Ph.D. dissertation, University of Tulane.

Lockwood, David G. 1993. *Morphological Analysis and Description*. Tokyo, etc.: International Language Sciences Publishers.

Lukas, Johannes 1937. *A Study of the Kanuri Language*. Oxford University Press. Reprinted 1967 by International African Institute.

Matthews, Stephen and Virginia Yip 1994. *Cantonese: a comprehensive grammar*. London and New York: Routledge.

Merlan, Francesca 1982. *Mangarayi*. Amsterdam: North Holland.

Nababan, P. W. J. 1981. *A Grammar of Toba-Batak*. Canberra, Pacific Linguistics Series D No 37.

Plag, I. 1998. "The polysemy of *-ize* derivatives. The role of semantics in word-formation." *Yearbook of Morphology 1997*, eds G. Booij and J. van Marle, 219–42. Dordrecht, etc.: Kluwer.

Rose, J. H. 1973. "Principled limitations on productivity in denominal verbs." *Foundations of Language* 10.509–26.

Ross, Malcolm and John Natu Paol 1978. *A Waskia Grammar Sketch and Vocabulary*. Canberra, Pacific Linguistics Series B No. 56.

Rowlands, E. C. 1969. *Yoruba*. London: Hodder and Stoughton.

Ryder, Mary Ellen 1999. "*Bankers* and *blue-chippers*: an account of *-er* formations in Present-day English." *English Language and Linguistics* 3.269–97.

Saltarelli, Mario 1988. *Basque*. London, etc.: Croom Helm.

Sapir, Edward 1912. "Takelma". *The Collected Works of Edward Sapir*, ed. by Victor Golla, vol VIII, 1990, Berlin and New York: Mouton de Gruyter.

Sohn, Ho-Min and B. W. Bender 1973. *A Ulithian Grammar*. Canberra: Australian National University.

Spencer, Andrew 1999. Chukchee. http: //privatewww.essex.ac.uk/~spena/Chukchee

Sulkala, Helena and Merja Karjalainen 1992. *Finnish*. London and New York: Routledge.

Thomas, David D. 1971. *Chrau Grammar*. Honolulu: University of Hawaii Press.

Thompson, Laurence C. 1965. *A Vietnamese Grammar*. Seattle: University of Washington Press.

Voskuil, Jan 1996. *Comparative Morphology: verb taxonomy in Indonesian, Tagalog and Dutch*. The Hague: Holland Academic Graphics.

Watkins, Laurel J. 1984. *A Grammar of Kiowa*. Lincoln and London: University of Nebraska Press.

Wells, Margaret A. 1979. *Siroi Grammar*. Canberra, Pacific Linguistics Series B No. 51.

Westermann, Diedrich 1930. *A Study of the Ewe Language*. London, etc.: Oxford University Press.

Williams, Marianne Mithun 1974. *A Grammar of Tuscarora*. Unpublished Ph.D. dissertation, Yale University, New Haven, Conn.

Chapter 4

How stems and affixes interact[1]

Stem alternants as morphological signata

Andrew Carstairs-McCarthy
University of Canterbury, Christchurch

1. The problem: affix-stem interaction

In inflectional morphology, how do stem alternations interact with affixal allomorphy? One point of view is that there is no fundamental theoretical difference between these modes of inflectional expression. This may be because affixation is merely one kind of phonological change that can be effected by word formation rules (Anderson 1992), or because stem change can be analysed as a kind of affixation involving distinct autosegmental tiers (Lieber 1992), or because stem alternation is largely a matter of affixally triggered 'adjustment' (Halle and Marantz 1993). Against this view, it has been argued that certain generalisations about how inflection class systems work depend on drawing a fundamental distinction between affixal inflection and stem alternation (Carstairs 1988a; Carstairs-McCarthy 1994).

This argument would be reinforced if it could be shown that stem alternations and affixal allomorphy interact in ways that support a fundamental distinction between them. The purpose of this chapter is to illustrate how one might set about investigating this. First I summarise a set of recent claims that are relevant to stem-affix interaction; then I outline various patterns of affixal allomorphy and stem alternation, distinguishing those that are consistent with these claims from those that are inconsistent.

This chapter is programmatic in nature, so the crucial issue of whether the patterns that exist in actual languages are all consistent with the claims is largely a matter for future investigation; but some pertinent facts about Polish, German, Italian and Warlpiri are mentioned. In order to visualise the inflectional systems outlined, readers may find it helpful to use pencil and paper, settting out stem alternants and accompanying affixes approriately in rows and columns.

2. Relevant claims

The first two claims have to do with the morphological sign (in the Saussurean sense) and its two components, the signans and the signatum, defined more precisely for present purposes as follows: If, under some condition(s) C (possibly null), the morphological item (stem alternant or affix) A is always accompanied on some linguistic level or levels by characteristic B (that is, if A implies the presence of B), then, subject to C, A is a *signans* of B and B is a *signatum* of A (Carstairs-McCarthy 2001). The claims are:

(1) Signata need not be extralinguistic, and the signatum of a morphological sign need not even be extramorphological; moreover, a morphological signatum may stand in either a paradigmatic or a syntagmatic relationship to its signans (Lass 1990; Carstairs-McCarthy 1994).
(2) One sign cannot have signata that are incompatible alternatives, or exclusive disjuncts (Carstairs-McCarthy 1998a; 1998b).

Claim (1) permits the signata of an inflectional affix to include, on the paradigmatic dimension, the inflection class to which lexemes that display this affix belong — provided that, in conformity with (2), there is only one such class. For example, the Plural suffix *-e* on German nouns such as *Tag* 'day', *Gast* 'guest' and *Hand* 'hand' can be analysed as a signans of not merely 'Plural' but also 'Member of affixal inflection class with suffixes -(*e*)*s* in the Genitive Singular (unless Feminine) and *-e* in the non-Dative Plural', because this *-e* is found in no other class. On the other hand, the Plural suffix -(*e*)*n* on nouns such as *Bär* 'bear', *Staat* 'state' and *Name* 'name' is a signans of 'Plural' only, because this suffix is found in more than one affixal inflection class, as is demonstrated by the contrasting Genitive Singular forms *Bären*, *Staats* and *Namens*. Claim (1) also permits the Afrikaans adjectival suffix *-e* to have on the syntagmatic dimension signata as follows: 'This adjective is structurally or morphophonologically complex, or is to be understood metaphorically'. If correct, these claims open the door to the interesting possibility that, in early childhood, inflectional affixes are learned in much the same way as ordinary words are, subject to precisely the same expectation of that no two items should be exactly synonymous (Clark 1993).

A further claim relates to paradigm structure conditions (PSCs) — that is, implicational relationships between forms within inflectional paradigms (Wurzel 1984; 1998):

(3) The best evidence for PSCs in inflectional systems involves relationships not between affixes but between stem alternants (Carstairs-McCarthy 1991; 1994).

Assuming that (3) is correct, it is not hard to suggest a possible reason for it. An inflectional relationship between two stem alternants (say, *Gast* and *Gäst-* in German) is unequivocally a relationship between forms of the same item (in fact, the same lexeme). On the other hand, a relationship between two affixes (say, between *-e* as a Plural suffix and -(*e*)*s* as a Genitive Singular suffix in German) is a relationship between different items, even though the lexemes that select them may overlap.

The fourth claim is, at this stage, a pure assumption, but a heuristically useful one because it should be easy to disprove if it is in fact false:

(4) In an inflectional paradigm exhibiting more than one stem alternant, all distinct alternants whose distribution is not purely a matter of low-level phonology must, in all their occurrences, be distinct as signantia or as signata or both (so a stem alternant cannot be simply 'empty' in the sense of Mel'čuk 1996).

3. Implications of the claims

To illustrate the implications of these claims, let us assume hypothetical languages in which nouns inflect for two Numbers (Singular and Plural) and four Cases (1, 2, 3 and 4). I will use lower-case letters in italics to indicate distinct affixes, while 'Alt A' and 'Alt B' stand for distinct stem alternants.

Distribution pattern 1. Alt A throughout Singular, Alt B throughout Plural. *Consistent with claims* (*1*)–(*4*)*? Yes.* In terms of (4), Alt B can be analysed as signans of 'Plural'.

Distribution pattern 2. Affixes: 1 *a*; 2 *b*; 3 *c* or *e*; 4 *d* or *f*. Realisation of Cases 3 and 4 by *c* and *d* is restricted to nouns with whose stem has a particular shape, e.g. disyllabic. *Consistent? Yes.* In terms of (4), 'disyllabic stem' is a signatum of *c* and *d*, alongside 'Case 3', 'Case 4' respectively.

Distribution pattern 3. Three inflection classes, with affixes realising Cases 1–4 as follows: Class I *a*, *b*, *e*, *f*; Class II *a*, *b*, *e*, *d*; Class III *a*, *b*, *c*, *d*. Alt B appears with affixes *c* and *d*, Alt A everywhere else. *Consistent? Yes*. In terms of (4), 'Alt B' is a signatum of *c* and *d*; further, in conformity with (3), there is a PSC "Alt B in Case 3 implies Alt B in Case 4".

Distribution pattern 4. Affixes realising Cases 1–4 are *a*, *b*, *c*, *d* respectively everywhere, but some nouns have Alt B in Cases 2 and 3, and all others have Alt B in Cases 3 and 4. Alt A is used everywhere else). *Consistent? No*. The distribution of the stem alternants can be expressed in terms of two PSCs that conform to (3), namely "Alt B in Case 2 implies Alt B in Case 3" and "Alt B in Case 4 implies Alt B in Case 3". However, Alt B cannot be a signatum of either *b* or *d*, because it does not appear consistently with either; and it cannot be a signans, because it would have incompatible signata ('Case 2 or 3 or 4'), so (2) would be violated.

Distribution pattern 5. Two affixal inflection classes. Class I has Singular *a*, *b*, *c*, *d*, Plural *e*, *f*, *g*, *h*. Class II has Singular *i*, *j*, *c*, *k*, Plural *m*, *n*, *g*, *p*. Alt B appears in Cases 3 Pl and 4 Pl of all nouns, and Case 4 Sg of Class I only; Alt A appears elsewhere. *Consistent? Yes*. Alt B cannot be a signans, because any signata would have to be an exclusive disjunction, ruled out by (2). However, Alt B is a signatum of *d*, *g*, *h*, and *p*, so fulfilling requirement 4. In addition, a PSC "Alt B in Case 4 Sg implies Alt B in Cases 3 and 4 Pl" complies with (3).

Distribution pattern 6. The same as Pattern 5, except that some members of Class II appear with Alt A throughout, i.e. with no stem alternation. *Consistent? No*. Alt B still cannot be a signans, and with affixes *g* and *p* it can no longer be a signatum either, because *g* and *p* can appear with Alt A too; so Alt B is no longer distinct in all its occurrences from Alt A in the manner required by (4). The same PSC applies as in Pattern 5, but this does not compensate for the failure to comply with (4).

4. Evidence relevant to these implications

Pattern 1 reflects in part the well-known situation of German, where an umlauted stem, if it alternates with a nonumlauted one in noun inflection, is a signans of 'Plural'. This does not, however, preclude the possibility that the umlauted stem may be a signatum also, in some contexts. For example, it can be analysed as a signatum of the Plural suffix *-e*, since the *-e* suffix never signals Plural on unsuffixed Feminine nouns in modern German unless the stem vowel is both umlautable and umlauted. (This does not apply to Feminines with the derivational suffix *-nis*, because this suffix forms Plurals in *-e* (*-nisse*) irrespective of Gender.)

Pattern 2 is instantiated in Warlpiri, where the Ergative suffix *-ngku* is restricted to disyllabic stems, *-rlu* appearing elsewhere (Dixon 1980: 306). This is an instance of 'phonologically conditioned suppletion' (Carstairs 1988b); the phonological condition counts as a signatum, according to the definition given above.

I am not aware of any actual inflectional behaviour that instantiates the disallowed Patterns 4 and 6. In respect of Pattern 6 this is particularly intriguing, because Pattern 6 looks at first less 'marked' than Pattern 5, through an increase in uniformity of the coding of lexical stems. This may illustrate how the dismantling of superficial inflectional complexity can be inhibited by the destruction of signans-signatum relationships that would result. If so, then recognising stem alternants as potential signata of affixal signs contributes usefully to answering one of the central puzzles of morphological theory and of linguistic theory generally: Why is it that semantically, syntactically and phonologically unmotivated inflectional diversity can maintain itself so robustly from generation to generation, for centuries and even millennia?

I am also unaware of any patterns that instantiate exactly the permitted Pattern 5. However, its central characteristic, whereby a stem alternant is a signatum of particular affixes, is shared with Pattern 3, which is essentially instantiated in Polish Masculine nouns (Cameron-Faulkner and Carstairs-McCarthy 2000). There, the Locative and/or Vocative Singular suffix *-e* is a signans of an 'expalatal' stem alternant that appears, for any given noun, either not at all, or in the Vocative only, or in the Vocative and Locative. For example, the nouns *syn* 'son' has no such alternant, *pan* 'mister' has such an alternant (*pani-*) in the Vocative only, and *baran* 'ram' has it (*barani-*) in both Cases. The accompanying suffixes are as illustrated in (5):

(5)	Nominative	*syn*	*pan*	*baran*
	Locative	*syn-u*	*pan-u*	*barani-e*
	Vocative	*syn-u*	*pani-e*	*barani-e*

These nouns illustrate the PSC "Expalatal stem in Locative implies expalatal stem in Vocative" that is obeyed by all Polish Masculines — an instantiation of the sort of PSC incorporated in Pattern 3.

5. Paradigm structure conditions and productive stem allomorphy patterns

Wurzel-style PSCs affecting stem alternation are statable for Patterns 3, 4, 5 and 6, but only Patterns 3 and 5 were deemed consistent with claims (1)–(4). That is, the mere fact that some pattern of stem alternation confirms to a PSC is not sufficient to 'rescue' it, at least if we continue to maintain claim (4). Yet compliance with a moderately complex chain of PSCs is a feature of nonaffixal inflection in German verbs, for instance (Bittner 1985, Carstairs-McCarthy 1991). Could it be, then, that claim (4) is excessively strong?

This is too large a question to answer conclusively here. I will however mention some considerations that may bear on it. Consider the further distribution pattern 7, involving this time not nouns but verbs, inflected for three Persons and two Numbers throughout the Present tense.

Distribution pattern 7. Two groups of verbs, with the same affixes throughout. Group I has Alt A everywhere. Group B has Alt B in the 2nd and 3rd Persons Singular, Alt A everywhere else. (I use the term 'group' rather than 'class' because, in terms of affixal inflection, the two groups are identical and hence belong to the same class.) *Consistent with claims (1)–(4)? Apparently not.* Alt B cannot be a signans because it would have incompatible signata ('2nd or 3rd Person'), and it cannot be a signatum of the affixes that accompany it, because it is not used in Group I, where the same affixes appear.

An embarrassment, seemingly, is that Pattern 7 is instantiated exactly by those German strong verbs that display a stem alternant with umlaut in the 2nd and 3rd Persons Singular of the Present Tense (e.g. *waschen* 'wash', *stoßen* 'push' versus *wäscht*, *stößt* 'washes, pushes', etc.). If this pattern is permitted, as clearly it is, what right have we to say that Pattern 4 is not permitted, especially when Pattern 4 is buttressed by two PSCs? The existence of these PSCs should make Pattern 4 at least as readily learnable as Pattern 7, one may think!

There is a crucial difference between Patterns 4 and 7, however. In Pattern 4, Alt B is distributed within the paradigm in two different ways: in Cases 2 and 3 for some nouns, and in Cases 3 and 4 for others. On the other hand, in Pattern 7, the distribution of Alt B (for those verbs that have it) is uniform: it always appears in the 2nd and 3rd Singular and nowhere else. This recalls the remarkable phenomenon in certain Romance languages discussed by Matthews (1981), Maiden (1992) and Aski (1995). In Italian, for example, a pattern of stem allomorphy has become somewhat productive, spreading to verbs where it lacks any diachronic phonological motivation, even though it has not acquired any straightforward morphosyntactic motivation to compensate. In our terms, within Present Tense forms, these verbs show Alt B in the Subjunctive (except the 1st and 2nd Plural) and in the 1st Singular and 3rd Plural of the Indicative, but Alt A elsewhere (i.e. in the other Persons of the Indicative, and in the 1st and 2nd Plural of the Subjunctive). What is crucial, I suggest, is that this allomorphy pattern spreads as a whole; no verb seems to acquire Alt B in (say) the appropriate Subjunctive forms and the 1st Singular of the Indicative, but retain Alt A in the 3rd Plural of the Indicative. This opens the door to the possibility that Alt B has here acquired not a syntagmatic but a paradigmatic signatum, namely *its own distribution* — a signatum not available to Alt B in patterns 4 and 6, because its distribution there is not consistent in the manner of the Italian alternants discussed by Maiden. So perhaps *wäsch-* and *stöß-* in German (and the several parallel alternants of other verbs) are reconciled with claim (4) by virtue of the signatum 'Appears in the 2nd and 3rd Singular Present Indicative'.[2]

Some readers may feel uncomfortable with recognising signata so apparently pointless and inward-looking, and so removed from traditional morphosyntactic functions. However, once we acknowledge that morphological signata may be purely intramorphological, there is nothing in principle to exclude a paradigmatic distribution from among such signata, provided that the distibution conforms with claim (2) by being uniform, with no disjunctions to complicate it. And, so far as PSCs are concerned, the appropriate provisional conclusion is perhaps that they cannot exempt a stem alternant from the responsibility (as it were) of functioning as either a signatum or a signans or both.

6. Conclusion

Stem alternation has tended to be a neglected Cinderella within a branch of linguistic theory (morphology) that itself has Cinderella status. The traditional view is that, if an alternation has no morphosyntactic correlates and is not phonologically motivated either, it is simply a lexical peculiarity, too irreducibly idiosyncratic to be of interest to the morphological theorist. However, if affixes and stems can (indeed, must) display the kind of signalling relationships discussed here, then the way is opened to establish new robust constraints on how stem alternants can be distributed within paradigms. I hope this programmatic chapter, and the work that I have briefly cited in it, will encourage other morphologists to explore and test the constraints proposed.

Notes

1. For comments on this chapter, I am grateful to participants at the Vienna Morphology Conference in February 2000, particularly Bernard Comrie and Greville Corbett, and also Nigel Vincent and Wolfgang U. Dressler. Faults that remain are my responsibility. I am grateful to the conference organisers for helping to finance my attendance.

2. German also has a class of strong verbs that display an unusual stem alternant not only in the 2nd and 3rd Persons Singular of the Present Indicative (like *waschen* and *stoßen*) but also in the 2nd Singular Imperative. These are verbs such as *lesen* 'read', which has (*ich*) *lese* '(I) read', but *lies!* 'read!', (*du*) *liest* '(you) read', (*er*/*sie*) *liest* '(he/she) reads'. At first sight, this looks like counterevidence to the claim that the distribution of *wäsch*- and *stöß*- is 'saved' by its uniform nature. But it is significant, I suggest, that there is a consistent difference in the phonological character of the alternation pattern displayed by the *waschen* group on the one hand and the *lesen* group on the other. In the former, the minority alternant displays conventional umlaut; in the latter, it displays [i] (orthographically -*ie*- or -*i*-). They can therefore appropriately be analysed as two distinct patterns of alternation, each with a uniform distribution of the alternants, rather than a single pattern with a non-uniform distribution.

References

Anderson, Stephen R. 1992. *A-morphous Morphology*. Cambridge: Cambridge University Press.

Aski, Janice M. 1995. "Verbal Suppletion: An Analysis of Italian, French, and Spanish *to go*". *Linguistics* 33.403–32.

Bittner, Andreas. 1985. "Implikative Hierarchien in der Morphologie: Das 'Stark-Schwach-Kontinuum' der neuhochdeutschen Verben". *Acta Linguistica Academiae Scientiarum Hungaricae* 35.31–42.

Cameron-Faulkner, Thea & Andrew Carstairs-McCarthy. 2000. "Stem Alternants as Morphological Signata: Evidence from Blur Avoidance in Polish Nouns". *Natural Language and Linguistic Theory* 18.813–35.

Carstairs-McCarthy, Andrew. 1988a. "Nonconcatenative Inflection and Paradigm Economy". *Theoretical Morphology: Approaches in modern linguistics*, ed. by Michael Hammond and Michael Noonan, 71–7. San Diego: Academic Press.

——1988b. "Some Implications of Phonologically Conditioned Suppletion". *Yearbook of Morphology 1988*, ed. by Geert Booij and Jaap van Marle, 67–94. Dordrecht: Foris.

Carstairs-McCarthy, Andrew. 1991. "Inflection Classes: Two Questions with One Answer". *Paradigms: The economy of inflection*, ed. by Frans Plank, 213–53. Berlin: Mouton de Gruyter.

——1994. "Inflection Classes, Gender and the Principle of Contrast". *Language* 70.737–88.

——1998a. "Comments on the Paper by Noyer". *Morphology and its Relation to Phonology and Syntax*, ed. by Steven G. Lapointe, Diane K. Brentari and Patrick M. Farrell, 286–301. Stanford: CSLI.

——1998b. "How Lexical Semantics Constrains Inflectional Allomorphy". *Yearbook of Morphology 1997*, ed. by Geert Booij and Jaap van Marle, 1–24. Dordrecht: Kluwer.

——2001. "Umlaut as Signans and Signatum: Synchronic and Diachronic Aspects". *Yearbook of Morphology 1999*, ed. by Geert Booij and Jaap van Marle, 1–23. Dordrecht: Kluwer.

Clark, Eve V. 1993. *The Lexicon in Acquisition*. Cambridge: Cambridge University Press.

Dixon, R. M. W. 1980. *The Languages of Australia*. Cambridge: Cambridge University Press.

Halle, Morris and Alec Marantz. 1993. "Distributed Morphology and the Pieces of Inflection". *The View from Building 20*, ed. by Kenneth Hale and S. J. Keyser, 111–76. Cambridge, Mass.: MIT Press.

Lass, Roger. 1990. "How to Do Things with Junk: Exaptation in Language Evolution". *Journal of Linguistics* 26.79–102.

Lieber, Rochelle. 1992. *Deconstructing Morphology: Word formation in syntactic theory*. Chicago: University of Chicago Press.

Maiden, Martin. 1992. "Irregularity as a Determinant of Morphological Change". *Journal of Linguistics* 28.285–312.

Matthews, Peter. 1981. "Present Stem Alternations in Italian". *Logos Semantikos: Studia linguistica in honorem Eugenio Coseriu*, *1921–81*, ed. by Horst Geckeler, vol. 4, 57–65. Madrid/Berlin: Gredos/Walter de Gruyter.

Mel'čuk, Igor. 1996. *Cours de morphologie générale: Volume 3*. Montréal: Les Presses de l'Université de Montréal/CNRS Éditions.

Wurzel, Wolfgang U. 1984. *Flexionsmorphologie und Natürlichkeit*. Berlin: Akademie-Verlag.

——1998. "Drei Ebenen der Struktur von Flexionsparadigmen". *Models of Inflection*, ed. by Ray Fabri, Albert Ortmann, and Teresa Parodi, 225–43. Tübingen: Niemeyer.

Chapter 5

Adjectival past-participle formation as an unaccusativity diagnostic in English and in Polish[1]

Bożena Cetnarowska
University of Silesia, Sosnowiec

1. The intransitivity split and unaccusativity mismatches

The split of intransitive predicates into unergative and unaccusative ones has been proposed in the literature for, among others, Germanic, Romance and Slavic languages (Perlmutter 1978; Burzio 1986; Babyonyshev 1996).[2] Standard unaccusativity diagnostics involve the occurrence of verbs in the resultative construction, the impersonal passive construction, the auxiliary selection, *ne*-cliticization or locative inversion/unmarked word order test (see Burzio 1986; Hoekstra 1984; Levin and Rappaport Hovav 1995). However, processes of derivational morphology are sensitive to the intransitivity split as well. Horn (1980) puts forward the hypothesis that the rules of *-ee*, *-able*, reversative *un-* and *re-* affixation in English select transitive verbs or unaccusative verbs as their bases.

The attributive use of past/perfect participles[3] is postulated as an unaccusativity diagnostic for Dutch in Hoekstra (1984). As exemplified further in Mulder (1992) and van der Putten (1997), participles in Dutch can be used as predicates over nouns which correspond to their initial (D-structure) objects.[4] In other words, nouns which can be premodified by participial adjectives are subjects of unaccusative verbs (in 1ab) or objects of transitive verbs (in 2).

(1) a. de gevallen man
the fallen man (unaccusative)
b. het gezonken schip
the sunken ship (unaccusative)
c. *de gelachen man
the laughed man (unergative)

(2) a. de geslagen hond
the beaten dog
b. het gezongen liedje
the sung song

d. *de gewerkte man
the worked man (unergative)

The premodifying use of participles in English is discussed at length in Levin and Rappaport (1986). They propose a lexical rule of conversion (zero-derivation), which changes the category of a participle from that of a verb to that of an adjective. The relevant examples of adjectival past participles (APPs) formed from unaccusative verbs are given in (3a). They are contrasted with the ill-formed APPs of unergative verbs in (3b).

(3) a. fallen leaves, frozen lake, vanished civilizations, wilted flowers, withered leaves
b. *sneezed child, *slept child, *worked man

Markantonatou (1995) argues that past participles of unaccusative verbs in Modern Greek convert to adjectives, e.g. *peθamenos* 'dead' from *peθeno* 'I die'. Haspelmath (1994: 157 ff.) demonstrates that participles/deverbal adjectives can modify subjects of unaccusative verbs in Mongolian, Kanuri, Margi, Hungarian, Turkish, Arabic, Mam and Panare.

In Polish resultative *-ł* adjectives are related to unaccusative predicates in (4a–d), but not to unergative predicates in (4e–f). Although the standard (synchronic) analysis of these adjectives is to regard them as derived by means of the *-ł* suffix from (infinitival) verb stems (Grzegorczykowa *et al.* 1984: 411), in Cetnarowska (2000b) I argue that the adjectives in (4) can be derived from past participles[5] of unaccusative verbs through conversion.

(4) a. *przybyły* 'arrived' (from *przybyć* 'to arrrive', PF)
b. *upadły* 'fallen' (from *upaść* 'to fall', PF)
c. *posiwiały* 'grey, grizzled' (from *posiwieć* 'to become grey', PF)
d. *przerdzewiały* 'rust-eaten' (from *przerdzewieć* 'to become rust-eaten', PF)
e. **kichnęły* 'that has sneezed' (from *kichnąć* 'to sneeze', PF)
f. **spały* 'that has slept' (from *spać* 'to sleep', IMPF)

There are, however, a number of instances when a putative unaccusative verb does not give rise to a felicitous adjectival past participle (or a resultative adjective) in the languages mentioned above. The phrases **arisen situation*, **arrived tourists* and **occurred difficulties* are unacceptable in English (though their acceptability can often improve in the presence of an adverbial element, as will be shown in Section 4). When a particular verb meets other tests for unaccusativity but fails to allow its participle to be used attributively (or fails to form a resultative adjective), there results a conflict between unaccusativity diagnostics, i.e. an unaccusativity mismatch. Below I will discuss clashes between predictions of participle-to-adjective conversion and other unaccusativity diagnostics, on the basis of the data which come mainly from Polish and English.

Pesetsky (1995: 24) claims that there can be no adjectival participles from unaccusatives in English. He regards phrases such as *elapsed time*, *departed travellers*, *capsized boat* (and the examples given in 3a) as exceptional.[6] It will be argued in the present chapter that such a view is too extreme. While participle-to-adjective conversion is less productive in English than in Dutch or German, it is far from being limited to a handful of lexicalized phrases. Some unaccusative verbs do not give rise to APPs due to a cross-linguistic semantic constraint prohibiting the creation of APPs from atelic verbs (discussed in Section 2). It will be illustrated in Sections 3–4 that certain well-formed adjectival participles/resultative adjectives sound obsolete or they are infelicitous without further modification.

2. Telicity as a requirement for adjectival past participle formation

Unaccusativity mismatches are discussed in, among others, Zaenen (1993), Levin and Rappaport Hovav (1995), and Alexiadou and Anagnostopoulou (1998). In Dutch, for example, the verb *blijven* 'stay' selects the *be*-type auxiliary (behaves as an unaccusative predicate) but it does not allow its past participle to be a premodifying adjective:

(5) a. *de gebleven jongen 'the remained boy' (Zaenen 1993).
b. de man is (*heeft) gebleven
the man is (*has) remained
'The man has remained'

Zaenen (1993) suggests for Dutch that unaccusativity diagnostics may be sensitive to different semantic correlates of unacccusativity, i.e. to thematic agentivity or to telicity. Past participles of verbs which are not telic (which do not imply reaching an inherent end-point) cannot be used attributively, hence the ill-formedness of (5a). A similar situation obtains in English. Levin and Rappaport Hovav (1995: 148ff.) classify verbs of existence as unaccusatives since they allow *there*-insertion, as in *There remained three documents on his desk* or *There existed no solution to their problems*. However, such verbs are stative and atelic, hence their past/perfect participles cannot be used attributively, as is shown by the unacceptability of the phrases **the remained documents* or **the existed solution*.[7]

Resultative *-ł* adjectives in Polish are derived mainly from telic verbs. It is instructive to compare, in this respect, the felicity of adjectives derived from prefixed perfective (telic)[8] verbs in (6) with the lack of resultative adjectives from the non-prefixed imperfective verbs in (7). The verbs in (7) are stative and atelic, while the prefixed verbs in (6) denote states resulting from other states.

(6) a. *zaistniały problem* 'problem that has emerged' (from *zaistnieć* 'to come into existence', PF)
   b. *zastała woda* 'water that has become musty' (from *zastać się* 'to become musty due to lack of current', PF)
   c. *wyleżałe owoce* 'mellow-ripe fruit' (from *wyleżeć się* 'to become ripe after being kept for a long time', PF)
   d. *zleżały towar* 'goods that have become spoiled by lying in the shop for too long' (from *zleżeć się* 'to lie for too long in a shop', PF)

(7) a. **istniały problem* 'problem that existed' (from *istnieć* 'to exist', IMPF)
   b. **stała woda* 'water that had no current' (from *stać* 'to stand', IMPF, cf. *stały* 'constant')
   c. **leżały na tapczanie człowiek* 'man that lay on a couch' (from *leżeć* 'to lie', IMPF)

There exist several *-ł* adjectives related to stative verbs, such as, for instance, *stały* in (7b), *były* 'former' (related to *być* 'to be'), *czuły* 'sensitive' (from *czuć* 'to feel') and *dbały* 'careful' (from *dbać* 'to be careful'). These formations are lexicalized semantically at present, though in Old Polish they exhibited close semantic bond to corresponding finite verbs and called for the semantic interpretation characteristic of past participles, e.g. *czuły* (arch.) 'that has felt' or *stały* (arch.) 'that has been standing' (cf. Długosz-Kurczabowa and Dubisz 1998). The issue of diachronic changes in this area of Polish morphology will be tackled in the immediately following section.

3. Diachronic changes in derivational paradigms

The following well-formed *-ł* adjectives (listed in, among others, Bajerowa

1992, Bartnicka 1970, Długosz-Kurczabowa and Dubisz 1998, and Oesterreicher 1926) are now perceived as obsolete in Polish:

(8) a. *nieudały* (arch.) 'failed' (from *udać się* 'to succeed', PF, cf. *nieudany* 'failed')
  b. *popękały* (arch.) 'cracked' (from *popękać* 'to crack', PF, cf. *popękany* 'cracked')
  c. *przeminęły* (arch.) 'elapsed' (from *przeminąć* 'to pass, to elapse')
  d. *pobiegły* (arch.) 'that has run (somewhere)' (from *pobiec* 'to run (in a particular direction)')
  e. *przyszły* (*do nas*) (arch.) 'that has come (e.g. to us)' (now lexicalized in the sense of 'future', from *przyjść* 'to come')
  f. *wyszłe z portu statki* (arch.) 'ships that have left the harbour' (from *wyjść* 'to leave')
  g. *znikły* (arch.) 'that has disappeared' (from *zniknąć* 'to disappear')

Długosz-Kurczabowa and Dubisz (1998: 317 ff.) observe two tendencies in the diachronic development of Polish past participles from the Old Polish period onwards. Firstly, such participles appeared less frequently in their predicative function and functioned more often as constituents of compound verbs forms, such as complex past tense forms, future tense and conditional forms. Secondly, *-ł* participles lost their nominal (short) declension, hence they were indistinguishable from adjectives in their inflectional paradigms. As a consequence of their tendency towards adjectivization, past participles from numerous verbs underwent semantic drift or were lost.

As late as in the first half of the nineteenth century, it was still possible in Polish[9] to use past participles of prefixed directed-motion verbs (containing the root *id-/sz*(*ed*)- 'to go' in 9d–f) as premodifying adjectives (cf. Bajerowa 1992: 190). Moreover, Old Polish allowed the formation of resultative *-ł* adjectives from verbs containing the thematic suffix *-ną-* (as shown in 8c, g) and from verbs taking the reflexive clitic *się* (as in 8a). In present-day Polish, such verbs either have no related resultative adjectives or they derive adjectives with the suffix *-n-*/*-t-* (e.g. *nieudany* 'failed' in (8a) or *popękany* 'cracked' in (8b)), the primary function of which is to form passive participles.[10]

In conclusion, the failure of the resultative adjective formation as an unaccusativity diagnostic in Polish can be due to diachronic changes. An expected (i.e. structurally well-formed) adjective may fail to occur as a synchronic form but it may be attested in older texts. While some of such historical changes in the derivational paradigm give rise to accidental 'gaps' in the lexicon, others result in imposing stricter morphological conditions on adjectival *-ł* participle formation, such as the requirement that the base for *-ł* adjective should be a non-reflexive verb and should not contain the suffix *-nął-*.

4. Restrictions on the occurrence of unmodified adjectival past participles

The felicity of adjectival past participles is frequently diminished by semantic or pragmatic factors.[11] Ackerman and Goldberg (1996), following Grimshaw and Vikner (1993), observe that certain English adjectival passives require obligatory adverbial modification. If not modifed, they are unacceptable in a 'neutral' (non-contrastive) context, as is signalled by '#' in (9).

(9) a. #a created house
b. a carefully created house
c. #a built house
d. a recently built house
e. #a served customer
f. a well-served customer

Grimshaw and Vikner (1993) propose that verbs whose passive participles require obligatory adjuncts have two-part event structures, where 'event structure' is a representation of aspectual properties of an eventuality, as discussed in Pustejovsky (1991), Grimshaw (1990) or van Hout (1996). Accomplishments and achievements, which are referred to as 'transitions' in Pustejovsky (1991), have the two sub-event structure schematized in (10). Accomplishments, in particular, consist of a process and a resulting state, as shown in (11a). Grimshaw and Vikner (1993) argue that both subevents of an accomplishment must be 'identified' by some element in a clause. Since the head noun *house* in the phrase *a created house* in (9a) identifies only the second subevent (i.e. the resulting state), the phrase is infelicitous in the absence of any temporal or manner adverbial which would serve to 'identify' syntactically the first subevent (i.e. the process).

(10) Transitions (cf. Pustejovsky 1991)

Event 1 ¬Event 1

(11) a. Accomplishment
Process State

b. x built y (cf. Grimshaw and Vikner 1993)
process state
x y

While Grimshaw and Vikner (1993) focus on verbal passives and prenominal passive participles in English, non-passive adjectival participles related to unaccusative verbs frequently require obligatory modification (cf. Pesetsky 1995; Levin and Rappaport Hovav 1995):

(12) a. #an appeared book
b. a recently appeared book
c. #an emerged scandal
d. a newly emerged scandal

In Polish some resultative *-ł* adjectives are not fully acceptable without adverbial modification, as exemplified in (13):

(13) a. #rozgorzały spór 'a quarrel that has broken out'
b. rozgorzały na nowo spór 'a quarrel that has broken out again/anew'
c. #wylęgłe ptaki 'hatched birds'
d. nowo wylęgłe ptaki 'newly-hatched birds'
e. #odrosłe gałęzie 'twigs that have grown out'
f. odrosłe na wiosnę gałęzie 'twigs that have grown out in spring'
g. #powstały uniwersytet 'a university which has been set up'
h. nowo-powstały uniwersytet 'a university which has been set up recently'

It is plausible to account for the data in (12)–(13) by extending the analysis from Grimshaw and Vikner (1993) to non-passive APPs. Since the verbs in (12)–(13) are achievements, their event structure can be subdivided into two subevents: a state followed by another state (see van Hout 1996: 90). As they denote the events of coming into existence, the noun assigned the role of Theme (e.g. *book* in *an appeared book* in 12a) can identify syntactically the resulting state but not the initial state (during which the Theme did not exist yet). Consequently, the first subevent requires syntactic identification by an adjunct (such as an adverb of manner, place, or time, e.g. *newly* or *recently*).

(14) x appeared
Event (achievement)
state state
x

It needs to be added, though, that the obligatory adjunct hypothesis put forward in Grimshaw and Vikner (1993) has been subjected to profound criticism in the literature. Szymańska and Śpiewak (2000), for instance, discuss several constructions which require obligatory adverbial modification in English and Polish, including middles, impersonal constructions and accomplishment passives. They argue that it is necessary to provide a unified explanation for all those constructions. They conclude that Grimshaw and Vikner (1993) postulate an excessively complex theoretical machinery to account for obligatory adjuncts with passive participles only.[12] Moreover, they show that Grimshaw and Vikner's proposal fails to predict the occurrence of two obligatory adjuncts in impersonal constructions, as is the case in the German sentence in (15a) from Fagan (1992: 189) and its Polish equivalent in (15b) from Szymańska and Śpiewak (2000: 326).

(15) a. Es tanzt sich *(gut) *(auf glattem Parkett).
it dances REFL well on smooth parquet
'It dances well on smooth parquet.'
b. *(Dobrze) się tańczy *(na gładkiej podłodze)
well REFL dance-3SG.PRES on smooth floor
'One can dance well on a smooth floor.'

Grimshaw and Vikner's (1993) obligatory adjunct hypothesis is criticized also by Ackerman and Goldberg (1996), who show that the acceptability of unmodified adjectival participles frequently depends on the noun to be premodifed, as in the examples quoted in (16) below:[13]

(16)	a.	#paid physician	e.	#killed man
	b.	paid escort	f.	killed e-mail messages
	c.	# cut meat	g.	#taken item
	d.	cut classes	h.	taken seat

Ackerman and Goldberg (1996) observe that the informativeness of the APP *paid* is higher in the phrase *paid escort* in (16b) than in *paid physician* in (16a). They propose to account for the infelicity of unmodified APPs, such as those in (16a) or (9a), by means of the Non-redundancy Constraint:[14]

(17) If the referent of the head noun, N, implies a property P as part of its frame-semantic or encyclopedic knowledge, then an APP is not allowed to simply designate P; it must be further qualified. (Ackerman and Goldberg 1996: 21).

Their Non-redundancy Constraint in (17) bears resemblance to Atlas and Levinson's Principle of Informativeness which says: "Read as much into an utterance as is consistent with what you know about the world" (Levinson 1983: 146–7). It is also related to Grice's Maxim of Quantity and Horn's conversational principles.[15]

An interesting aspect of the Non-redundancy Constraint is its cross-linguistic applicability. Ackerman and Goldberg (1996) suggest tentatively that the constraint in (17) is active in German and in Hungarian. The data in (13) indicate that it is also at work in Polish.[16] There is, however, a difference between the acceptability of selected Polish unmodified adjectival participles in (18) and the infelicity of the corresponding English APPs.[17]

(18) a. Pol. *nakarmione dziecko* vs. Eng. *#fed child* (cf. *well-fed child*)
b. Pol. *upieczone ciasteczka* vs. Eng. *#baked cakes* (cf. *half-baked cakes*)
c. Pol. *wypoczęte dzieci* vs. Eng. *#rested children* (cf. *well-rested children*)

The examples in (18) can be construed as indicating that languages may differ in their degree of tolerating redundancy, hence the constraint in (17) is "a conventionalized, although clearly motivated, part of the grammar" (Ackerman and Goldberg 1996: 29). Let us note, however, that adjectival past participles from perfective verbs in Polish denote achievement of an inherent end-point of an event. The corresponding APPs in English are ambiguous as to whether the culmination of the event has been reached or not, hence they have lower informational value than their Polish equivalents. The whole issue undoubtedly deserves more in-depth research.

5. Conclusion

The present chapter has discussed the reliability of the formation of adjectival past participles in English and the derivation of resultative (departicipial) *-ł* adjectives in Polish as unaccusativity diagnostics. I have argued against the claim put forward in Pesetsky (1995) that unaccusative verbs in English do not form adjectival participles. I have shown on the basis of the data from English and Polish that — while the appearance of such participles/adjectives indicates that the related verbs are unaccusative — the non-occurrence of the forms in question is not necessarily a proof of the unergative character of corresponding verbs. For instance, adjectival past participles are not derived from stative (atelic) verbs in both languages, though in Polish the addition of a prefix to a verb denoting a state may change it into a suitable base for the resultative *-ł* adjective. The lack of departicipial adjectives from particular unaccusative verbs may also be due to diachronic changes in the lexicon. Some of such changes involve imposing stricter morphological conditions on the formation of adjectival participles, as is the case in Polish. Moreover, there are pragmatic (and semantic) factors restricting the use of structurally well-formed adjectival participles when they are unmodified. I have considered the possibility of employing Grimshaw and Vikner's hypothesis of obligatory adjuncts for predicting the infelicity of unmodified adjectival past participles. I have then shown that the Non-redundancy Constraint, proposed in Ackerman and Goldberg (1996) for English, can be postulated to operate in Polish.

Notes

1. I am grateful to two anonymous reviewers for this volume and to participants of the 9th International Morphology Meeting in Vienna for their comments.

2. The class of intransitive verbs in Polish considered here includes both 'intransitives proper' (*upaść* 'to fall', *umrzeć* 'to die') and verbs with the reflexive clitic *się* 'self', such as *potknąć się* 'to trip'.

3. Various terms are used in the literature with reference to participles/adjectives analysed in the present chapter. I follow here Ackerman and Goldberg (1996) who use the term 'adjectival past participles' (APPs). Levin and Rappaport Hovav (1995: 151) employ the term 'adjectival perfect participles'. Van der Putten (1997) refers to the Dutch forms quoted here in (1) as 'past participle adjectives' or *ge*-adjectives. Levin and Rappaport (1986) and Grimshaw (1990) refer to such forms as 'adjectival passives'. This is somewhat confusing, since the phrases *fallen man* or *departed guests* do not imply any existence of an external Causer.

4. Such a generalization, proposed in Hoekstra (1984), involves making an assumption that surface subjects of unaccusative verbs originate in the structural position of objects (internal arguments) at D-structure (see Hoekstra 1984 or Burzio 1986). In a lexical approach the relevant generalization concerning APPs can be stated by invoking a semantic feature or thematic role of the head noun, without making reference to D-structure objects. Wunderlich (1997), for instance, proposes that perfect participles in German can be used attributively to modify participants undergoing a change of state or location if we have (partial) knowledge of their posterior (i.e. resulting) state.

5. Past participles (i.e. participles based on *-ł* stems) are employed to form complex future tense forms (as in *będę spała* 'sleep'-FUT.1SG.FEM) or conditional forms (e.g. *spałabym* 'sleep'-COND.1SG.FEM).

6. He suggests that such verbs have adjectival participles since they can be construed as involving two participants/arguments: the Theme and a controlled A(mbient) Causer.

A-Causer, which is the external argument, expresses the internal source/cause of the event, e.g. "some force intrinsic to the travellers provokes their departure, and some property of the boat causes it to capsize" (Pesetsky 1995: 117). He observes further that adjectival participle formation depends on auxiliary selection. In 'have' languages such as English the phenomenon is not fully productive.

7. The equivalent adjectives in Polish are well-formed, i.e. *pozostały* 'remaining' and *zaistniały* 'that has come into existence'. However, the related verbs *pozostać* 'to remain' and *zaistnieć* 'to come into existence' are prefixed and perfective, hence presumably telic (cf. the data in 6)

8. One of the reviewers (Reviewer 1) remarks that perfectivity and the presence of a prefix cannot be equated with telicity of a given verb. There are prefixed perfective verbs in Polish which are atelic (do not imply reaching an inherent terminus), e.g. *poczekać* 'to wait a little'. Further examples of atelic perfective verbs in Polish are provided in Cetnarowska (2000b). On the other hand, some telic verbs lack a prefix, e.g. *minąć* 'to pass'.

9. Wunderlich (1997: 13) quotes the German phrase *die ins Stadion gelaufenen Touristen* 'the tourists that have run into the stadium'. While its direct translation into Polish, i.e. *??wbiegli na stadion turyści*, sounds odd nowadays, presumably such a phrase could be fully acceptable in Polish two hundred years ago.

10. Consequently, *-n-/-t-* participial adjectives related to verbs used both transitively and intransitively (with the reflexive clitic *się*) are ambiguous between passive and non-passive interpretation, e.g. *złamany* 'broken' (i.e. that was broken or broke by itself).

11. Such restrictions are to be expected if APPs are regarded as derivatives (e.g. derived through conversion). Bauer (1988) shows that the institutionalization of structurally well-formed derivatives often depends on pragmatic (or extra-linguistic) factors. An institutionalized derivative is such that is accepted by native speakers as a known lexical item.

12. Let us observe, however, that the need for the separation of argument structure and event structure of predicates has been independently argued for in Pustejovsky (1991) and Grimshaw (1990). Another objection raised in Szymańska and Śpiewak against Grimshaw and Vikner's analysis is that it results in blurring the argument/adjunct dichotomy. The definition of an argument as an obligatory element (and an adjunct — as an optional one) is no longer valid. Nevertheless, as has been pointed out to me by the second reviewer for this volume (Reviewer 2), the distinction between arguments and adjuncts is far from being clear and it remains to be 'a bone of contention' in various contemporary syntactic theories.

13. Reviewer 1 observes that the examples in (16c) and (16d) exhibit distinct senses of the participle, which blurs the effect of the Non-redundancy Constraint. The same is true of the participles in (16ef) or (16de). However, the pairs of the phrases in (9ab) or (12ab) indicate more clearly that the non-redundancy of adjectival participles results from the informativeness of the context, rather than from the intended reading of the participle.

14. Another constraint postulated by them is Paradigmatic Informativeness which states that "An APP is not felicitous if it is based on a superordinate verb which contrasts with semantically more specific predicates (i.e. with troponyms)" (Ackerman and Goldberg 1996: 27). This principle accounts for a higher felicity of the phrase *donated funds* than *given funds*.

15. Grice's Maxim of Quantity says: "Make your contribution as informative as is required for the current purposes of the exchange" (Levinson 1983: 101). Horn's R-Principle is stated in Horn (1984) as: "Make your contribution necessary; say no more than you must", while his Q-Principle is formulated as: "Make your contribution sufficient; say as much as you can."

16. A constraint which is similar in spirit to Ackerman and Goldberg's Non-redundancy Constraint, dubbed "enrichment constraint", is proposed in Szymańska and Śpiewak (2000). According to them, constructions which require obligatory adverbial modification frequently result in an informational deficit at the 'propositional' layer of the semantic structure of a sentence. This deficit can be compensated for at the layer of 'modality' constituent, e.g. by the use of corrective stress, negation, change of mood or the use of adverbial modifiers.

17. It needs to be borne in mind that the expressions *fed child* or *rested child* are infelicitous only in neutral (non-contrastive) contexts. The presence of an appropriate contrast makes these phrases acceptable, as in the following sentence provided by Reviewer 2: *A fed child is usually quieter than an unfed one.*

References

Ackerman, Farrell and Adele E. Goldberg. 1996. "Constraints on Adjectival Past Participles". *Conceptual Structure, Discourse and Language* ed. by Adele E. Goldberg, 17–30. Stanford, Calif.: CSLI Publications.

Alexiadou, Artemis and Elena Anagnostopoulou. 1998. "Unaccusativity Mismatches in Greek". Ms., ZAS, Berlin.

Atlas, J. D. and S. Levinson. 1981. "*It*-clefts, Informativeness and Logical Form: Radical Pragmatics (Revised Standard Version)". *Radical Pragmatics* ed. by P. Cole, 1–61. New York: Academic Press.

Babyonyshev, Maria. 1996. *Structural Connections in Syntax and Processing: Studies in Russian and Japanese.* Ph.D. dissertation, MIT.

Bajerowa, Irena. 1992. *Polski język ogólny XIX wieku. Stan i ewolucja. vol 2 Fleksja* [Polish language of the nineteenth century. Its state and evolution. Vol 2. Inflection]. Katowice: Uniwersytet Śląski.

Bartnicka, Barbara. 1970. *Adiektywizacja imiesłowów w języku polskim* [Adjectivization of participles in Polish]. Warszawa: PWN.

Bauer, Laurie. 1988. *Introducing Linguistic Morphology.* Edinburgh: Edinburgh University Press.

Burzio, Luigi. 1986. *Italian Syntax. A Government-Binding Approach.* Dordrecht: Reidel.

Cetnarowska, Bożena. 2000a. "The Unergative/Unaccusative Split and the Derivation of Resultative Adjectives in Polish". *Formal Approaches to Slavic Linguistics 8. The Philadelphia Meeting 1999* ed. by Tracy Holloway King and Irina A. Sekerina, 78–96. Ann Arbor: Michigan Slavic Publications.

——2000b. "Resultative Adjectives in Polish". *Acta Linguistica Hungarica* 47: 1–4. 47–79.

Długosz-Kurczabowa, Krystyna and Stanisław Dubisz. 1998. *Gramatyka historyczna języka polskiego* [Historical grammar of Polish]. Warszawa: Wydawnictwa Uniwersytetu Warszawskiego.

Fagan, Sarah M. B. 1992. *The Syntax and Semantics of Middle Constructions.* Cambridge: Cambridge University Press.

Grimshaw, Jane. 1990. *Argument Structure.* Cambridge, Mass.: MIT Press.

——and Sten Vikner. 1993. "Obligatory Adjuncts and the Structure of Events". *Knowledge and Language II: Lexical and Conceptual Structure* ed. by Eric Reuland and Werner Abraham, 143–55. Dordrecht: Kluwer.

Grzegorczykowa, Renata, Roman Laskowski and Henryk Wróbel (eds.). 1984. *Gramatyka współczesnego języka polskiego. Morfologia* [A grammar of present-day Polish. Morphology]. Warszawa: PWN.

Haspelmath, Martin. 1994. "Passive Participles across Languages". *Voice: Form and Function* ed. by Barbara Fox and Paul J. Hopper, 151–77. Amsterdam: Benjamins.

Hoekstra, Teun. 1984. *Transitivity.* Dordrecht: Foris.

Horn, Laurence. 1980. "Affixation and the Unaccusative Hypothesis". *Papers from the 16th Regional Meeting of CLS* ed. by Jody Kreiman and Almerindo E. Ojeda, 134–46. Chicago: Chicago Linguistic Society.

——1984. "Toward a New Taxonomy for Pragmatic Inference: Q-Based and R-Based Implicature". *GURT'84: Meaning, Form and Use in Context* ed. by D. Schiffrin, 11–42. Washington: Georgetown University Press.

van Hout, Angeliek. 1996. *Event Semantics of Verb Frame Alternations. A Case Study of Dutch and its Acquisition.* Ph.D. dissertation, University of Tilburg.

Levin, Beth and Malka Rappaport. 1986. "The Formation of Adjectival Passives". *Linguistic Inquiry* 17. 623–61.

—— ——1995. *Unaccusativity. At the Syntax-Lexical Semantics Interface.* Cambridge, Mass.: MIT Press.

Levinson, Stephen C. 1983. *Pragmatics.* Cambridge: Cambridge University Press.

Markantonatou, Stella. 1995. "Modern Greek Deverbal Nominals: an LMT Approach". *Journal of Linguistics* 31. 267–99.

Mulder, René. 1992. *The Aspectual Nature of Syntactic Complementation.* HIL dissertations 3. The Hague: HAG.

Oesterreicher, Henryk. 1926. *Imiesłów bierny w języku polskim.* [Passive participle in Polish]. Kraków: Nakładem Polskiej Akademii Umejętności.

Perlmutter, David. 1978. "Impersonal Passives and the Unaccusative Hypothesis". *Proceedings of the Fourth Annual Meeting of the Berkeley Linguistic Society* ed. by J. Jaeger et al., 159–89. University of California at Berkeley: Berkeley Linguistic Society.

Pesetsky, David. 1995. *Zero-Syntax.* Cambridge, Mass.: MIT Press.

Pustejovsky, James. 1991. "The Syntax of Event Structure". *Cognition* 41. 47–81.

van der Putten, Frans. 1997. *Matter and Mind in Morphology.* HIL dissertations 36. The Hague: HAG.

Szymańska, Izabela and Grzegorz Śpiewak. 2000. "Deconstructing the So-Called Obligatory Adverbial Modification — an Exercise in Data Interpretation". *PASE Papers in Language Studies. Proceedings of the 8th Annual Conference of PASE* ed. by Bożena Rozwadowska, 321–37. Wrocław: Aksel.

Wunderlich, Dieter. 1997. “Participle, Perfect and Passive in German”. Theorie des Lexikons, Arbeiten des Sonderforschungsbereichs nr. 99. Düsseldorf: Seminar für Allgemeine Sprachwissenschaft Heinrich-Heine-Universität.

Zaenen, Annie. 1993. “Unaccusativity in Dutch: Integrating Syntax and Lexical Semantics”. *Semantics and the Lexicon* ed. by James Pustejovsky, 129–61. Dordrecht: Kluwer Academic Publishers.

Chapter 6

Morphophonological alternations

Typology and diachrony

Bernard Comrie
Max Planck Institute for Evolutionary Anthropology

1. Introduction

The immediate inspiration for this chapter is the following passage relating to a hypothesized general property of morphophonological alternations:[1]

> . . . morphophonological alternations do not act independently in the historical evolution of a language. We do not wish to affirm by this that one cannot witness the extension of a morphophonological process from generation to generation as the opposite is easy to attest. Neither do we wish to affirm that a morphophonological alternation could not be produced spontaneously during the evolution of a language. Picard (1977) gives excellent examples of this type of phenomenon, especially the deletion of *l* in Québec French. What we wish to affirm is that a morphophonological process is not dynamic in the sense that it can wander from one morphological context to another. For example, we'd like to claim that the mark of the imperfect or the morpheme *-los* ['-less' — BC] could not trigger umlaut in German and that diminutive *-ito*/*-ita* could not trigger monophthongization in the Spanish noun. (Ford and Singh 1983: 67–8)

My aim in this chapter is not, however, literally to give an exegesis of the above passage. Rather, I will use some of the ideas in the above passage, or rather my interpretation of these ideas (which may or may not correspond to the authors' intent) in order to explore some aspects of the nature of morphophonological alternations. In particular, I want to explore two questions on the basis of a set of empirical material: (i) Can morphophonological alternations wander in order to mark a new morphological or other grammatical opposition? (ii) If this property of morphophonological alternations can be validated, is it a specific property of morphophonological alternations, not shared, for instance, by other means of expressing morphological oppositions, most obviously affixation? As a byproduct, I will also consider what attitude some earlier linguists who have analyzed the same empirical material have taken towards the question of whether morphophonological alternations can wander.

But some minimal textual criticism will be necessary. I find it interesting that Ford and Singh allow the possibility of morphophonological alternations arising ex nihilo. My impression is that those linguists who have examined the empirical material that I treat in the body of this chapter have been reluctant to accept this possibility: typically, they have tried to propose explanations for the apparent wandering of a morphophonological alternation, typically in the direction of analogical extensions, even if the empirical basis of the proposed analogical extension is often quite fragile — better some analogical explanation than the assumption of a random transfer of a morphophonological alternation to a new set of instances. The possibility of the spontaneous arising of morphophonological alternations also threatens to empty Ford and Singh's claim of its empirical significance: after all, would it not mean that any putative case of the wandering of a morphophonological alternation could be reanalyzed as the spontaneous creation of a new morphophonological alternation that just happens to involve the same phonemes as the old one? One way around this last problem would be to distinguish between natural and unnatural morphophonological alternations. Some morphophonological processes, like reduplication, are so natural that it would not be surprising if they were made use of independently in a number of different areas of the grammar of a language. But others — a prime example would be the Celtic mutations discussed in Section 2 — are so unnatural in the phonetic relations among alternants that it would be difficult to imagine them arising independently in different areas of the grammar. Thus unnatural morphophonological alternations are actually the better test of the hypothesis.

A second question that arises in relation to the quote from Ford and Singh is what exactly is intended by the term 'morphophonological alternation'. Ford and Singh provide the following characterization:

> By morphophonological alternation, we shall mean non-automatic alternations that take place in specific morphological contexts . . . (Ford & Singh 1983: 65)

My own interpretation of the term may be somewhat broader than their intent, and this is one of the reasons why I make the disclaimer that I am not simply attempting an exegesis of their ideas. Basically, I take morphophonological alternations to be all non-automatic alternations between different forms of the same morpheme. While some of these will indeed be triggered by morphological contexts, for example, in order to mark (or participate in the marking of) morphological categories, others are more syntactically determined, as in the Celtic examples discussed in Section 2.1.

2. Illustrative morphophonological alternations

This section, which comprises the bulk of the present chapter, will examine a number of morphophonological alternations, in each case trying to see whether there is evidence for wandering of the alternation in question.

2.1 The Celtic mutations

The Celtic languages are famous, if not notorious, for the morphophonological alternations that affect their initial consonants, a phenomenon referred to in the traditional grammar of the Celtic languages as 'mutation' (whence: the mutations). In Irish, the basic initial consonant of a word (occurring, for instance, when the word is pronounced in isolation) can take up to two other forms in particular environments, as illustrated in Table 1, which shows both the orthographic representation (first line in each group) and the phonological representation (second line in each group). The main source for the discussion of Irish here and below is Ó Siadhail (1989), with a few irrelevant simplifications.[2]

Table 1. Irish mutations (omitting *l*, *n*, *r*) (Ó Siadhail 1989: 112)

Basic	*c*	*t*	*p*	*g*	*d*	*b*	*m*	*s*	*f*
	k	t	p	ɡ	d	b	m	s	f
Lenition	*ch*	*th*	*ph*	*gh*	*dh*	*bh*	*mh*	*sh*	*fh*
	x	h	f	ɣ	ɣ	w	w̃	h	Ø
Eclipsis	*gc*	*dt*	*bp*	*ng*	*nd*	*mb*			*bhf*
	ɡ	d	b	ŋ	n	m			w

In Table 2 corresponding details are given for Welsh, for which language my main source is Thorne (1993). Again, some less important details are omitted.[3] The mixed mutation is not always recognized as a distinct mutation — its effect is a combination of the soft and aspirate mutations — but it will play an important role in what follows.

It will be noted that while there is some general kind of phonetic basis for each of the mutations, characterized to some extent by the name of the

Table 2. Welsh mutations (main source: Thorne 1993)

Basic	*c*	*t*	*p*	*g*	*d*	*b*	*m*	*ll*	*rh*
	k	t	p	g	d	b	m	ɬ	r̥
Soft Mutation	*g*	*d*	*b*	Ø	*dd*	*f*	*f*	*l*	*r*
	g	d	b	Ø	ð	v	v	l	r
Aspirate Mutation	*ch*	*th*	*ph*						
	x	θ	f						
Nasal Mutation	*ngh*	*nh*	*mh*	*ng*	*n*	*m*			
	ŋh	nh	mh	ŋ	n	m			
Mixed Mutation	*ch*	*th*	*ph*	Ø	*dd*	*f*	*f*	*ll*	*rh*
	x	θ	f	Ø	ð	v	v	ɬ	r̥

mutation, there is also a fair amount of arbitrariness, especially in Irish, where sound changes (such as the shift of [ð] to [ɣ]) have disrupted the transparent phonetic nature of several of the alternations.

Historically, the mutations derive ultimately from purely phonetically conditioned word sandhi phenomena, with the initial consonant of one word being influenced by the final segment of the preceding word. Welsh soft mutation and Irish lenition originated after a final vowel. Welsh nasal mutation and Irish eclipsis originated after a final nasal. Welsh aspirate mutation (with no equivalent in Irish) originated after a final consonant other than a nasal, but must have retreated considerably even in the prehistoric period, since there are many environments in which an initial consonant is not mutated, although except in initial position in the phonological phrase every initial consonant must occur either after a vowel, a nasal, or another consonant. However, loss of final vowels and consonants, before the earliest attestations of the Celtic languages, means that synchronically the set of environments for each mutation is essentially arbitrary. The original distribution can usually be retrieved by comparison with other Indo-European languages; in what follows, Latin and Ancient Greek will often be used in this way.[4]

It is convenient to divide the mutations observable synchronically in the Celtic languages, illustrated in this paragraph by Welsh, into two sets. Contact mutation refers to a change brought about by an immediately preceding element. For instance, the preposition *am* 'for' triggers soft mutation, so that from *punt* 'pound' we get *am bunt* 'for a pound' (Welsh, likewise Irish, has no indefinite article). Sometimes a covert property of the preceding element is responsible for the mutation. In Welsh, nouns are divided into masculine and feminine genders, although there is no overt marker on the noun itself to indicate gender (gender can be revealed, for instance, through agreement with demonstrative pronouns). Masculine nouns trigger no mutation on a following adjective — in Welsh, nearly all adjectives usually follow the head noun — so that the adjective *golygus* 'attractive' retains this form in *dyn golygus* 'attractive man'; feminine nouns, however, trigger soft mutation, so that 'attractive woman' is *gwraig olygus*. Compare the Latin forms *vir bonus* 'good man' (masculine nouns typically end in a nonnasal consonant in conservative Indo-European languages) with *femina bona* 'good woman' (feminine nouns typically ended in a vowel). Sometimes it is a covert property of the mutating word itself that is decisive, so that the definite article *y* 'the', itself invariant for number and gender, triggers soft mutation of following feminine singular nouns only, compare *y dyn* 'the man' but *y wraig* 'the woman'; Latin equivalents would be *is vir* but *ea femina*. Cases like the definite article can in fact be subsumed under covert properties of the preceding element if we assume that the definite article actually has covertly distinguished forms, with the feminine singular article triggering soft mutation, and masculine and plural articles not doing so, even though the definite article does not itself vary in form. Such cases of contact mutation clearly continue the original pattern whereby the mutations result from sandhi at the word boundary.

In addition, the Celtic languages have instances of syntactic mutation, which occur independent of adjacency. In Welsh, for instance, direct object noun phrases undergo soft mutation, whether they are adjacent to the verb, as in (1), or adjacent to the subject, as in (2). (The usual word order in Welsh is Verb–Subject–Object; unstressed subjects may be omitted.)

(1) *Lladdodd ddraig.*
killed.3SG dragon
'S/he killed a dragon.'

(2) *Lladdodd dyn ddraig.*
killed.3SG man dragon
'A man killed a dragon.'

Given the possibility of comparison with other Indo-European languages, it is usually possible to tell whether a particular instance of mutation in a Celtic language is etymologically justifiable or whether it represents an innovation. Such innovations are of particular interest, since they provide potential instances of the wandering of mutations. Some such innovations are rather transparent instances of analogy, and although they do literally involve the extension of a mutation to a new environment, they have not caused discomfort to traditional historical linguists, who have been happy to see them as special cases of the general phenomenon of analogy, an assessment with which I concur. A reasonably simple example is provided by lenition after prepositions in Old Irish (Thurneysen 1946: 146, 497–9, 510–14, 541–8). Usually, prepositions that ended etymologically in a vowel trigger lenition, while those that did not end in a vowel do not, as expected etymologically, and irrespective of the synchronic final segment in Old Irish. Thus lenition is found after *fo* 'under' (cf. Ancient Greek *hupó*), *air* 'before, for' (cf. Ancient Greek *pára*), and *imb*/*imm* 'about' (cf. Ancient Greek *amphí*), while *etar* 'between, among' (cf. Latin *inter* or Old High German *untar*) and *for* 'on, over' (cf. Ancient Greek *hupér*) do not. However, in Old Irish analogical lenition is occasionally attested after *etar* and *for*, and one of the Modern Irish reflexes of the former, namely the co-ordinative preposition *idir* (in the construction *idir X agus*/*is Y* 'both X and Y') regularly lenites. Another, though somewhat different kind of transparent analogy is the spread of mutations to phonetically similar consonants that occur only in borrowings. In some varieties of Welsh, for instance, the affricate [tʃ] is found in loans from English, for instance [tʃɒklad] 'chocolate', and just like any other voiceless stop this can be voiced under soft mutation, for instance after the possessive pronoun *dy* 'your (singular)', as in [də dʒɒklad] 'your chocolate'; compare *tad* 'father', but *dy dad* 'your father'. Note that this last example is not even a candidate for wandering to a new environment: the environment determined by the possessive pronoun *dy* already exists, all that is new is the range of consonants undergoing the morphophonological alternation.

In some other cases, however, the synchronic occurrence of mutation is not so readily explained by the interaction of regular diachronic developments interacting with transparent analogy. A particularly difficult case is provided by the soft mutation of direct objects in Welsh, which in the modern language is in no sense a kind of word sandhi, since it is purely the syntactic position of the noun phrase that is relevant, with the nature of the immediately preceding word being quite irrelevant. Unfortunately, in the case of the soft mutation of direct objects the historical evidence is far from clear as to the origin of the current distribution. Some insight can be gleaned by looking at the soft mutation of such noun phrases in Middle Welsh (Evans 1970: 17–19); Middle Welsh covers the period from the twelfth to the end of the fourteenth century, and is the earliest period for which extensive documentation of continuous Welsh text is attested. In Middle Welsh, subjects underwent soft mutation after certain verbal forms (something that does not happen in the modern language), but not after others, though with a certain amount of variation. In addition, the subject undergoes soft mutation if it is separated from its verb, in presentative sentences, for instance, something that is also true of the modern language. In Middle Welsh, soft mutation of the direct object is usual, especially if it separated from its verb, and if the direct object is adjacent to its verb lack of soft mutation is particularly common after certain verb forms. The behavior of subjects and objects when immediately following the verb might be attributable to the operation of analogy upon a distribution originally conditioned by the final segment of the verb, although even in Middle Welsh such a situation would already have evolved considerably, since direct objects are much more likely to undergo soft mutation than are subjects after the same verb form. The reason for increased incidence of soft mutation when the noun phrase is separated from its verb is especially unclear, since there is no particular reason to assume that the intervening string of elements would have been particularly likely to end in a vowel. This is thus one of those cases where one would have liked to be present at the time the change took place. There is not, to my knowledge, any detailed explanation as to why the present distribution of soft mutation with subjects and objects is found, and the Middle Welsh distribution also involves a fair amount of diachronic mystery. If we compare our expectations from the Indo-European etymology with the earliest attested Welsh, then one certainly has the impression that soft mutation has wandered to mark new categories, indeed by the time of the modern language to distinguish subjects (not mutated, unless separated from the verb) from direct objects (mutated, even if adjacent to the verb). But the lack of direct knowledge of the intervening stages means that this cannot stand as a clear counterexample to the prohibition of wandering morphophonological alternations. And it is clear that traditional historical linguists have been puzzled by the attested distribution in the various periods.

There is another example, this time from Irish, which comes somewhat closer to providing an instance of the wandering of a morphophonological alternation, in this case lenition, although an explanation via analogy is also possible, even if the analogy is this time somewhat more diffuse. In Irish, definite nouns used attributively (typically, as possessors, in a broad sense of that term) undergo lenition (Ó Siadhail 1989: 120). In order to understand such examples, it is necessary to know that in Irish the possessor follows the possessed, and that the possessed noun phrase is normally interpreted as definite but cannot take an explicit definite article.[5] Thus, the genitive of 'Thomas' is *Tomáis*, but 'Thomas's chair' is *cathaoir Thomáis*; *barr an ualaigh* is 'the top of the load' — already a possessive construction — but 'the rope of (that is, for securing) the top of the load' is *téad bharr an ualaigh*.[6] It is known from the textual attestation that this lenition is an innovation, and indeed there are still exceptions in certain set phrases, for example, *Lá Fhéil Padraig* 'St. Patrick's Day', literally 'day festival Patrick'. Since this use of lenition cannot be explained in terms of the original, phonetically conditioned distribution of lenition, the question arises whether it can be considered an instance of analogy, or whether it must rather be considered a case of the wandering of a morphophonological alternation. There are possible bases for analogy, but they are not particularly close, and tend to involve a rather vague notion of lenition characterizing the dependent in some, but by no means all or even most, nominal modifying constructions. Within noun phrases, lenition is found as follows: (i) adjectives are lenited after a masculine genitive head noun; (ii) adjectives are lenited after a masculine vocative head noun; (iii) adjectives are lenited after a feminine nominative head noun; (iv) adjectives are lenited after a plural noun ending in a consonant. It will be noted that each of these includes restricting factors (some combination of gender, case, number, even preceding segment) that do not characterize possessor lenition, where the restriction is quite different: definiteness. Thus, if these instances of lenition were to spread analogically, there are much more likely areas for them to expand into, for instance to other genders, cases, or numbers. Another possible analogy would be compound nouns, where the second component is lenited, as in *cúlchaint* 'gossip, backbiting', cf. *cúl* 'back', *caint* 'speech'. Here, comparison with other Indo-European languages suggests that the first part would have been vowel final, as in Ancient Greek *khorodidáskalos* 'chorus teacher', and even more closely Continental Celtic forms such as Gaulish names like *Cingeto-rix* 'heroes' king'. But there are still substantial differences: for instance, in compounds the constituent order is head-final, that is, it is the head that is lenited, whereas in the possessive construction it is the dependent that is lenited. To the extent that one can use analogy here, it is a very extended notion of analogy.

As the final sets of examples in this section, we will return to Welsh, which provides further instances of the spread of particular mutations to new environments. One such phenomenon is found in a number of varieties of Welsh in which the soft mutation is tending to replace at least some instances of the other mutations. In standard Welsh, the preposition *yn* 'in' requires a following nasal mutation, as expected from its etymology (cf. Latin *in*), so that from *Caerdydd* 'Cardiff' we form *yng Nghaerdydd* 'in Cardiff'. In some dialects, however, we find, as an innovation, soft mutation here, i.e. *yn Gaerdydd*. In other words, soft mutation is moving into new environments, taking over the territory of other mutations. But since the set of environments for contact mutation in Welsh is synchronically arbitrary, one could readily imagine analogy leading a particular element to lose its ability to trigger a following mutation, or to acquire this ability, or to substitute one mutation for another, by the general transparent application of analogy. Indeed, Dressler (1991) notes a variety of Breton where all the mutations have been replaced by a single mutation, corresponding historically to Welsh soft mutation.

A more complex situation is provided by the so-called mixed mutation in Welsh, which occurs in some varieties of Welsh (including the standard language) after the negative particles *ni*, *na*. Traditionally, these particles took aspirate mutation, that is, only the consonants *c*, *t*, *p* were affected, and this is the situation found in Middle Welsh — other consonants simply remained unmutated. If one assumes that the prevocalic forms of these particles, *nid* and *nac* (pronounced [nag]) respectively, are closer to the original forms, then this would be an expected instance of aspirate mutation after a preceding nonnasal consonant.[7] However, the mutation has been reanalyzed to the extent that it occurs even if the negative particle is omitted, as is possible with *ni*.[8] As an innovation in some varieties of Welsh, including the standard, after these negative particles (including cases where *ni* is dropped), the consonants *g*, *d*, *b*, *m*, *ll*, *rh* show the soft mutation. Note that in these varieties it is not possible to use soft mutation of *c*, *t*, *p* under these conditions — that is, this is not simple replacement of aspirate mutation by soft mutation. The mixed mutation thus consists of aspirate mutation where overt, and of soft mutation elsewhere. The traditional explanation is that, in the absence of the possibility of showing any change by means of the aspirate mutation for initial consonants other than *c*, *t*, *p*, the soft mutation is brought into play in order to show an overt change of initial consonant; note that this implies 'wandering' of a mutation specifically to carry out a new function. It is less easy to subsume this under analogy, since it does not involve a general spread of soft mutation to the position after negative particles. Nor can one fully justify an alternative explanation, claiming that the fricativizing character of aspirate mutation is simply extended as a literal phonetic process to other segments: this could in principle account for the fricativization of *g*, *d*, *b* (and perhaps *m*) — this fricativization then being purely by chance equivalent to the operation of soft mutation — but it would not be able to account for the mutation of *ll* and *rh*, which involves voicing.

The consideration of Celtic mutations has been deliberately rather extensive. While some of the innovations can rather readily be subsumed under analogy, others are less clear: either the historical development is unclear because of lack of direct historical evidence, or the notion of analogy to which appeal must be made is dangerously tenuous, threatening to make the empirical claim vacuous.

2.2 Initial gemination (*raddoppiamento*) in Italian

The phenomenon of initial raddoppiamento (raddoppiamento sintattico, doubling, gemination) is one of the classical themes in Italian (morpho-) phonology. After certain words ending in a vowel, with a fair amount of dialect variation, the initial consonant of a following word is geminated. Of particular interest here will be the incidence of raddoppiamento after an unstressed vowel, for example, the final unstressed vowel of a polysyllable, or the sole vowel of an unstressed item like an article, preposition, or conjunction.[9] In the core cases, an original final consonant (visible, for instance, in the Latin etymon) is the historical cause of raddoppiamento. Thus, raddoppiamento is found after the conjunction *e* 'and', deriving from Latin *et*, so that *e Roma* is pronounced [e rˈroma]. By contrast, *di* 'of', from Latin *de*, without a final consonant, does not cause raddoppiamento, so that *di Roma* 'of Rome' is pronounced [di ˈroma]. However, as with the Celtic mutations, the list of items that trigger raddoppiamento is synchronically arbitrary, so that some items do not behave as expected historically; for instance, *come* 'how, like', deriving ultimately from Latin *quomodo*, does trigger raddoppiamento: *come Roma* 'like Rome' is pronounced [kome rˈroma].

In standard Italian, based on Tuscan usage, raddoppiamento essentially has no strictly morphological function, but this situation changes as one moves further south to dialects like Neapolitan, from which the following examples are taken — more specifically, from the material presented in Rohlfs (1968: 106–10, 207–9). Here, the absence versus presence of raddoppiamento can, for instance, be the sole indicator of the difference between the so-called masculine and neuter genders. In southern Italian dialects, this gender difference is primarily semantic with nonfeminine nouns, the so-called masculine being used with count nouns, the so-called neuter with mass nouns, so that we have masculine gender (without raddoppiamento) in [o ˈkanə] 'the dog', but raddoppiamento in [o mˈmɛlə] 'the honey'. With a noun that has both count and mass interpretations, for example 'iron' (implement for ironing clothes; metal), the absence versus presence of raddoppiamento distinguishes the two meanings. Etymologically, the difference correlates with etymologically distinct forms of the definite article, the masculine form continuing vowel-final Latin masculine *ille*, the neuter form consonant-final *illud*. With demonstrative pronouns, the masculine and neuter forms are overtly distinct, as well as differing in their effect with respect to raddoppiamento, as in masculine [ˈkistə] 'this' (not triggering raddoppiamento) versus neuter [ˈkestə] (triggering raddoppiamento); compare Latin masculine *iste* versus neuter *istud*.[10] In these examples distinguishing masculine from neuter, the absence versus presence of raddoppiamento derives directly from the Latin masculine (vowel-final) and neuter (consonant-final) forms, even if masculine and neuter have been reinterpreted semantically in southern Italian dialects as expressions of the count/mass distinction.

The distinction is different, however, when we turn to the masculine/feminine gender opposition in the plural. Here, Neapolitan, like many southern dialects, has no raddoppiamento after the masculine plural article, but does have raddoppiamento after the feminine plural article, and this distinction carries over to certain other forms. For example, masculine plural nouns show no raddoppiamento after a preceding demonstrative or adjective, while feminine nouns do, as in [e ˈfiʎʎə] 'the sons' versus [e fˈfiʎʎə] 'the daughters'; note that in this pair, because of neutralizations of unstressed vowels, the absence versus presence of raddoppiamento is the only feature distinguishing between masculine and feminine. Here, there is no readily apparent etymological basis for the distinction, since both the Latin masculine plural etymon *illī* and the feminine plural etymon *illae* are vowel-final. Could this therefore be an example of an existing morphophonological alternation, raddoppiamento, extending itself to mark a new morphological opposition?

Scholars of the history of the Italian language have indeed addressed themselves to this question, and have proposed that there is a historical basis for this differentiation of gender in the plural. In fact, at least two suggestions have been put forward (they are summarized in Rohlfs 1968: 108). The first is that there may have been, in late nonstandard Latin usage, an alternative feminine plural form with final *-c* [k], †*illaec* (where the symbol † indicates an unattested form),[11] parallel to such forms as the neuter plural *haec* 'these', where the final *-c* is etymologically a particle (*-ce*) added to the end of the form. The second is that there may have been an alternative form †*illaes*, with the final *s* deriving by analogy from the final *-s* of nominative plural nouns of the third declension (*clavēs* 'keys', for instance), and parallel forms such as the adjective *bonaes* 'good' are found in inscriptions. Although neither hypothesis is perhaps compelling — for instance, why was not *-c* also attached to the masculine plural? and likewise *-s*, since there are also masculine third declension nouns with a nominative plural ending in *-s*? — at least they have the advantage of shifting the problem to the often idiosyncratic behavior of analogy, rather than assuming that a morphophonological alternation wandered across to mark a new opposition. The fact that historical linguistics have preferred these appeals to analogy is again indicative of their intuitive acceptance of the generalization that morphophonological alternations should not simply be assumed to have wandered.

2.3 Initial gemination in Maltese loan verbs

As the last instance of a morphophonological alternation, this section will consider the use of initial consonant gemination as a marker of 'undigested' (that is, not fully assimilated) borrowed verbs in Maltese; rich empirical material is presented by Mifsud (1995: 142–68, 219–21), from whom the term 'undigested' is taken. In Maltese, many loan verbs from Sicilian and Italian have an initial geminate consonant, which seems to find no basis in the source language, and which in Maltese will serve to distinguish the verb from the derivationally related noun or adjective.[12] Examples are given in (3). The first column gives the Maltese verb, in the third person singular past ('perfect') form (as will be true of all other cited Maltese verb forms). The second column gives the Italian/Sicilian etymon (with some slight hedges on aspects of the forms that are not relevant to the present discussion); since the Maltese forms have nonfinal stress, they are taken most directly not from the Italian/Sicilian infinitive, but rather from a form such as the third person singular present indicative or the second person singular imperative. The third column gives the English translation of the Maltese verb. The fourth column gives the corresponding Maltese noun or adjective, with its gloss in the last column.

(3)	*ffirma*	< *firma-*	'sign'	cf.	*firma*	'signature'
	ggverna	< *governa-*	'govern'		*gvern*	'government'
	pprova	< *prova-*	'prove'		*prova*	'proof'
	ttondja	< *tonda-*	'make/become round'		*tond*	'round'

In the case of the last item, there is a further derivational suffix *-ja* in the verb which will not be of concern to us here; Mifsud suggests that it originates in the productive Sicilian frequentative verb suffix *-ia*(*ri*). A similar pattern is found in loan verbs from English, this time with effectively no exceptions to the initial geminate consonant (and the derivational suffix *-ja*); again, the verbs are clearly distinct from corresponding nouns and adjectives, where such exist. In (4), the first column gives the Maltese verb (third person singular past), the second the English gloss of the Maltese verb, while the last column gives the related Maltese noun (whose English gloss will be homophonous with that of the verb).

(4)	*pparkja*	'park'	cf. noun: *park*
	sswervja	'swerve'	
	żżumja	'zoom'	*żum*

The question that arises is how this morphophonological alternation arose. It could, of course, within the terms of Ford and Singh's hypothesis, be a spontaneous innovation. Interestingly, Mifsud tries rather to find an explanation either internal to Maltese or in terms of the interaction of Maltese with Italian/Sicilian, though acknowledging that he is unable to come up with a really convincing historical origin for the gemination. The Maltese-internal origin that he considers is that some pairs of transitive and intransitive verbs in Maltese are related by means of apparent gemination of the initial consonant, e.g. *żewweġ* 'marry' (for instance, said of a priest uniting a couple in matrimony), *ż-żewweġ* 'get married'. However, there are at least two serious problems with this hypothesis. First, this initial gemination is found only with intransitive verbs, whereas the initial gemination of loan verbs is independent of transitivity; even some of the verbs listed above either must or may be transitive. Second, the gemination is actually accidental; the real marker of intransitivity in such verbs in Maltese is the prefix *t-*, as in *qaddes* 'sanctify', *t-qaddes* 'be sanctified'; before certain initial consonants (*s*, *x* [š], and *ż* [z]), and only before these, this *t-* obligatorily assimilates to the initial consonant; this derivational pattern would thus not account for geminate initial consonants other than these three. The contact explanation relies on the fact that some southern Italian dialects have sporadic unconditioned initial gemination; indeed, the dialect of Pantelleria (an island located, like the Maltese archipelago, between Sicily and North Africa) has some initial gemination in verbs that lack such gemination in mainstream Sicilian, such as *nnigári* 'deny'. But in none of these dialects is the gemination restricted to verbs; moreover, it usually applies only to certain consonants. The initial gemination of unassimilated loan verbs in Maltese thus remains unexplained diachronically. My aim in this subsection has not been to propose a new explanation (I have none), but rather to illustrate a diachronically perplexing morphophonological alternation, but one where linguists nonetheless feel compelled to seek a historical explanation.

3. Affixation

We may now turn to the question of whether the property claimed for morphophonological alternations by Ford and Singh, to the extent to which it can be maintained, is characteristic specifically of morphophonological alternations, or whether it is not equally characteristic of affixation, the other major means of indicating morphological oppositions. In other words, can affixes wander? Is an affix marking one morphological opposition likely to be selected as the marker of some other morphological opposition?

Clearly, the empirical material that would have to be sifted through in order to answer this question is enormous, and instead of attempting this daunting task I have rather selected one restricted but nonetheless rich source of potential material, namely the treatment of analogical extension of morphological affixes in the Slavic languages presented in Janda (1996). This book is a particularly rich documentation of instances of the analogical extension of suffixes, and might therefore be expected to provide evidence of the 'wandering' of affixes, if such is indeed possible. Yet nearly all the material presented by Janda can be subsumed under a narrow traditional conception of analogy, such that a particular affix that is used under one set of circumstances to mark a particular morphological category extends to mark this same morphological category under other circumstances. A good illustration of this is the relation between the Slavic suffixes marking the dative case of nouns in *o*-stems and in *u*-stems (Janda 1996: 169–70). The former is the main declension class of masculine nouns in the attested Slavic languages, the latter a small class in the process of disappearing as a distinct class from the earliest attestations. But in some Slavic languages, especially the West Slavic languages and Ukrainian, certain suffixes of the *u*-stem declension have spread to compete with and in some instances replace the original *o*-stem suffixes. In Polish, for instance, the *u*-stem dative singular suffix *-owi* is now the normal suffix, rather than the original *o*-stem suffix *-u* (now restricted to a handful of nouns); thus, the dative singular of the etymologically *o*-stem Polish noun *sąsiad* 'neighbor' is *sąsiad-owi*. Something similar has happened in Czech, albeit restricted to animate nouns, in addition to which here old *o*-stem and new *u*-stem forms are often in competition; for example, *soused* 'neighbor', dative singular *soused-ovi* (alongside *soused-u*). So far, this is straightforward analogy: the suffix of the *u*-stem dative singular has spread to the *o*-stem declension.

But in one respect, Czech (but not Polish) has taken this a step further. In Czech, *soused-ovi* can also be used, alongside *soused-u*, as locative singular. This has no direct etymological basis: The expected *o*-stem suffix in the locative singular would be *-ě*, and this is indeed found with some inanimate nouns; *-u* is the expected *u*-stem locative singular suffix. The suffix *-ovi*, however, is etymologically justifiable only as a dative singular suffix, and thus appears to have wandered to mark also locative singular. However, with a somewhat broader concept of analogy, as was used in some of the discussion in Section 2, the Czech example can also be treated as an instance of analogy. In several declension classes in Czech, there is syncretism of dative and locative singular. In the *a*-stem declension, the main declension class for feminine nouns, the syncretism continues the Common Slavic situation, as in *žena* 'woman', dative/locative singular *ženě*. In the case of the dative/locative singular form *soused-u*, the dative form is the etymologically expected *o*-stem form, the locative form borrowed from the *u*-stem declension. What is then extended analogically is not so much a particular suffix, but rather the pattern of dative–locative syncretism, so that by analogy to dative/locative singular *ženě* or *soused-u*, the dative singular *soused-ovi* licenses a new syncretic dative/locative singular. This analysis places clear constraints on the possible apparent wandering of suffixes: the dative singular suffix *-ovi* could not, for instance, suddenly spread to mark the instrumental singular, since Czech noun declension does not have instances of dative–instrumental syncretism that could serve as a model.

4. Conclusions

In this chapter, a number of examples of historical changes involving morphophonological alternations have been examined. Some of them, though seemingly idiosyncratic synchronically, have a ready diachronic explanation in terms of earlier segments that have since been lost. Some of the exceptions can readily be treated as analogical extensions, and indeed historical linguists seem to have expected that this should be the case, since they have tried to propose explanations of this kind for less clear cases, in particular where the relevant historical evidence is lacking but can plausibly (not necessarily correctly!) be extrapolated. But there remains a small set of cases where the positing of analogy makes the notion so tenuous that there is a danger of circularity, emptying of its empirical content the claim that morphophonological alternations do not wander. In addition, investigation of the behavior of affixes suggests that the constraint against wandering, to the extent that it holds, is true equally of affixes, and is not a particular property of morphophonological alternations. While this chapter started off wondering whether morphophonological alternations can wander, perhaps the more compelling question is actually whether affixes can wander.

Notes

1. I wish also to thank the participants in the Vienna Morphology Conference 2000 for discussion on many of the points in this chapter; in particular Michele Loporcaro for raddoppiamento (fono)sintattico in Italian (see also Loporcaro 1997), and Wolfgang Dressler for initial mutation in Breton.

2. For instance, I have left out of account some more specific irregularities, and also some dialectally restricted instances of lenition, e.g. those affecting the liquids and *n*.

3. For instance, the fact that *ll* and *rh* fail to undergo soft mutation in some environments where the other initial consonants are affected.

4. Obviously, this does not imply that the Celtic forms 'derive' historically from Latin or Ancient Greek forms. The Latin forms are simply standing in for Celtic forms reconstructable on the basis of comparison with other Indo-European languages.

5. This often strikes English speakers as strange, though in fact a similar phenomenon is found in English, where the noun phrase *Thomas's chair* must be interpreted as definite but may not carry a definite article. Perhaps the strangeness stems from the difference in word order, which also means that in Irish definite article and possessor do not occupy the same linear position, since the definite article precedes its noun, while a possessor follows; in English, both precede.

6. *Barr* 'top' happens to have the same form in nominative and genitive.

7. The aspirate mutation is rare in the modern language, even in conservative varieties. One striking instance is after the possessive pronoun *ei* 'her', e.g. *pen* 'head', but *ei phen* 'her head'. This contrasts with the homophonous form *ei* 'his', which requires soft mutation, e.g. *ei ben* 'his head'. The gender distinction goes back to a masculine genitive singular in *-ī versus a feminine genitive singular in *-(*j*)*ās*. Two other items triggering aspirate mutation are the numerals *tri* (cf. Latin *trēs*) and *chwech* 'six' (cf. Latin *sex* [seks]).

8. Welsh has a double negation *ni . . . ddim*, with a tendency in the modern language for *ni* to be dropped and *ddim* to take over as the prime marker of negation; compare the parallel development of French *ne . . . pas*.

9. In many varieties of Italian, a final stressed vowel automatically conditions raddoppiamento, so that the interesting variations discussed in the text play no role here.

10. The initial velar derives from the Latin particle *ecce* 'lo, behold'.

11. The form *illaec* (feminine plural) is actually attested in early Latin, but it is not clear that the hypothesized late nonstandard forms would be a direct continuation of this.

12. In isolation, the initial geminate consonant is preceded by the vowel *i*, e.g. *iffirma*. However, this vowel is epenthetic, and does not show up if the preceding word ends in a vowel.

References

Dressler, Wolfgang U. 1991. "Sociolinguistic and Patholinguistic Attrition of Breton Phonology, Morphology and Morphonology". *First Language Attrition* ed. by Herbert W. Seliger and Robert M. Vago, 99–112. Cambridge: Cambridge University Press.

Evans, D. Simon. 1970. *A Grammar of Middle Welsh*. Dublin: The Dublin Institute for Advanced Studies.

Ford, Alan & Rajendra Singh. 1983. "On the Status of Morphophonology". *Papers from the Parasession on the Interplay of Phonology, Morphology, and Syntax*, ed. by John F. Richardson, Mitchell Marks, and Amy Chukerman, 63–78. Chicago: Chicago Linguistic Society.

Janda, Laura A. 1996. *Back from the Brink: A Study of How Relic Forms in Languages Serve as Source Material for Analogical Extension*. Munich & Newcastle: LINCOM Europa.

Lewis, Henry & Holger Pedersen. 1937. *A Concise Comparative Celtic Grammar*. Göttingen: Vandenhoeck & Ruprecht.

Loporcaro, Michele. 1997. *L'origine del raddoppiamento fonosintattico: Saggio di fonologia diacronica romanza*. Basel & Tübingen: Francke.

Mifsud, Manwel. 1995. *Loan Verbs in Maltese: A Descriptive and Comparative Study*. Leiden, New York & Cologne: E. J. Brill.

Ó Siadhail, Mícheál. 1989. *Modern Irish: Grammatical Structure and Dialectal Variation*. Cambridge: Cambridge University Press.

Rohlfs, Gerhard. 1968. *Grammatica storica della lingua italiana e dei suoi dialetti, morfologia*. Torino: Einaudi. [Updated from German original of 1949.]

Thorne, David A. 1993. *A Comprehensive Welsh Grammar*. Oxford: Blackwell.

Thurneysen, Rudolf. 1946. *A Grammar of Old Irish*. Dublin: Dublin Institute for Advanced Studies. [Revised and enlarged from German original of 1909.]

CHAPTER 7

Morphology, typology, computation[1]

Greville G. Corbett, Dunstan Brown and Nicholas Evans
University of Surrey (GGC and DB) and University of Melbourne (NE)

Introduction

We were asked to write on computational matters in morphology, and have combined this with a typological view. This is thus a reflective and prospective chapter. We review joint research, including work involving Norman Fraser. We shall draw out general points, which we hope will shed interesting light on our topic. We shall not justify the analyses, which are either already published or will be published: our intention in this chapter is to take a more general view.

1. Morphology and typology

These form an obvious combination. The earliest 'whole language' typologies were based on morphology. The tradition persists, since morphologists tend to be typologically inclined. While a good deal of recent work in typology has been concerned with constructions, alongside this work there has also been work on the typology of categories: aspect, gender, case, number and so on. A newer trend, which was evident at the previous Vienna meeting in 1996, is research on the typology of morphological phenomena, notably defectiveness and suppletion. It seems inevitable, as well as desirable, that morphology will continue to have a strong typological slant.

2. Computation and typology

Typology requires *computational methods* as much as other disciplines, probably more than many. Here are just some possible examples. First, sampling is a special problem in typology, and computational aids may prove valuable: see the work of Rijkoff, Bakker, Hengeveld and Kahrel (1993) and Bakker (1994: 84–91). Second, databases, with the structuring now possible, have great potential. There are several at different stages. A significant one is Dryer's database which is typological in the most direct way, and from which helpful maps can be derived (http://wings.buffalo.edu/soc-sci/linguistics/dryer/dryer.htm). At Surrey we are working on databases on syncretism (Matthew Baerman, Dunstan Brown and Greville Corbett) and on agreement (Julia Barron, Dunstan Brown, Greville Corbett, Andrew Hippisley and Carole Tiberius), which will have a substantial amount of information on a restricted number of diverse languages. Third, statistical techniques, which used to be complex and laborious, are now much easier to apply computationally, and the results can be presented in ways which are easier to grasp.

However, it is not just a matter of appropriate computational tools. Typology belongs also with computational linguistics, in more principled ways. Computational linguistics can offer ways of demonstrating that particular analyses are valid (in the sense of demonstrating that they account for the data). Take the example of an analysis of gender assignment in languages like Russian, which is crucial for a typology of such systems. That account has been published (Fraser and Corbett 1995): here we will just sketch it as an illustration of the general point, that of genuine interaction between computational linguistics and typology.

Gender systems have agreement as their defining characteristic. Nouns of a gender language can be grouped analytically according to agreement evidence. We then ask how the native speaker, who produces the agreement evidence, 'knows' the gender of the different nouns. Assignment to a gender is always possible for the great majority of nouns, from information required independently in the lexical entry (Corbett 1991: 7–69) and the particular type of information used gives us a typology of assignment systems. We find *semantic systems* (where only semantic information is required) and *semantic + formal systems* (where semantic information is supplemented by morphological and/or phonological information). Purely formal systems (where gender would be predicted by formal means but where the different agreement classes of nouns would have no semantic significance) are not found.

Godoberi is an example of a semantic assignment system (Kibrik 1996). In this Nakh-Daghestanian language of the Botlikh area of Daghestan, nouns are assigned to three genders as follows: nouns denoting male rationals, like *ima* 'father', are masculine; female rationals, like *ila* 'mother', are feminine, and all others, such as *hamaXi* 'donkey', are neuter. This simple assignment system predicts gender without reference to form.

The other main type of assignment system also uses semantic information but supplements it with formal information (phonological or morphological). In Qafar (Afar), an East Cushitic language (Parker and Hayward 1985) nouns denoting male humans and the males of sexually differentiable animals are masculine (*bàqla* 'husband') and females (human and animal) are feminine (*barrà* 'woman, wife'). The phonological assignment rules are that nouns whose citation form ends in an accented vowel are feminine (*catò* 'help') while others are masculine (*gilàl* 'winter', *baànta* 'trumpet'). There are few exceptions to these phonological rules and when the two sets of rules conflict, the semantic takes precedence.

Semantic systems and formal-phonological systems are relatively unproblematic. The most difficult are the formal-morphological systems. These have often been analysed differently; instead of gender being predictable, some treat gender as specified, and from it attempt to predict the morphological class. When the number of genders and the number of declensional classes are the same or nearly so, it is not immediately obvious which analysis is to be preferred. We propose that Russian is one of many languages with a gender assignment system in which morphological information supplements semantics. Russian has fairly standard semantic assignment rules: sex-differentiable nouns denoting males (humans and higher animals) are masculine: *d′ad′a* 'uncle', *lev* 'lion', while sex-differentiable nouns denoting females are feminine: *t′ot′a* 'aunt', *l′v′ica* 'lioness' (Russian examples are transcribed, with *i* and *y* treated as allophones). There are few exceptions to these rules but many nouns are simply not covered by them. Unlike Godoberi, Russian does not treat all nouns in the semantic residue in the same fashion. They are subject to further rules, notably the following morphological assignment rules. Russian has arguably four inflectional classes of nouns. Given this, we can predict the gender: nouns of declensional class I (*zakon* 'law' type) are masculine; nouns of declensional classes II (*komnata* 'room') and III (*kost′* 'bone') are feminine; others are neuter.

Given the dispute as to whether this is the right analysis, there are two traditional types of argument available here. First, and most important, there are language-specific arguments. It can be shown that predicting gender on the basis of declensional class is simpler and involves fewer exceptions than the attempt to predict declensional class on the basis of gender (Corbett 1982). Second, there is the typological argument: since there are many languages where gender is straightforwardly predictable, it is simpler to claim that it is predictable in all languages, with typological variation being restricted to the type of information used for prediction.

There is also a third type of argument; if we can demonstrate that one approach works, this gives it a certain validity. It does not, of course, show that it is right but it removes a potential objection and leaves the onus on those favouring the alternative to investigate whether it actually works. Our demonstration is within the framework known as Network Morphology (Corbett and Fraser 1993, Brown et al. 1996, Fraser and Corbett 1997, Brown 1998). This framework belongs in the Word and Paradigm family of theories. In Stump's helpful characterization it is of the inferential-realizational type (Stump 2001). Network Morphology is typologically informed, and has a tradition of implementing analyses to demonstrate their validity. The means used has been the lexical knowledge representation language DATR (Evans and Gazdar 1996). DATR has been conceptually helpful, since it is based on the notion of default inheritance, which has proved valuable in approaching morphological problems and allows us to demonstrate that our analysis of Russian inflectional morphology and gender assignment does indeed yield the correct results. As an illustration, consider the following lexical entry:

(1)
```
Komnata:
    <> == NOUN
    <declensional_class> == N_II: <>
    <gloss> == room
    <infl_root all> == komnat.
```

Komnata is merely a label or address for stored information: it could equally be '42'. Given this minimal entry, consisting of category, declensional class, gloss and stem, the following information is available from our account:

(2)
```
Komnata: <gloss> = room.
Komnata: <mor sg nom> = komnat _a.
Komnata: <mor sg acc> = komnat _u.
Komnata: <mor sg gen> = komnat _i.
Komnata: <mor sg dat> = komnat _e.
Komnata: <mor sg inst> = komnat _oj.
Komnata: <mor loc sg> = komnat _e.
Komnata: <mor pl nom> = komnat _i.
Komnata: <mor pl acc> = komnat _i.
Komnata: <mor pl gen> = komnat.
Komnata: <mor pl dat> = komnat _a _m.
```

Komnata: <mor pl inst> = komnat _a _m'i.
Komnata: <mor pl loc> = komnat _a _x.
Komnata: <syn gender> = fem.
Komnata: <syn animacy> = inanimate.

The important point is that the inflectional forms and the gender are correctly predicted. The full analysis (Fraser and Corbett 1995) covers much more completely the interrelations of semantics, gender, declensional class and phonology. However, the aim of this section is not to justify that analysis. Rather we want to emphasize that this analysis, that of a theoretical linguist working within the Network Morphology framework, can be shown to work using computational methods. Other analyses of gender in Russian are not backed by similar demonstrations of accuracy. Thus formal tools like DATR can elucidate cases which are crucial for typological purposes.

3. Morphology and computation

We now turn to the interaction of morphology and computation. A useful type of interaction has already been alluded to: computational linguistics can provide means of *validation*, of checking whether a particular theory covers the data it is claimed to cover. This is particularly relevant since morphology is a branch of linguistics where there is frequently a single 'right answer'. Some will ask whether we cannot do the checking by hand. Consider these data from Dalabon, an Australian language of the Gunwinyguan family from central Arnhem Land (Evans, Brown and Corbett forthcoming a).

Table 1 summarizes the transitive paradigm of pronominal affixes, showing how the 102 distinct combinations are generated, the numbers of possibilities in square brackets being multiplied to give the numbers in the cells.[2] In addition, there are six tense/aspect /mood combinations, giving a total of $102 \times 6 = 612$ forms. Then there are fascinating patterns of syncretism. Faced with paradigms like this, it makes sense to have the computer check that the analysis is indeed valid. This is not an idle example: before the computer check was done, the authors had an incorrect number of combinations in the table.

Second computational work can offer *new ideas*, such as the now prevalent notion of 'default'. Linguists have used this notion in contradictory ways, and we therefore discuss a distinction drawn within the Network Morphology framework: 'normal case default' and 'exceptional case default'. The normal case default is the outcome expected for a given domain, while the exceptional

Table 1. Number of subject/object combinations in Dalabon

	Objects			
Subjects	1st exclusive [3]: 1sg, 1du, 1pl	1st inclusive [2]: 1inc.du, 1inc.pl	2nd [3]: 2sg, 2du, 2pl	3rd [3]: 3sg, 3du, 3pl
1 excl.sg 1 excl.du [4] 1 excl.dis 1 excl.pl			12	12
1inc.du 1inc.dis [3] 1inc.pl				9
2sg 2du [4] 2dis 2pl	12			12
3sg 3dis [4] 3du 3pl	12	8	12	13 [includes distinct 3/3 forms for higher and lower object]

case default is what an item may have as a last resort. Let us return to gender in Russian. By default nouns are assigned to the first inflectional class: this class has the largest number of nouns and takes the majority of borrowings. According to our assignment rules, nouns in inflectional class I are by default masculine, so that we make masculine the default gender for nouns, without specifying it directly (for the implementation see Corbett and Fraser 2000).

While having masculine as the default gender fits with the intuitions of some investigators, it seems unsatisfactory to others. If masculine is *the* default gender for Russian, then we would expect it to appear, for instance, in examples like the following (transliterated, from Paustovskij, *Sud'ba Šarlja Lonsevilja*):

(3) *Nočju exat' stal-o nevozmožn-o*
by.night to.travel became-NEUT.SG impossible-NEUT.SG
'It became impossible to travel by night.'

Here there is no normal subject, that is a noun phrase headed by a noun or pronoun; but the verb and adjective must still take an agreement form and they take the neuter, not the masculine.

The resolution of this apparent paradox is that we are claiming only that the masculine is the default gender for *nouns*. Taking a broader view, we would claim that there is a default for gender at a higher level than the nodes relating directly to nouns. This higher default is necessary for items other than nominals which may head syntactic constituents with which gender agreement is required. The situation arises if an infinitive phrase or a clause stands in subject position, or there is an interjection or other quoted material, or no subject at all. Here we normally find the neuter.

Let us think of defaults more generally. Consider the following situation. Sigrid and Klaus both work for a firm in Salzburg. Sigrid is the personnel manager and has her office in Salzburg. Occasionally, when there are problems or training courses she spends the day at head office in Vienna. By default, then, Sigrid works in the office at Salzburg. Klaus is a salesman. He normally spends Mondays in the south of Austria, Tuesdays in the west, and Wednesdays and Thursdays in the north. If, however, clients cannot see him, or his car is unserviceable, or there is a department meeting, he goes to the office in Salzburg. On Fridays he often plays golf, but if it rains he goes to the office. By default, then, Klaus also works in the office in Salzburg. Intuitively the two cases are rather different. Sigrid is 'normally' at the office, Klaus is not. And yet at a higher level of abstraction it is true to say that the office is the default workplace for both. It is these two types of default, both reasonable uses of the term, which have led to the differences in usage in the literature, both generally and specifically in relation to gender.

In our analysis of the gender system of Arapesh (Fraser and Corbett 1997) based on Aronoff (1992) and Fortune (1942) we distinguish these two types of default. In the first type, the default accounts for the cases when 'everything goes right' (as in Sigrid working in the office); this is the *normal case default*. In the second use, a default is something which applies when the normal system breaks down, when 'something goes wrong' (as in Klaus working in the office). This is the *exceptional case default*. One form of default is concerned with the typical, the other with the exceptional.

4. Morphology, typology, computation

These two types of contribution from computational linguistics, validation and new ideas, come together with morphology and typology in an analysis of the gender and morphological class systems of Mayali, a non-Pama-Nyungan language of northern Australia. Mayali requires us to extend the typology of gender systems, its system is clarified by use of the notions of 'normal case default' and 'exceptional case default', and using DATR allows us to demonstrate the extent to which our analysis captures the recorded facts of Mayali. This work is outlined very briefly as an example of possible convergences of morphology, typology and computation.

4.1 *Morphology: gender and morphological class in Mayali*

We use Mayali as a cover term for a dialect chain with a number of named varieties: Gundjeihmi, Kunwinjku, Kundedjnjenghmi, Kuninjku, Kune and Manyallaluk Mayali. See Evans (forthcoming) for a full discussion of these varieties, and see Evans (1997) and Evans, Brown and Corbett (1998, forthcoming b) for details of the analysis of Mayali. In Mayali both gender and the morphological class of the noun are assigned on the basis of semantics, but the semantic assignment systems for gender and morphological class differ. These systems overlap, but the exceptional behaviour of certain noun types can be accounted for only if the two are treated as separate. Although all dialects have basically the same system of morphological classes, they have significant differences in gender systems: Kunwinjku has all four genders, Gundjeihmi has lost the neuter gender, extending vegetable agreement to what in Kunwinjku are neuter nouns, and Kune has extended masculine agreement to all nouns and in the process got rid of all gender contrasts. It retains the formal marker of masculine gender on modifiers, and the full set of class prefixes on nouns. We give examples from Kunwinjku in Table 2.

The systems of gender and morphological class are logically independent, even though there is a large measure of congruence between them. (We use

Table 2. Typical gender/morphological class correlations in Kunwinjku

	Congruent examples	Examples with ø-class nouns with parallel semantics
Masculine	'good boy' *na-rangem na-mak*	'good man' *bininj na-mak*
Feminine	'good old.woman' *ngal-kohbanj ngal-mak*	'good woman' *daluk ngal-mak*
Vegetable	'good food' *man-me man-mak*	'good cheeky.yam' *kamarn man-mak*
Neuter	'good rock' *kun-wardde kun-mak*	'good water' *kukku kun-mak*

congruence for the situation exemplified by *man-me* and *ngal-kohbanj*, in which a noun has gender agreement of the same form as its (non-zero) class prefix.) A large proportion of animate nouns, and some inanimate nouns, have no overt class prefix (hence belonging to Class V, the 'zero class'); zero class nouns, nonetheless, belong to one of the four genders, as shown by the behaviour of their modifiers. See the right hand side of Table 2.

Finally there is a significant number of lexemes where morphological class and gender are non-congruent, e.g. *man-djewk* 'rain, rainwater', which controls masculine agreement. One of the formal challenges for our analysis, then, was to give semantic rules for class assignment that capture the large measure of congruence between the two systems of gender and noun-class, but can also operate independently in one domain or another.

4.2 Typology: relations between morphological class and gender

The semantics of assignment to gender, on the one hand, and morphological class, on the other, are independent but linked. We now ask what combinations are logically possible, and what representational mechanisms we use to allow specifications for gender and morphological class to be made independently, while exploiting the many predictable relations to avoid overspecification. Table 3 displays the grid of logically possible combinations between gender and morphological class. Many of the cells are empty or have just one or two highly marked entries: vegetable agreement is not found with nouns belonging to the basically animate Classes I and II; neuter agreement is not found with Classes I, II or III; feminine agreement is not found with Class III nouns, and with only one Class IV noun (*kun-dung* 'sun'). These gaps are due to the general principle that feminine gender will not be found with inanimates, nor the inanimate genders (vegetable and neuter) with nouns from the basically animate classes (I and II), and that the most marked gender (neuter) can only occur with nouns of the congruent class (IV) or the zero class.

In Table 3, dark shaded areas are unattested and pale shaded areas are attested only with a very few lexemes under highly specifiable conditions. We have space to consider here only the cells with substantial populations, which fall into three categories:

(a) the four 'congruent' cells, in which the gender and morphological class match formally, e.g. *na-worneng* 'joker at ceremony' (masc.), *ngal-yod* 'rainbow serpent', who is mythologically female (fem.), *man-dubang* 'ironwood tree' (veg.) and *kun-ngey* 'name' (neut.). For most types of noun with inanimate referents, e.g. nouns denoting plants and body parts, the default situation is for them to be in the appropriate one of these cells. For animates, on the other hand, this is the second rather than the first choice, since animates normally take no overt prefixation, going into class V but with the semantically appropriate gender. However, going into the congruent cell is then their second preference: in other words, simply by marking a lexical entry for such an entity as 'marked', one can predict with near certainty that it will go into the cell containing an overt morphological class congruent with its (semantically determined) gender.

This is of particular value for non-human animates: although we have to make an additional lexical stipulation concerning the choice between masculine and feminine, or I and II, we only have to do so on one dimension. For example, for a bird in the feminine gender with a class II prefix, we need to

Table 3. Possible combinations of gender and morphological class

Morphological class / Gender	I **na-**	II **(ng)al-**	III **man-/(ng)an-**	IV **kun-**	V Zero class
Masculine **na-**	congruent	Exceptions: biological sex	A few lexically specified exceptions	Many cases	Many cases (commonest pattern for animate masculines)
Feminine **(ng)al-**	Exception: biological sex	congruent		One exception: *kun-dung* 'sun'	Many cases (commonest pattern for animate feminines)
Vegetable **man-/(ng)an-**			congruent	Many cases	Some cases (occasional pattern for vegetable nouns)
Neuter **kun-**				congruent	Some cases (occasional pattern for neuter nouns)

specify that it is 'marked' for morphological class; from this we determine that it must take the congruent class, i.e. II. As an animate it would take class V by default. We would need to specify the morphological class directly in the lexical entry only if it had an overt prefix that was not congruent with its gender, e.g. a *na-* prefix but obligatory feminine agreement or vice versa. So far we have not found any such cases.

(b) the four cells with class V nouns. For animates, which normally eschew overt prefixation, as well as for implement terms, these are the default cells: zero prefixation, plus the semantically appropriate gender. For most inanimates, which prefer overt prefixation, these are the second choice in a way that mirrors the congruent cells as the second choice for animates: by simply marking inanimate nouns as 'marked', one can predict that they go into class V, with gender determined by their semantics.

(c) the two cells in which class IV nouns belong to one of the two default genders, i.e. masculine or vegetable. For masculine class IV nouns, this can reflect either the use of masculine gender for many implement and painting terms, e.g. *kun-rodjbe* 'red ochre' (masc.), or dual principles of semantic assignment. For vegetable class IV nouns, the situation is more complex. For many, their assignment results from two semantic principles, one in the domain of gender and one in the domain of morphological class.

Let us sum up. Some semantic principles are identical for both gender and morphological class. Some are specific to one domain or the other, e.g. the rules of assigning life-form plants to class IV, where the category of 'plant life-form' is relevant to morphological class but not gender, or 'fire', which operates (at least at this higher level of generality) just for gender. Many others, such as principles for assigning gender on the basis of sex, are most economically represented just for gender, with congruence rules and default-specification taking care of whether marking actually shows up as a non-zero morphological class. The model we are proposing thus allows us to distribute the semantically-based decisions in a number of ways, so that we can capture the interdependencies of the two systems without being forced to locate all semantic information in one or the other.

4.3 *Results*

We cannot discuss all the possible combinations. Rather we refer readers to the implementation at http://www.surrey.ac.uk/LIS/SMG/mayali/. Here we

Table 4. Exceptional case defaults versus total idiosyncrasy

	Morphological class		Gender	
	Exceptional Case Default	Direct specification	Exceptional Case Default	Direct specification
Proportion of 258 nouns in the lexicon	63 (24%)	16 (6%)	33 (13%)	13 (5%)

simply point out that a major benefit of formal implementation is that we can check our claims on a portion of the actual lexicon and see how it fares. We tested the theory on 258 Mayali ordinary language nouns. We were not in a position to choose a totally rigorous sample, as agreement information is currently not available for every noun. However, our selection has been guided by the Swadesh list and other lists of basic vocabulary.

In Table 4 we give the figures for exceptional case default and direct specification of morphological class and gender. Our analysis requires no lexical specification of morphological class for 70 per cent of the nouns in the lexicon, and no lexical specification of gender for 82 per cent of nouns in the lexicon.

From our approach it can be seen that 30 per cent (24 per cent + 6 per cent) of the nouns in the lexicon are irregular in some way with regard to morphological class, but only 18 per cent (13 per cent + 5 per cent) with regard to gender. So even under a system in which morphological class may for certain items be assigned according to gender, the gender system is still highly predictable, and more so than the morphological class system.

Our use of the exceptional case default construct is further justified in that we find that there is predictable exceptionality: only 6 per cent of the nouns have to be specified for a particular morphological class which is not predictable (either as the normal case default or exceptional case default); only 5 per cent of the nouns have to be specified for a particular gender which is not predictable (again as either the normal case default or exceptional case default).

5. Conclusions

We have shown that gender should be separated from morphological class in Mayali, and that both are assigned according to different, but overlapping, semantics. We have suggested that the notion of 'Exceptional Case Defaults' allows for restricted lexical specification. Given our implementation, we are able to show that the analysis gives appropriate forms and to quantify the degree of coverage of the theory. Though we have only been able to indicate analyses in this chapter, rather than to demonstrate them, we hope to have shown that the interactions between morphology, typology and computation have great potential.

Notes

1. Versions of this chapter were given at the 9th International Morphology Meeting in Vienna (February 2000) and at Stockholm University (May 2000). We are grateful for the invitations to present this research. We also wish to thank those present for constructive discussion, an anonymous reviewer for useful comments, and the ESRC (UK) for support under grant R000238228.

2. Coreferential combinations are excluded, as they are encoded by the intransitive set plus a reflexive/reciprocal suffix.

References

Aronoff, Mark. 1992. "Noun classes in Arapesh". *Yearbook of Morphology 1991*, ed. by Geert Booij and Jaap van Marle, 21–32. Dordrecht: Kluwer.

Bakker, Dik. 1994. *Formal and Functional Aspects of Functional Grammar and Language Typology* (Studies in Language and Language Use 5). Amsterdam: IFOTT.

Brown, Dunstan. 1998. "Defining 'subgender': virile and devirilised nouns in Polish". *Lingua* 104. 197–233.

——Greville Corbett, Norman Fraser, Andrew Hippisley and Alan Timberlake 1996. "Russian noun stress and network morphology". *Linguistics* 34.54–107.

Corbett, Greville G. 1982. "Gender in Russian: an account of gender specification and its relationship to declension". *Russian Linguistics* 6, 2.197–232.

——1991. *Gender*. Cambridge: Cambridge University Press.

——and Norman M. Fraser 1993. "Network morphology: A DATR account of Russian inflectional morphology". *Journal of Linguistics* 29.113–42.

——and Norman M. Fraser. 2000. "Default genders". In: *Gender in Grammar and Cognition: I: Approaches to Gender* (Trends in Linguistics: Studies and Monographs 124), ed. by Barbara Unterbeck and Matti Rissanen, 55–97. Berlin: Mouton de Gruyter.

Evans, Nicholas. 1997. "Head classes and agreement classes in the Mayali dialect chain". *Nominal classification in Aboriginal Australia*, ed. by Mark Harvey and Nicholas Reid, 105–46. Amsterdam: John Benjamins.

——Forthcoming. *A Pan-dialectal Grammar of Bininj Gun-wok*. Canberra: Pacific Linguistics.

Evans, Nicholas, Dunstan Brown and Greville G. Corbett. 1998. "Emu divorce: A unified account of gender and noun class assignment in Mayali". *Papers from the 34th Regional Meeting of the Chicago Linguistic Society*, *Chicago*, 147–72.

—— —— ——forthcoming a. "Dalabon pronominal prefixes and the typology of syncretism: a Network Morphology analysis". To appear in: *Yearbook of Morphology*.

—— —— ——forthcoming b. "The semantics of gender in Mayali: partially parallel systems and formal implementation". To appear in *Language*.

Evans, Roger and Gerald Gazdar. 1996. "DATR: a language for lexical knowledge representation". *Computational Linguistics* 22.167–216.

Fortune, Reo F. 1942. *Arapesh*. (Publications of the American Ethnological Society 19). New York: J. J. Augustin.

Fraser, Norman M. and Greville G. Corbett. 1995. "Gender, animacy and declensional class assignment: a unified account for Russian". *Yearbook of Morphology 1994*, ed. by Geert Booij and Jaap van Marle, 123–50. Dordrecht: Kluwer.

—— ——1997. "Defaults in Arapesh". *Lingua* 103.25–57.

Kibrik, Alexandr E. 1996. "Agreement in conjoined NPs". *Godoberi* (Lincom Studies in Caucasian Linguistics 2) ed. by Alexandr E. Kibrik, Sergej G. Tatevosov and Alexander Eulenberg, 156–9. Munich: Lincom Europa.

Parker, E. M. and Hayward, R. J. 1985. *An Afar–English–French Dictionary* (*with Grammatical Notes in English*). London: School of Oriental and African Studies, University of London.

Rijkoff, Jan, Dik Bakker, Kees Hengeveld and Peter Kahrel. 1993. "A method of language sampling". *Studies in Language* 17.169–203.

Stump, Gregory T. 2001. *Inflectional Morphology: A Theory of Paradigm Structure*. Cambridge: Cambridge University Press.

Chapter 8

On contrastive word-formation semantics

Degrees of transparency/opacity of German and Hungarian denominal adjective formation[1]

Wolfgang U. Dressler and Mária Ladányi
Vienna University and ELTE University, Budapest

Introduction: Opacity and morphological typology

Degrees of morphosemantic transparency/opacity have been investigated much more for compounding (Fabb 1998: 68; Libben *et al.* 1997) than for derivational morphology (cf. Stump 1998: 17; Marslen-Wilson *et al.* 1994; Schreuder and Baayen 1995) and, to our knowledge, have never been focussed in language typology. Our research started from the very general hypothesis that word formation (WF) is more productive in an agglutinating language (such as Hungarian) than in an inflecting-fusional language (such as German), cf. Dressler and Ladányi (1998, 2000a, b). More productivity means that there is a greater number of productive WF rules (WFRs), that (on the average) their degree of productivity is higher, and that there is a higher number of categories expressed via WFRs (= greater morphological richness). According to a widely held view (Kastovsky 1986; Rainer 1993: 33–4; McQueen and Cutler 1998: 413; Badecker and Caramazza 1998: 399 f), productivity is linked to morphosemantic transparency: in principle, inflection is both more transparent (morphosemantically) and more productive than WF, and productive WFRs are supposed to generate (account for) more transparent derivatives or compounds than unproductive WFRs. Therefore Hungarian WF should be also morphosemantically more transparent than German WF. Our principal field of empirical research have been the subsystems of denominal suffixal adjective formation of both languages.

1. Types of morphosemantic opacity

The main problem is how to determine or, at least, to characterize types and degrees of opacity. The basic approach is to compare the WF meaning of a productive WFR with the actual lexical meanings of the words derived by this WFR, because the potential meaning of a WFR is semantically transparent (with the possible exception of parasitic morphology). However, the actual lexical meanings (word meanings, not contextual meanings in performance) of its derivatives are prototypically not completely compositional, because they are lexicalised (as autonomous lexical entries), i.e. they are, at least minimally, morphosemantically opaque. Even in the case of very transparent neologisms, such as H. *internet-ezik* (verb from the noun *internet*), actual accepted meanings constitute only a subset of conceivable legal meanings. For example, it would be legal for *internet-ezik* to mean also 'to establish internet', but in fact *internet-ezik* means only 'to use/to play with the internet'. Only non-prototypical derivations (cf. Dressler 1989), such as deverbal agent nouns and process action nouns (deverbal complex event nouns, cf. Grimshaw 1992) may inherit, in a transparent way, the entire word meaning of their verbal base without any idiosyncratic semantic modification.

Such comparison between WF meaning and word meaning (e.g. in Ernst 1981; Kastovsky 1982), however, is too global and undifferentiated. There are many factors involved in bridging the gap between potential WF meaning ("sémantique des mots construits" in Corbin 1987; Temple 1996) and word meanings:

1.1. When the potential WF meaning of a WFR is applied to a certain lexical field or semantically definable group of words, then irrespective of the actual meanings of these words, semantic and pragmatic inferences are drawn, due to semantic incompatibilities (or at least improbabilities) when composing or calculating or blending (Fauconnier 1997) the meaning of the WFR with the meaning of a lexical item of the lexical field/group.

Semantic inference represents a purely semantic entailment or coercion (cf. van de Velde 1992); for example, the WF meaning of the Hungarian derivational suffix -(*e*/*o*/*a*/*ö*)*s* is polysemous: it has the two main meanings 'to be supplied with; similar to'. Since the meaning 'to be supplied with' is incompatible with bases denoting humans, the WF meaning 'like, similar to' has to be chosen in this case, e.g.

(1) *feln#tt* → *feln#tt*-es e.g. *feln#tt-es* viselkedés
'adult' 'like an adult' 'an adult-like behaviour'

A weaker version of inferences are invited inferences and implicatures (cf. Davis 1998); for example German denominal adjective formation in *-isch* invites a pejorative meaning, if negative connotations are, or can be easily, associated with the base, e.g.

(2) *ab-gött-isch* vs. *gött-lich*, *dilettant-isch* vs. *fach-männ-isch*
'idolatrous' 'godly' 'like a bad amateur' 'like a specialist'

from G. *Abgott* 'idol' and *Dilettant*, which both have pejorative connotations. When contrasted with *Groß-stadt* 'large town', *Klein-stadt* 'small town' and *Vor-stadt* 'suburb' easily acquire a negative connotation, thus *klein-städt-isch* 'of a small town', *vor-städt-isch* 'suburban' are both negative, in contrast to *groß-städt-isch* 'of a large town' (positive). With *Herr* 'master' and *Weib* 'woman', both negative and positive connotations can be easily associated. These have been lexicalised in the derivations

(3) *herr-isch* vs. *herr-lich*, *weib-isch* vs. *weib-lich*
'domineering' 'magnificent' 'womanish' 'womanlike, female'

Implicatures are considered to be, in a very general sense, context-dependent. Our examples show that the morphological context of the base, i.e. purely morphological conditions (irrespective of the sentence level), suffice to trigger a pragmatic inference. This results via (a) similarity and (b) contiguity in metaphorical (a) and metonymic (b) extensions (cf. Blank 1998) and in respective systematic restrictions of polysemous meanings.

Metonymic meaning extension or specification via contiguity in a conceptual frame occurs in the following Hungarian examples, i.e. meaning specification in:

(4) *virág-os*, *gyöngy-ös*, *szalag-os*, *fodr-os*
'supplied > decorated with flowers, pearls, ribbons, frills'

Concretisation (a) and then meaning extension (b) both in (5) and (6):

(5) *vér-es*, *hús-os*, *hal-as*, *sár-os*
'supplied (a: > covered) with blood, meat, fish, mud'; b: > 'dirty with blood . . .'

(6) *leves*, *zsír-os* (=G. *fett-ig*), *olaj-os* (=G. *öl-ig*), *mérg-es* (=G. *gift-ig*), *tej-es* (=G. *milch-ig*)

'supplied with (a: > containing) juice, fat, oil, poison, milk'; b: > 'saturated with juice . . .'

All our examples of such implicatures which hold for homogeneous groups of words are metonymical, i.e. the same metonymical operation applies to those bases which share the same semantic features and undergo the same WFR.

1.2. Metaphors represent less homogeneous semiotic operations of much freer analogical mechanisms employed by the interpreter who conceives of some similarity (cf. Peirce 1965; Lakoff and Johnson 1980; Grady 1999).

Thus metaphorical (but also some metonymic) meanings should then be word-specific, i.e. linked to meanings of actual words (specific word meanings), e.g.

(7) H. *vér-es*: *vér-es esemény-ek* = G. *blut-ige Ereignisse*
'blood-y' (a) 'brutal' (a') 'brutal events, i.e. events where blood is flowing'; (b) 'full of blood-vessels'

(a) is metaphorical, but (a'), in addition, metonymical, whereas (b) refers metonymically to eyes.

Word-specific are also all inactive ("dead") metaphors (cf. Goatly 1997). Another metaphoric example is:

(8) H. *fagy-os* = G. *frost-ig*, e.g. *fagy-os mosoly* = *ein frost-iges Lächeln*
'frosty' > 'cold, unfriendly' 'a frosty smile'

Another metonymic example is:

(9) G. *fleiß-ig* = H. *szorgalm-as* ← *Fleiß* = *szorgalom*
'diligent' 'diligence'

when referring to the result of an activity instead of its actor, as in:

(10) G. *eine fleiß-ige Arbeit* = H. *szorgalm-as munka*
'a diligent work'

1.3. As far as restrictions are concerned, it is often over-looked or underrated (with the notable and pioneering exception of the Moscow school of WF, cf. Uluxanov 1977), that actual derivatives are derived from actual words, both in form and meaning. In relation to form we may cite the case of suppletion of the base, as in E. *go-er* vs. *gon-er*. In relation to meaning, we have to discuss idiosyncratic restrictions of the polysemy of an actual word when it functions as the base of a WFR, e.g. G. *erd-ig* refers to Erde as 'earth as material', *ird-isch* 'earth-ly' to earth as surface, but neither to its meanings as planet, as the opposite of sea, as possessed land. A similar stem allomorphy (like G. *erd-/ird-*) occurs in H. *mag-os/magv-as* 'seed-y', but only *magv-as* refers to *mag* as 'substantial part of smth' and neither of them to its meanings 'kernel, starting point, descendant', cf. the adjectives:

(11) H. *daru-s* ← *daru* vs. *darv-as* ← *daru*
'crane' (machine) 'crane' (bird)

(12) G. *zug-ig* vs. *züg-ig* (with umlaut) ← *Zug*
'draughty' 'uninterrupted, quick' 'drawing, draught, pull'

(13) G. *sach-lich* vs. *säch-lich* (with umlaut) ← Sache
'to the point' 'neuter' 'thing'

1.4. In addition to the afore-mentioned paradigmatic aspects of derivational meanings, we must also study the syntagmatic aspects of collocations. Here we claim that they involve actual derivations, not the level of WFRs and potential WF meanings. For example, H. *has-as* 'bellied' refers to the form of vessels and containers (like the G. synonym *bauch-ig*), but it also means pregnant with female animals (excluded in German) and pejoratively with humans. Thus H. *has-as* has the potential WF meaning 'bellied', but the additional actual meaning 'pregnant' includes collocational, syntagmatic information in the lexical entry. This fact can be considered as evidence for specific assumptions about the modular organisation of language: morphology (responsible for potential WF meanings), syntax (or the "logical form" of syntax, which accounts for non-idiomatic collocations) and the lexicon are separated and interact, also in semantics, only after lexical insertion (in contrast to, e.g. Distributed Morphology, cf. Halle and Marantz 1993). Therefore we claim that syntagmatic semantic collocations of derived adjectives are never determined by the WFR itself, i.e. by a WF meaning.

Similar cases are H. *terh-es* 'burdensome', meaning also pregnant if it refers to female humans or animals, G. *bock-ig* 'obstinate' (from *Bock* 'ram'), when referring to humans.

Also pragmatic inferences may be triggered by collocations, as in:

(14) H. *apá-s szülés* ← *apa*
'father-ly birth' 'father'
(a) *'birth supplied with a father' (b) *'birth like a father's (birth)'
(c) 'birth supplied with the presence of the father'

Both starred meanings of the suffix *-s* (a) 'supplied with' and (b) 'like, similar to' are excluded for semantic reasons (collocation), (a) via a semantic inference (cf. (1) above), (b) via a conventional implicature (cf. below). But according to Grice's Cooperative Principle (and if the context allows), the reader/hearer may make the pragmatic inference that this NP might refer to a birth supplied with the presence of the father. This is a conversational implicature, which presupposes that the collocation is unusual and non-lexicalized, that the Cooperative Principle is respected, and that the cotext and the situational context allow the specific (contextual) meaning. Analogical examples are (15) and (16):

(15) H. *igazgató-s ünnepség*
'a ceremony in the presence of the director (*igazgató*)'

(16) H. *gyerek-es kirándulás*
'an excursion where also child-ren (*gyerek-ek*) may participate'

When a (typically urban) native speaker of Hungarian has accepted and stored the contextual meaning of (14), then the conversational implicature has been substituted with a new lexical meaning (alloseme in structuralist terms) of *apás*. Then there remains just the conventional implicature which eliminates the morphologically conceivable (b) meaning of (14), insofar as the interpreter concludes about the collocation of the adjective with the head noun that there exists a semantic incongruence between the meaning of the head noun and the (b) meaning of the modifying adjective. Thus the main difference between semantic inference and conventional implicature consists for WF in their respective domains: semantic inferences operate within the paradigmatic word domain with its morphological makeup, conventional implicatures within the sentence domain of syntagmatic semantic collocations. Both semantic inferences and conventional implicatures are independent of situational context.

1.5. Competition/Rivalry among WFRs for application to the same lexical bases as inputs (cf. Dressler 1997) leads to further semantic restrictions and idiosyncracies, again (similar to (14)) on the level of actual lexical semantics of derivatives. Here, again, we deal only with productive WFRs. E.g. the relational adjective of H. *levél* 'letter' is *levél-beli* 'related to a letter' (literally: 'from inside a letter') which blocks rival **levél-i* (nevertheless this form is presupposed as an intermediate false step by the further derivation *levél-i-leg* 'via letter'), although *-beli* prototypically expresses a container relation (cf. adjectives of H. *ház* 'house' with purely relational *-i* vs. *-beli* expressing container relation: *ház-i feladat* 'homework' vs. *ház-beli lakó* 'an occupant in the house').

Since WF also includes compounding, derivational WFRs of denominal adjective formation may also compete with noun compounding. A case in point is the non-existence of the Hungarian adjectival derivatives because of their actually existing compound competitors:

(17) **szó-i* vs. *szó-rend* *szó-alkotás* *szó-jegyzék*
'word-y' 'word order' 'word formation' 'word list'

(18) **írás-i* vs. *írás-készség* *írás-gyakorlat*
'writing-ly' 'writing skill' 'writing practice' etc.

Cf. the notion of extended paradigm in Pounder (1987), who also shows that, in German, for certain kind of meat only compounds but no adjectives can be used, e.g. *Pferde-fleisch* 'horse meat' vs. **pferd-e(r)n*, whereas the adjectives *rind-ern* 'beef-', *schaf-en* 'mutton-' occur only in certain dialects. Such rivalry may not block the formation of an adjective but simply block the use of one of the rivals in certain collocations, e.g. the adjective in German, the compound in Hungarian (19a) (idomatic meaning 'brandy') vs. the non-idiomatic but metaphoric adjectives in (19b):

(19) a. G. *Feuer-wasser*=H. **tűz-víz* vs. G. **feur-iges Wasser*=H. *tüz-es víz*
'fire water' 'fier-y water'
b. G. *feur-iger Wein* = H. *tüz-es bor*
'fier-y wine'

2. Degrees of morphosemantic opacity

So far we have dealt with types of morphosemantic opacity. Now we pass over to degrees of opacity (cf. already Moshinsky 1976). As already evident from our introduction, we claim that degrees of opacity are never a matter of potential WF meaning, but refer only to lexical word meanings, where they follow from our criteria discussed above and are thus of a secondary nature.

Thus metaphoric or metonymic meanings can be said to be more opaque when they are word-specific (see 2), than if they hold for homogeneous groups of derivatives (see 1). This follows from the lack of generalisation and predictability in the case of word-specific opacity, which contradicts the property of predictability that transparency has.

Polysemous bases of derivatives and/or WFRs may be said to produce more opaque derivatives than monosemous ones. This follows from the connection between the scalar parameters of morphosemantic transparency–opacity and of biuniqueness–uniqueness–ambiguity (cf. Dressler in Dressler *et al.* 1987). Polysemy blocks biuniqueness and effects at least uniqueness, if not ambiguity, even if polysemy can be derived from a common basic concept (as in Plag 1998). Let us take again the polysemous H. -(*e/o/a/ö*)*s*: in addition to its two main meanings 'to be supplied with; similar to', it has two minor meanings with very specific base restrictions: (a) 'belonging to', (b) 'connected with'. These minor meanings are restricted to (a) bases referring to organisations (institutions, groups, as in (20a)) and (b) to time expressions (see (20b)) and loaned bases denoting processes (as in (20b′), respectively, cf. Dressler and Ladányi (2000b):

(20) a. *SZDSZ-es*, *MDF-es*
'belonging to the political party SZDSZ/MDF'
b. *három órá-s*
'three hour-ly'
b.′ *privatizáció-s*
'connected with privatisation'

One efficient way of grading morphosemantic opacity of compounds has been to derive it from transparency vs. opacity of its members in relation to the meaning of the whole compound (Libben *et al.* 1995): as a result, compounds with two transparent constituents are most transparent (as in E. *car-wash*), compounds with one opaque constituent (either the first or the second one) are less transparent (for example, E. *straw-berry*, *jail-bird*), compounds with two opaque constituents are most opaque (E. *hog-wash*, for instance). The types of opacity of derivatives, however, that we have distinguished so far, have only to do with the opacity of the lexical base: in our search within the area of denominal adjective formation we have not found a single example where morphosemantic opacity depends on the opacity of the suffix (as always: provided that suffixation is productive).

This is a further argument against considering suffixes as lexical entries (as in Lieber 1992: 26; Beard 1998: 47; cf. the arguments in Aronoff 1976), that is, suffixal heads appear not to have the possibility of being opaque in relation to the whole word, in contrast to the head-constituents of compounds. This is important for the frequent diachronic evolution of compound heads to suffixes via so-called suffixoids (semisuffixes), as in (21).

(21)	OE. *dom*	vs. *cyning-dom*	OHG.	*lih*	*friunt-licho*
	E. *doom*	*king-dom*	G.	*Leiche*	*freund-lich*
				'body'	'friend-ly'

First the second constituent of these compounds had a rather transparent meaning in relation to the whole compounds. Then in an intermediate period the meaning ME. 'trial' of *dom* or 'body' of *lich*(*o*) was rather opaque within *king-dom* and *freund-lich*, respectively. When, however, the second constituents were reanalysed as suffixes, their new, much more abstract relational meanings became transparent again. A similar meaning split via "deopacifying" reanalysis took place in E. *wise* vs. the suffix in *other-wise*, etc. (cf. Dalton-Puffer and Plag 2000).

3. Conclusions: On the independence of morphosemantic and morphotactic transparency

Our account of types and degrees of morphosemantic opacity demonstrates, first of all, the unfoundedness of an overall binary contrast between transparency and opacity, as it is all too often practiced both in theoretical linguistics and in psycholinguistic investigations of processing and of aphasic impairments. Second we have not found any significant difference between Hungarian and German. In other words, the crosslinguistic typological difference in morphological richness and productivity does not correspond to a similar difference in morphosemantic transparency/opacity, with the exception of synonymy (see Dressler and Ladányi 2000b). This is a blow against the frequent assumption of a close link between productivity and transparency (see above and the reservations in Dressler in Dressler *et al.* 1987). This conclusion is also in line with what can be inferred from Kiefer's (2001) findings, that Hungarian compounding — comparable to German compounding in productivity — involves about as much morphosemantic opacity as occurs in other European languages such as German and English.

Note

1. This research has been supported by a Collegium Hungaricum (Vienna) fellowship to the second author in 1999.

References

Aronoff, Mark. 1976. *Word Formation in Generative Grammar*. Cambridge, Mass.: MIT Press.

Badecker, William and Alfonzo Caramazza 1998. "Morphology and aphasia". *The Handbook of Morphology* ed. by Andrew Spencer and Arnold M. Zwicky, 390–405. Oxford and Malden, Mass.: Blackwell.

Beard, Robert. 1998. "Derivation". *The Handbook of Morphology* ed. by Andrew Spencer and Arnold M. Zwicky, 44–65. Oxford and Malden, Mass.: Blackwell.

Blank, Andreas. 1998. "Kognitive Italienische Wortbildungslehre". *Italienische Studien* 19. 5–27.

Corbin, Danielle. 1987. *Morphologie dérivationnelle et structuration du lexique*. Tübingen: Niemeyer.

Dalton-Puffer, Christiane and Ingo Plag. 2000. "Categorywise, some Compound-Type Morphemes Seem to be Rather Suffix-Like". *Folia Linguistica* 34.225–44.

Davis, Wayne A. 1998. *Implicature: Intention, convention, and principle in the failure of Gricean theory*. Cambridge: Cambridge University Press.

Dressler, Wolfgang U. 1989. "Prototypical differences between inflection and derivation". ZPSK 42. 3–10.

——1997. *On Productivity and Potentiality in Inflectional Morphology*. CLASNET Working Paper 7. University de Montréal.

——and Mária Ladányi. 1998. "On grammatical productivity of word formation rules (WFRs)". Wiener Linguistische Gazette 62–3. 29–55.

—— ——2000a. "Productivity in Word Formation (WF): a morphological approach". *Acta Linguistica Hungarica* 47.103–14.

—— ——2000b. "On contrastive word formation: German and Hungarian denominal adjective formation". *Words: Structure, Meaning, Function* ed. by Christiane Dalton-Puffer and Nikolaus Ritt, 59–74. Berlin: Mouton de Gruyter.

——Willi Mayerthaler, Oswald Panagl and Wolfgang U. Wurzel 1987. *Leitmotifs in Natural Morphology*. Amsterdam and Philadelphia: John Benjamins.

Ernst, Gerhard. 1981. "Ein Blick durch die durchsichtigen Wörter. Versuch einer Typologie der Wortdurchsichtigeit und ihrer Einschränkungen". *Linguistica* 21. 47–72.

Fabb, Nigel 1998. "Compounding". *The Handbook of Morphology* ed. by Andrew Spencer and Arnold M. Zwicky, 66–83. Oxford and Malden, Mass.: Blackwell.

Fauconnier, Gilles. 1997. *Mappings in Thought and Language*. Cambridge: Cambridge University Press

Goatly, Andrew. 1997. *The Language of Metaphors*. London: Routledge.

Grady, Joseph. 1999. "A typology of motivation for conceptual metaphor". *Metaphor in Cognitive Linguistics* ed. by Raymond W. Gibbs and Gerard J. Steen, 79–100. Amsterdam and Philadelphia: John Benjamins.

Grimshaw, Jane. 1992. *Argument Structure*. Cambridge, Mass.: MIT Press.

Halle, Morris and Alec Marantz. 1993. "Distributed Morphology and the pieces of inflection". *The View of Building 20: Essays in Linguistics in Honour of Sylvain Bromberger* ed. by Kenneth Hale and Samuel J. Keyser. Cambridge, Mass.: MIT Press.

Kastovsky, Dieter. 1982. *Wortbildung und Semantik*. Bern: Francke.
——1986. "The problem of productivity in word formation". *Linguistics* 24. 585–600.
Kiefer, Ferenc. 2001. "Productivity and compounding". *Naturally!* ed. by Christiane Schaner-Wolles *et al.*, 225–31. Torino: Rosenberg and Sellier.
Lakoff, George and Mark Johnson. 1980. *Metaphors we live by*. Chicago: The University of Chicago Press.
Libben, Gary, Martha Gibson, Yeo Bom Yoon and Dominiek Sandra. 1997. *Semantic Transparency and Compound Fracture*. CLASNET Working Paper 9. Université de Montréal.
Lieber, Rochelle. 1992. *Deconstructing Morphology*. Chicago: The University of Chicago Press.
Marslen-Wilson, William *et al.* 1994. "Morphology and meaning in the English mental lexicon". *Psychological Review* 101. 3–33.
McQueen, James M. and Anne Cutler 1998. "Morphology in Word Recognition". *The Handbook of Morphology* ed. by Andrew Spencer and Arnold M. Zwicky, 406–27. Oxford and Malden, Mass.: Blackwell.
Moshinsky, Julius. 1976. *Measuring Nominal Descriptivity*. Köln: akup 24.
Peirce, Charles S. 1965. *Collected Papers*. Cambridge, Mass.: Harvard University Press
Plag, Ingo. 1998. "The Polysemy of *-ize* derivations: On the role of semantics in word formation". *Yearbook of Morphology 1997*. 219–42.
Pounder, Amanda. 1987. *Systemangemessenheit in der Wortbildung am Beispiel desubstantivischer Adjektivableitung im Deutschen*. PhD thesis, University of Vienna.
Rainer, Franz. 1993. *Spanische Wortbildungslehre*. Tübingen: Niemeyer.
Schreuder, Robert and Harald Baayen. 1995. "Modeling morphological processing". *Morphological Aspects of Language Processing* ed. by L. B. Feldman, 131–54. Hillsdale: Erlbaum.
Temple, Martine. 1996. *Pour une sémantique des mots construits*. Villeneuve d'Ascq: Septentrion.
Uluxanov, Igor'. S. 1977. *Slovoobrazovatel'naja semantika v russkom jazyke*. Moskva: Nauka.
van de Velde, Roger. 1992. *Text and Thinking*. Berlin: Mouton de Gruyter.

CHAPTER 9

The acquisition of German plurals

Hilke Elsen

1. Introduction

In German, there are several endings for plural formation: -(*e*)*n* (*Auge/Augen* 'eye'), -*e* (*Hund/Hunde* 'dog'), -*e* +UL (*Kuh/Kühe* 'cow'), -*er* (*Kind/Kinder* 'child'), -*er* + UL (*Mann/Männer* 'man'), 0 (*Adler/Adler* 'eagle'), UL (*Vater/ Väter* 'father'), -*s* (*Auto/Autos* 'car'). For approximately 85 per cent of the nouns, masculine and neuter nouns take the plural -*e* or 0, masculine nouns ending in -*e* and feminine nouns take -(*e*)*n*. Further plurals are irregular, for example *Lexikon/Lexika* 'lexicon', *Kaktus/Kakteen* 'cactus', *Atlas/Atlanten* 'atlas'. New nouns first take the -*s*, later one of the other productive plural endings:

(1) *Pizza/Pizzas* → *Pizzen* 'pizza'
Kiosk/Kiosks → *Kioske* 'kiosk'
Birkenstock/Birkenstocks → *Birkenstöcke* 'extremely healthy sandal'
Modem/Modems → *Modeme* 'modem'
Balkon/Balkons → *Balkone* 'balcony'

Traditionally, the main tendencies of plural formation are stated as rules, and exceptions are added in long lists. Another possibility is paradigms. There are several declension types for singular and plural forms in various combinations. They are listed in tables and most nouns can be assigned to one of these paradigms. However, there are more or less frequent endings. The schema-model (Köpcke 1993, 1998, for instance) assumes a continuum of more or less prototypical plural schemata. The best singular (the worst plural) is monosyllabic, ends in a plosive and has the article *der* or *das*. The best plural is polysyllabic, ends in -(*e*)*n* and has the article *die*. The better the form, the more frequent, the more resistant against change it will be, and it will be acquired early on by the child. Furthermore, there are several cues with different degrees of importance which are relevant for the choice of a plural marker, phonological, morphological, semantic and lexical ones (Köpcke 1998; Wurzel

1998). One of these cues is ‘non-native‘. A foreign word will form its plural with *-s*. When it is integrated into the German lexicon, it will receive a different marker according to gender, form etc.

2. Method

The findings reported here are based on the diary data of a German speaking girl, A., collected continuously up to the age of 2 years, 5 months. All new words, word forms and novel pronunciations of established items were documented in IPA. Striking facts about situation and referents, comments on frequency and obsolescence of individual lexical items and notes on morphology and syntax were recorded. Imitations were distinguished from deferred imitations and spontaneous productions (cf. Elsen 1991 ff.). Here, only spontaneous productions are considered. Further data on the acquisition of plurals can be found in Mugdan (1977); Park (1978); Schaner-Wolles (1988); Clahsen *et al.* (1992); Gawlitzek-Maiwald (1994); Vollmann *et al.* (1997); Ewers (1999).

3. Results

From around 1;3, the child started to differentiate between one / more than one. First plural *forms* did not represent plural meaning, but were probably mere formal reproductions. The first instances of the concept ‘more than one’ were expressed with the help of the number *two* /tsvaɪ/ or *three* /draɪ/: [baɪ], [vaɪ], without plural ending on the noun. First plural forms with plural meaning appeared at 1;5. At 1;6/1;7, the girl did not differentiate consistently between singular and plural forms. At 1;8/1;9, she usually produced correct singular vs. plural forms. For a detailed discussion cf. Elsen (1999b; ex. (2), figures, tables adapted from Elsen 1999b, by kind permission of Niemeyer).

(2) [bamə] 1;2,29 *Bäume* ‘trees’, probably no plural meaning
[vɯs̄e] 1;3,0 *Füße* ‘feet’, probably no plural meaning
[baɪ] 1;3,24 ‘two’, for two stones
[da vav̇au, vavau] — [vaɪ vaɪ] — [baɪ baɪ] *da Wauwau*, . . ., 1;4,0, ‘there doggy, . . .’, for two dogs
[ɛṫə] — [baɪ baɪ baɪ] *Ente*,. . . 1;4,5 ‘duck, two two two’, for three ducks

[tɪn̍a, vaɪ vaɪ] *Kinder*, . . . 1;4,24 'children, . . .', for several children
[baɪ baɪ] 1;5,0 breaks a piece of potato chip into two halves
[baɪ baɪ] 1;5,1 for two socks
[baɪ dē] *zwei Zeh*, 1;5,2 'two toe', for two toes
[baɪ, vaɪ] 1;5,3 for two bottles
[baɪ, vaɪ] 1;5,3 for two shovels
Büche 1;5,5 'books', plural intended
zwei Bulli 1;5,8 'two VW-vans', plural intended
Füße kalt 1;5,25 'feet cold'
Bücher 1;6,1 'books'
Bälle 1;6,4 'balls'

In the corpora studied in the literature, the children produced first *e*- and (*e*)*n*-plurals, later -*s* (e.g., Schaner-Wolles 1988; Vollmann *et al.* 1997). There were always *e*-overgeneralizations, and the most frequent plural marker was -(*e*)*n* (e.g., Mugdan 1977; Park 1978; Mills 1985; Russ 1989; Schaner-Wolles 1988; Gawlitzek-Maiwald 1994; Vollmann *et al.* 1997; Ewers 1999; Behrens/Kiekhoefer 2000). It is the most frequent marker in adult language (see Table 1). Less frequent are -*e* and -*s*, for children as well as adults. This holds true for the diary data, too (Table 1). The relatively high number of A.'s words with *s*-plural results from words typical of the children's environment, such as *Mama* 'mummy', *Papa* 'daddy', *Oma* 'granny', *Teddy* 'teddy bear', *Buggy* 'buggy', *Lego* 'lego', all taking the -*s*.

A's. rate of the acquisition of words with the plural ending -(*e*)*n*, (UL)-*e* and (UL)-0 was nonlinear, that of words with -*s* and (UL)-*er* as well as others

Table 1. Distribution of plural groups in various corpora, in types, in %

	AD/AD° Janda*	AD/CH Wagner*	CH Elsen
-(e)n	42	53	31
-e	35	33	25
-0	12	/+	24
-er	10	8	6
-s	1	5	9
Others	/+	/+	5

° AD/AD Adult to adult, AD/CH Adult to child, CH A.' s output
* from Clahsen *et al.* 1996: 121
+ not counted/not given

(other plural endings, singularia-, pluraliatantum) was linear (see Figure 1; for nonlinearity in learning compare, for instance, Stadler *et al.* 1996; Elman *et al.* 1996). Whereas the growth of the last three groups remained relatively stable over time — there were none, one, two, three, hardly ever more new nouns in a group within ten days — the first three showed an acceleration at 1;8. For the group with -(*e*)*n*, there were about 11 new nouns in ten days at 1;8 and 1;9 (after three or five new ones before). After up to four, seldom more new words taking -*e*, there were 7, 9 or 13 new nouns at the end of 1;7, at 1;8 and 1;9. And for zero plural nouns, there were up to three new ones, but at 1;8 and 1;9 there were 6, 8 and ten new nouns in ten days.

In her overregularizations, the girl used mainly -(*e*)*n* (for a complete list cf. Elsen 1999b) in addition to (UL)-*e*, (UL)-*er*, and -*s*, even UL-*en* and UL-*s*, e.g., *Tüchen* 'cloths', *Vögels* 'birds', *Bäums* 'trees' (1;8–B 2;1). For a short time (1;9,12–1;9,19), no (*e*)*n*-overregularizations were noted, but only three with -*e* (*Kruke* 'jugs', *Balongse* 'balloons', *Nusse* 'nuts') and two with -*s* (*viele Mannis*, *Männer*, *Männis* 'many men' (three different forms), 1;9,19). Afterwards, -(*e*)*n* dominated over the other markers. Only during the middle of 2,1, A. used mainly -*s* (eight times in ten days in contrast to once or, exceptionally, twice otherwise), e.g., *Fensters* 'windows', *Schokolades* 'chocolates', *Affens* 'monkeys', *Wursts* 'sausages'), then again mainly -(*e*)*n*, cf. Table 2. No 0-plurals were included because there was not always an explicit indication of plurality such as *more* or *two*.

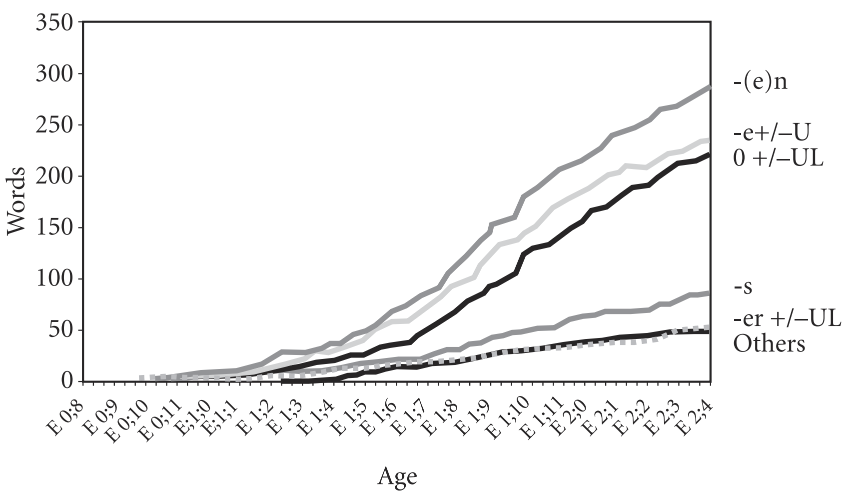


Figure 1. A.'s acquisition of nouns, in plural groups, word types

Table 2: A.'s incorrect plurals, word types

Age[a]	(UL)-(e)n	(UL)-e	(UL)-er	(UL)-s	Total
E 1;2		(1)			
B 1;3		(1)			
M 1;3					
E 1;3					
B 1;4					
M 1;4					
E 1;4					
B 1;5		1			1
M 1;5					
E 1;5					
B 1;6					
M 1;6					
E 1;6					
B 1;7		1			1
M 1;7					
E 1;7		1		1	2
B 1;8	5			2	7
M 1;8					
E 1;8					
B 1;9	1				1
M 1;9		3		2	5
E 1;9	7		1		8
B 1;10	9	1		1	11
M 1;10	5	1			6
E 1;10	6		1	1	8
B 1;11	3			1	4
M 1;11	8			1	9
E 1;11	10	1			11
B 2;0	1				1
M 2;0	1				1
E 2;0	5	1			6
B 2;1	1	2		1	4
M 2;1	3	2		8	13
E 2;1	6	2			8
B 2;2	4				4
M 2;2				1	1
E 2;2		1		2	3
B 2;3	2	1			3
M 2;3	4	1		1	6
E 2;3	3	2		1	6
B 2;4	4	2			6
M 2;4	1	1			2
E 2;4	4	1			5
Total	93	25	2	23	143

[a]*B* means the first third of a month, *M* the second third and *E* the last third.

The various plural affixes in the diary study of A. show differences in the rate of acquisition and overregularization behaviour. The most frequent incorrect, i.e. overgeneralized, plural marker, for A. as well as for the other children, was -*en*. Initially, A. chose (UL)-*e* and 0 (1;3–1;7). From 1;8 to 2;1, mostly -(*e*)*n*, hardly (UL)-*s*, -*er*, -*e* appeared as incorrect plural suffixes. During the middle of 2;1, the number of *s*-overregularizations increased. There were only a few examples with -(*e*)*n*. Then again forms with -(*e*)*n* dominated.

4. Discussion

One way to deal with acquisition data is to assume inborn symbolic rules and parameters (Clahsen *et al.* 1992, 1996, for instance). In such an approach, a qualitative difference between regular (or *default*, i.e. -*s*, according to a generative approach) and irregular inflection (all others, according to such an approach) is assumed — regulars are learnt with the help of a morphological rule, irregulars are lexically represented and learnt associatively or by rote. The development of inflection is independent of the lexicon. Steps of development are irreversible. After the acquisition of the default ending -*s*, there is no regression to a non-default marker. Irregular endings such as -*e* or -*er* should not be overgeneralized, as irregular forms are learnt by rote. In this light, it is difficult to account for the high frequency of (*e*)*n*-plurals in all the data, the oscillation between various dominating endings, the overgeneralized use of -*e* and -*er* and, especially, the abandoning of -*s* as dominant plural in favour of -(*e*)*n*. Instead, we should expect a relatively quick and steady acquisition of the default -*s*. There should be no frequency effects of lexical items on morphological marking, nor a regression to -(*e*)n after the dominant use of -*s* (for the use of 'plurals' in compounds see Elsen 1999b).

However, we can understand the development, if we assume a single associative learning mechanism, the basic principle of network processing. With the help of computer simulations of language processing, a lot can be learnt about developments resulting from the system per se. We can investigate how learning is possible with a given network architecture as well as input material but without rules, without negative input, merely with the ability to recognize patterns, to abstract and generalize them. Artificial networks are based on the neural networks of the brain (cf. e.g., Elman *et al.* 1996; Lamb 1999; Kochendörfer 2000). Information is not stored in the form of symbols and rules. It is coded in units and/or connections between the units in the form of activation patterns. Activation energy spreads through the system in a cascade-like way. In principle, the same basic processing mechanisms operate everywhere in the system. There are multiple subsystems. Language is one of many cognitive skills. When information is processed in such a system, automatic consequences are generalizing via pattern association, interaction of linguistic levels, interaction of linguistic and non-linguistic information, variation, transitions, a prototypical structure of items and concepts, the gradual emergence of structure and concepts and effects arising from the distribution of forms in the target language.

In our case, we might assume that A.' s early forms with *-e* were influenced by the most frequent German word shape. At the beginning of the acquisition process, a child does not yet differentiate between word classes and plural and singular forms. Thus, the frequency of word forms (patterns) in general is an influential factor for associative learning. In German, two-syllable words with initial stress and schwa in the second syllable are the most frequent pattern (Ortmann [2]1975). Up to 1;6, A.' s articulatory capacities did not allow for words ending in [-ən] or [-n̩]. All target words, such as *Mädchen* 'girl', *lesen* 'to read', *Lätzchen* 'bib', ended in a schwa-like vowel. Therefore, most of her words corresponded to the dominant German word shape, influenced by her articulatory capacities. The very first overregularizations were probably phonetically motivated schemata or word-patterns, independent of plural meanings. As the child was articulatorily not able to produce *(e)n*-endings, overgeneralizations with a vowel were to be expected. In simulations, the overproduction of the most frequent syllabic structure can also be found (Cottrell and Plunkett 1994).

When the child differentiated actively between singular and plural forms, she used mainly *-(e)n*, and the number of overgeneralizations increased (cf. B 1;8, Table 2). Here, we might assume an influence of the cognitive discovery 'plural' on the increased production of plurals. Although there is only a temporal relationship in the data, we might nevertheless suppose that, as the girl now differentiated between singular and plural forms, the high frequency of the *(e)n*-plurals was specifically responsible for the dominance of *(e)-n* in overregularizations. This might have been inforced by her ability to pronounce this syllable correctly. Higher numbers of nouns may also have been an additional influence. But although they increased throughout the study, the use of overregularization did not. The dominant use of *-(e)n* was not consistent. Gradual learning in this case might be explained as a transient phase leading to a clear (*e*)*n*-dominance from E 1;9 on, just as variation between several endings accentuates the instability of the still developing system (cf. *Bälle*, *Bäller*, *Bällen*, *Balle*, *Ballen* 'balls'). Gradual development is an automatic consequence of processing in a network, as are times of over- and underproduction of target patterns till the distribution of the target language is reached. Thus, the switch to the *s*-endings as dominant plural marker could be explained as a result of the dynamics of learning. When a learning system has processed a certain amount of patterns, these become established, and the output behaviour may change suddenly due to a subsequent reorganization of the processing system. In network-terminology, there may be an abrupt change in development when the system passes a threshold value and a new problem space can be entered (Elman *et al.* 1996: 205). For A., a critical mass in the processing of *s*-plurals was probably reached — the child had processed a sufficient number of examples ending in -*s*, so that this pattern could be generalized now. This new achievement led to overgeneralization.

The plural with -*s* was the prominent pattern for ten days. This short time of overshoot in production was very quickly repaired, possibly due to frequency factors. For the same reasons, the use of -*e* and -*s* continued, but -(*e*)*n* remained most prominent.

Network simulations produce a similar development. As a preliminary result, a recent pilot study of the acquisition of German plurals showed a clear preference to overgeneralize novel items with the help of -(*e*)*n*. There were different kinds of deviations at different points in time, -(*e*)*n* as well as -*e* and (for a while 27 per cent of) -*s*-overgeneralizations (Kiekhoefer, pers. comm.). As only system-internal influences and frequency factors can be responsible for such a development, it remains to be seen in how far cognitive aspects mean an additional interacting parameter for the acquisition process in children.

The development of noun plurals is influenced by various factors, system-internal ones as well as number of words and nouns in general and number of nouns in a plural group. Up to 2;5, other relevant factors for the choice of the plural marker, like gender, derivational suffix, animacy or foreign word, have not yet been realized as being decisive. For this early period of development, phonological form and frequency (the most obvious and handy information) in building the patterns of plural words are the crucial factors (and cf. Behrens and Kiekhoefer 2000).

The formation of plurals is output-oriented (cf. Köpcke 1993), as it shows the use of schemata/patterns. There are frequency effects. The development was probably influenced by the cognitive realization that there are more than one of the same kind. The gradual acquisition with oscillation between correct and various incorrect forms and the influence of frequent patterns point to an associative learning mechanism. Differences in overregularization behaviour indicate a shift of determining criteria. At different points in time, different patterns, or, more generally, different information for the choice of the marker are decisive. It must be emphasized that not only A.'s nominal lexicon and plural formation, but also her acquisition of verb vocabulary, inflection and lexico-semantic development are consistent with network simulations (Elsen 1998, 2000).

The relevance of frequency factors, gradual changes as well as system-internal reorganizations due to accumulating a critical mass, the interaction of linguistic levels and discourse factors, the oscillation between coding levels, the co-existence of old and new forms and, finally, a prototypical organization of concepts and structures are developmental aspects that result automatically from the way the system processes information and that can be found in acquisition, synchronic variation, diachronic change and even language contact (cf. Elsen in press a, b). Several of these factors were relevant to A.'s acquisition of plurals.

5. Conclusion

Plurals form a continuum of more or less prototypical schemata, showing more or less relevant phonological, morphological etc. features. The child became aware of the different criteria which determine the choice of a marker at different points in time. Accordingly, she used different linguistic cues at different times to form plurals, i.e. to choose a schema, so that the pattern of overregularizations changed over a period of time: There was a shift in the emphasis of the decisive criteria for the plural ending. Frequency effects point to an interaction between lexicon and inflectional behaviour. The data call into question the claim of a qualitative distinction between regular and irregular inflection. Inflectional morphology is not based on rules (symbolically represented), but rather on pattern association.

The present results are compatible with network simulations. They are in line with a one-mechanism approach. The idea of learning by pattern association is also compatible with ideas by Dressler, Karpf, Kilani-Schoch and others, who see 'morphological operations' as rote-learned precursors of later grammatical formations (Kilani-Schoch and Dressler 2000): holistic patterns develop into analytical grammatical ones. Finally, data on the acquisition of German plurals, of verb morphology (Elsen 1998, 1999b) and syntax (Elsen 1999b) are consistent with the psycholinguistic predictions of connectionists as well as with functionally motivated concepts of change such as grammaticalization, language economy, invisible hand phenomena and naturalness (Elsen in press a, b). Results from network processing will thus provide us with a psychological foundation for linguistic models.

References

Behrens, H. and Kiekhoefer, K. 2000. "Identification of inflectional paradigms: the acquisition of the German plural". Paper presented at the 9th International Morphology Meeting, Vienna, 25–27 February 2000.

Clahsen, H., Marcus, G., Bartke, S. and Wiese, R. 1996. "Compounding and inflection in German child language". *Yearbook of Morphology* 1995. 115–42.

——Rothweiler, M., Woest, A. and Marcus, G. F. 1992. "Regular and irregular inflection in the acquisition of German noun plurals". *Cognition* 45. 225–55.

Cottrell, G. W. and Plunkett, K. 1994. "Acquiring the mapping from meaning to sound". *Connection Science* 6.4. 379–412.

Elman, J. L., Bates, E. A., Johnson, M. H., Karmiloff-Smith, A., Parisi, D. and Plunkett, K. 1996. *Rethinking Innateness. A Connectionist Perspective on Development.* Cambridge, Mass./London: MIT.

Elsen, H. 1991. *Erstspracherwerb. Der Erwerb des deutschen Lautsystems.* Wiesbaden: DUV.

——1995. "Der Aufbau von Wortfeldern". *Lexicology* 1.2. 219–42.

——1996. "Linguistic team-work. The interaction of linguistic modules in first language acquisition". *The Proceedings of the 27th Annual Child Language Research Forum* ed. by E. Clark. Stanford: CSLI.

——1998. "The acquisition of past participles: One or two mechanisms?" *Models of Inflection* ed. by R. Fabri, A. Ortmann and T. Parodi, 134–51. Tübingen: Niemeyer.

——1999a. "Auswirkungen des Lautsystems auf den Erwerb des Lexikons — Eine funktionalistisch-kognitive Perspektive". *Das Lexikon im Spracherwerb* ed. by J. Meibauer and M. Rothweiler, 88–105. Tübingen: Francke.

——1999b. *Ansätze zu einer funktionalistisch-kognitiven Grammatik. Konsequenzen aus Regularitäten des Erstspracherwerbs.* Tübingen: Niemeyer.

——1999c. "Interrelations between phonological and lexico-semantic development". *Issues in Normal and Disordered Child Language: from Phonology to Narrative* ed. by M. Garman, B. Richards, C. Schelletter, C. Letts and S. Edwards, 1–10. Reading: The University of Reading.

——2000. "The structure of meaning: Semasiological and onomasiological aspects of development". *Onomasiology Online.* [http://www.onomasiology.de].

Elsen, H. in press a. “Formen, Konzepte und Faktoren der Sprachveränderung”. *Zeitschrift für Germanistische Linguistik* 29.1.

——in press b. “Acquisition and Change. Principles, concepts, explanations”. *Proceedings of the 34th Colloquium of Linguistics 1999* ed. by R. Rapp. Peter Lang.

Ewers, H. 1999. “Schemata im mentalen Lexikon: Empirische Untersuchungen zum Erwerb der deutschen Pluralbildung”. *Das Lexikon im Spracherwerb* ed. by J. Meibauer and M. Rothweiler, 106–27. Tübingen: Francke.

Gawlitzek-Maiwald, I. 1994. “How do children cope with variation in the input? The case of German plurals and compounding”. *How Tolerant is Universal Grammar?: Essays on Language Learnability and Language Variation* ed. by R. Tracy and E. Lattey, 225–66. Tübingen: Niemeyer.

Kilani-Schoch, M. and Dressler, W. U. 2000. “The emergence of verb paradigms in two French corpora as an illustration of general problems of pre- and protomorphology”. Poster presented at the 9th International Morphology Meeting, Vienna, 25–27 February 2000.

Kochendörfer, G. 2000. *Simulation neuronaler Strukturen der Sprache*. Tübingen: Narr.

Köpcke, K.-M. 1993. *Schemata bei der Pluralbildung im Deutschen*. Tübingen: Narr.

——1998. “The acquisition of plural marking in English and German revisited. Schemata vs. Rules”. *Journal of Child Language* 25. 293–319.

Lamb, S. 1999. *Pathways of the Brain: The Neurocognitive Basis of Language*. Amsterdam/ Philadelphia: John Benjamins.

Mills, A. E. 1985. “The acquisition of German”. *The Crosslinguistic Study of Language Acquisition* I. *The Data* ed. by D. Slobin, 141–254. Hillsdale, N.J.: Lawrence Erlbaum.

Mugdan, J. 1977. *Flexionsmorphologie und Psycholinguistik*. Tübingen: Narr.

Ortmann, W. D. ^{2}1975. *Beispielwörter für deutsche Ausspracheübungen. 7952 hochfrequente Wortformen der KAEDING-Zählung, rechnersortiert nach Einzellauten, Lautverbindungen, Silbenzahl und Akzentposition*. München: Goethe-Institut.

Park, T.-Z. 1978. “Plurals in child speech”. *Journal of Child Language* 5. 237–50.

Russ, C. V. J. 1989. “Die Pluralbildung im Deutschen”. *Zeitschrift für Germanistische Linguistik* 17:1. 58–67.

Schaner-Wolles, C. 1988. “Plural- vs. Komparativerwerb im Deutschen — Von der Diskrepanz zwischen konzeptueller und morphologischer Entwicklung”. *Experimentelle Studien zur deutschen Flexionsmorphologie* ed. by H. Günther, 155–86. Hamburg: Helmut Buske.

Stadler, M., Vetter, G., Haynes, J. D. and Kruse, P. 1996. “Nonlinear phenomena in learning processes”. *Learning as Self-Organization* ed. by K. H. Pribram and J. King, 157–69. Mahwah, N.J.: Lawrence Erlbaum.

Vollmann, R., Sedlak, M., Müller, B. and Vassilakou, M. 1997. “Early verb inflection and noun plural formation in 4 Austrian children: The demarcation of phases and interindividual variation”. *Papers and Studies in Contrastive Linguistics* ed. by K. Dziubalska-Kolaczyk, 59–78. Poznan.

Wurzel, W. U. 1998. “Drei Ebenen der Struktur von Flexionsparadigmen”. *Models of Inflection* ed. by R. Fabri, A. Ortmann and T. Parodi, 244–65. Tübingen: Niemeyer.

Chapter 10

Language-specific effects on the development of written morphology

Steven Gillis and Dorit Ravid

1. Introduction

This chapter discusses the morphology of children's written language from a developmental perspective, examining the acquisition of written morphology in gradeschool children from the beginning of formal literacy education to the end of gradeschool. We examine how children learning to spell Hebrew and Dutch — two typologically very different languages — approach problems in mapping phonology and morphology onto written graphemes in their respective languages.

While morphology constitutes an important part of the spoken modality of many languages, it is also reflected in the written modality of languages with alphabetic orthographies, which often express morphological regularities in their units. For example, the consonantal root, which constitutes the lexical core of the word in Hebrew (Berman, 1987; Holes, 1995) takes slightly different forms in the Hebrew words *mixtav* 'letter', *ktav* 'writing', and *ktuba* 'marriage contract', due to stop–spirant alternation, but its written form remains consistent in MKTB, KTB, and KTWBH[1] respectively, despite these phonological alternations (Ravid, in press a).

The aim of this study is to find out how such morphological consistencies in Hebrew and Dutch are learnt by Israeli and Belgian gradeschoolers, using an experimental design which looks into the acquisition of spelling. We intend to show that the acquisition of spelling is linguistic in nature and interacts with knowledge of spoken morphology.

1.1 Ways to overcome phonological neutralization

The central phenomenon focused on in this chapter is learning to overcome homophonous spelling resulting from neutralized phonological distinctions which are retained in the spelling system.

Alphabetic orthographies are based on the grapho-phonemic principle, and thus learning consists of linking phonemes to graphemes. However, most orthographies are not entirely shallow: they do not reflect phonological information fully and accurately. Homophonous graphemes, which provide alternative spellings for the same phoneme, occur in many orthographies. For example, the homophonous Dutch form *verplicht*(*t*)*e* 'required, Adjective/ Simple Past' may be spelled with either a single or a geminate ⟨t⟩ but there is no change in the pronunciation. In the same way, the homophonous Hebrew form *va'ir* 'and-city/light' may be spelled with either ⟨W⟩ or ⟨B⟩. These cases of opacity often result from neutralizations of underlying phonological distinctions in phonetic strings, which are nevertheless retained in the spelling system and are typical sources of spelling errors[2].

It is possible, of course, to learn the spelling of homophonous words arbitrarily, or to use visually consistence patterns as cues. But as we shall show, morphological and morpho-phonological analysis can also serve as spelling aids. Spelling systems often encode morphological units consistently and children have to learn and use this information in order to spell correctly. For example, the homophonous Dutch word [bəpalt] 'determine(d)' may be spelled with either final ⟨t⟩ or ⟨d⟩, which are not merely phonological segments but also meaning-carrying elements, signifying present tense (*bepaalt*) or past participle (*bepaald*) forms. In this case, conscious manipulation of the verbal paradigm can directly assist in finding the correct spelling. In Hebrew, the rhyming words *kashot* 'hard'.PL.FEM and *mashot* 'oar' are spelled differently and the spelling carries different morphological significance. In *mashot*, the [t] is part of the root and is spelled with ⟨*T*⟩, representing a historically emphatic coronal stop. In *kashot*, the [t] is part of the suffix *-ot* signifying feminine plural, and is spelled with ⟨T⟩. Being able to analyze Hebrew words into their morphological components, even to a shallow degree, can help recover the difference in spelling.

However, morphological manipulation is not always applicable. For example, in Dutch *arend* 'eagle' and *agent* 'policeman', the identical final segment [t] serves in both cases as a stem consonant, so a learner cannot be helped by morphology in deciding which to spell with ⟨t⟩ or with ⟨d⟩. In the same way, the final [*x*] in Hebrew *dérex* 'road' and *kérax* 'ice' is spelled differently, but does not carry morphological significance, since these are both root segments. Thus, Hebrew spellers cannot be assisted by morphology to decide on the correct spelling.

Fortunately, alphabetical orthographies may provide their learners with another, morpho-phonological means for recovering the grapho-phonemic link in cases of phonological opacity with distinct spelling. For example, the two Dutch words *arend* 'eagle' and *agent* 'policeman' share a final [t] in speech due to final devoicing. However written Dutch retains the ⟨t⟩/⟨d⟩ distinction in the spelling. This neutralized phonological distinction can be recovered through pluralization to *arenden* and *agenten* respectively, and thus conscious morpho-phonological manipulation of these words can assist in their correct spelling. In the same way, awareness of Hebrew morpho-phonological patterns can assist in the spelling of *dérex* 'road' and *kérax* 'ice'. These words are susceptible to spelling errors since they have the same vocalic pattern *CéCeC*, and they also share a final surface segment *x* which can be spelled as either ⟨K⟩ or ⟨H⟩. Noting that *kérax* has a lower vowel *a*, making it deviant from the general pattern and thus marked, can help in recovering the correct spelling. This phonological markedness is related to a historical Hebrew distinction between letters representing a spirantized velar fricative (⟨K⟩), on the one hand, and a pharyngeal fricative (⟨H⟩), on the other. Though such morpho-phonological cues may be rather complex to formulate explicitly, independent empirical evidence shows they exist in the linguistic cognition of mature spellers and are eventually accessed by children (Ravid, in press b).

Thus Dutch and Hebrew spellers are faced with similar, though by no means identical, problems in learning to spell homophonous words with distinct spelling, and may resort to similar morphological and morpho-phonological strategies in recovering spelling differences. But will they indeed employ similar strategies and follow the same developmental path in learning to spell? Recent cross-linguistic research has demonstrated the influence of language-specific effects on a variety of domains from early speech perception to children's narrative development in different languages (see the summary in Berman and Ravid, in press). We assume that children are attuned to typological underpinnings of their language from early on and employ appropriate strategies in linguistic problem-solving. In this study we trace the impact of morphological typology on children learning Hebrew, a Semitic language with a highly synthetic morphology, and Dutch, a Germanic language with a sparse morphology.

2. The study

This cross-linguistic study concerns spelling morphological and morphophonological strategies in gradeschool children faced with phonological opacity which may lead to spelling errors.

2.1 Population and materials

The study population consisted of 192 Israeli and 192 Belgian monolingual Hebrew- and Dutch-speaking schoolchildren with a middle-high socio-economic background from grades 1–6. They were presented with two spelling tests (one in Hebrew, one in Dutch), containing neutralized phonological segments and asked to spell the target words, which were given in a sentential context to ensure clear and non-ambiguous understanding.

There were four test conditions, each represented by eight target words. Condition 1 contained homophonous target segments recoverable through both morphological and morpho-phonological cues. Condition 2 contained homophonous items with a morpho-phonological (but without a morphological) conversion cue for each language. Condition 3 contained homophonous items with a morphological (but without a morpho-phonological) conversion cue for each language. Condition 4 consisted of homophonous segments with two possible spellings with no recoverability through either morphological or morpho-phonological cues.

2.2 Predictions

Following from the background presented above, we expected that given a neutralized phonological distinction, the more motivated the relationship between phonology and orthography, the better the children's performance. 'Motivation' means here that the target segment/grapheme either has a morphological function (root vs. affix morpheme, for example) or is recoverable through a particular morpho-phonological conversion process that can be applied so as to figure out how to spell the target letters. In this respect we did not expect any major differences between Dutch and Hebrew.

3. Results

Results are verbally summarized below. For numerical tables and statistical analyses, we refer to Gillis and Ravid (2000).

3.1 Written morphology in Hebrew and Dutch

Our predictions were confirmed for Hebrew: all conditions showed a distinct learning pattern. The condition with the most motivation — Condition 1, with both morphological and morpho-phonological cues — was the easiest. It was followed by Condition 3 (morphological cues only) and Condition 2 (morpho-phonological cues only). The most difficult condition was Condition 4, the least motivated condition, in which there is an arbitrary relationship between the spoken and the written form. For Dutch these predictions were not confirmed. The two conditions with no morphological cues — Conditions 4 and 2 — were the easiest, with almost ceiling scores from second grade onwards. However for the two morphologically informative conditions Condition 1 and Condition 3, no learning was found until fifth grade.

Judging from these results, it seems easier to learn to spell in Hebrew than in Dutch. Moreover, children learning to spell Hebrew perform better when the target segments have a morphological function, and less well when they do not. Children learning to spell in Dutch show the opposite pattern: when the target segments do not have morphological function, they score better than when segments do have a morphological function.

3.2 Different morphological functions in Hebrew and Dutch

We now turn to learning to spell with the assistance of different morphological functions. We looked at the same target segment as part of the root[3] / stem and as part of the affix. For example, in Dutch the letters ⟨t⟩ and ⟨d⟩ were contrasted as stem letters in the words ⟨arend⟩ 'eagle' / ⟨agent⟩ 'officer', and as affix letters in ⟨bepaald⟩ 'determined' / ⟨bepaalt⟩ 'determines'. In Hebrew, ⟨*T*⟩ and ⟨T⟩ were contrasted as root and affix letters. ⟨*T*⟩ functions as root letter in *mašot* 'oar', spelled MšW*T*, while T functions as an affix letter signifying number and gender in *kašot* 'hard'.PL.FEM, spelled QšWT. Presumably, affix letters, whose spelling is more consistent and regular, should be spelled correctly earlier than root or stem letters.

This assumptions holds for Hebrew. In Hebrew, affix letters were found to be easier to spell than root letters from first grade onwards. Root letters take longer to learn. In Dutch, the opposite pattern emerged: letters that are part of the stem were found to be easier to spell than when they are part of the affix. Only stem letters showed learning early on, while affix letters stayed more or less at chance level.

3.3 Morpho-phonological cues in Hebrew and Dutch

We now turn to morpho-phonological information that could also assist in recovering underlying distinctions and consequently in learning to spell homophonous segments. We examined one particular aspect of recoverability, morpho-phonological markedness, using only roots and stems in Condition 2, so as to isolate recoverability from morphological function. Both the Hebrew and Dutch spelling tests contained marked and unmarked elements. Unmarked segments were those segments for which pronunciation coincided with the spelling; marked segments were those whose pronunciation was neutralized to that of the unmarked segments. For instance, in Dutch [t] can be spelled as either ⟨t⟩ (as in *agent* 'policeman') or ⟨d⟩ (as in *arend* 'eagle'). The marked element ⟨d⟩ deviates from "phonetic spelling" ([t] in *agent* written as ⟨t⟩, but [t] in *arend* written as ⟨d⟩) and surfaces in the plural (singular *arend* versus plural *arenden*). Thus, ⟨t⟩ is the default (spelling follows pronunciation) and ⟨d⟩ is the marked segment, since the spelling does not follow its pronunciation.

In Hebrew, marked elements like ⟨*H*⟩ in *kérax* 'ice' deviate from the canonical structure *CéCeC* by lowering /e/ to /a/ and creating a non-canonical allomorphic pattern template. Unmarked elements such as ⟨K⟩ in *dérex* 'road' behave regularly and follow the general pattern. Thus, ⟨K⟩ is the default segment, where *dérex* 'road' is spelled ⟨DRK⟩, while /*H*/ is the marked segment, where *kérax* 'ice' is spelled ⟨QR*H*⟩. Presumably, unmarked items would lead to more success in spelling.

Across the two languages, morpho-phonologically recoverable distinctions indeed led to better results than non-recoverable ones. However, Israeli and Belgian gradeschoolers made different use of marked and unmarked segments. In Dutch, unmarked segments were easier. They were spelled correctly from the very beginning, while marked ones showed a learning curve and intersected with unmarked segments in third grade. In Hebrew, marked segments were easier. Learning proceeded for both segment types with age and schooling, however marked segments reached almost top scores early on, while unmarked ones took a long time. Our results thus showed a crossover effect, where in Dutch unmarked segments were easier than marked ones, while in Hebrew, marked segments were easier than unmarked ones.

4. Discussion and conclusions

This study tested Hebrew- and Dutch-speaking gradeschoolers (grades 1–6) on spelling words with homophonous segments with and without morphological and morpho-phonological cues which they could use to detect the correct spelling.

One of the clear findings of this study is that spelling development is not a mere technical skill of phoneme to grapheme conversion. There is more to it than simply mirroring speech. Orthographic knowledge is linguistic in nature and it involves integrating information from a number of linguistic dimensions — phonology, morpho-phonology and morphology. This is because orthographic systems encode linguistic concepts such as phonemes, morphemes, words, and sentences, and children have to represent these in their oral language knowledge, as well as learn how these concepts are represented in the specific orthography they are learning.

Another major finding of this study relates to the impact of typology and the interface of spoken and written language. As has been pointed out by Olson (1994), there is a reciprocal relationship between spoken and written language systems. The type of spoken system children are exposed to from birth affects the way they think about their orthography — and has been shown in other studies, written language perception shapes thinking about spoken language. Learning to think about spoken language thus shapes and is shaped by thinking about written language. Our study is one more contribution to the growing number of studies that have investigated the impact of typology on language acquisition. The idea is that children who are learning to spell do not approach the orthography they are learning "tabula rasa". Rather, their linguistic problem-solving is shaped by the spoken language system they have been learning.

This attention to morphological information does not relate only to form-meaning relations, but also to morpho-phonology. Morpho-phonological information is meaningful to children learning to spell in Hebrew, who are used to dealing with allomorphic variations and to making generalizations across forms that differ in phonological shape. For children learning to spell in Dutch, this information, as we have shown, is not very significant. We have also shown in this study that "easy" and "hard" in the acquisition of written morphology are not straightforward terms. Dutch is a language with a simplex morphology and with a relatively shallow spelling system, which is easy to teach at school. Nevertheless, our Belgian gradeschoolers did not on the whole do as well as the Israeli gradeschoolers who are learning a deep non-vowelled orthography in a language which is morphologically complex, where a variety of semantic notions are mapped onto a large array of morpho-phonological allomorphic variations.

Clearly, children are guided by the interface of strategies appropriate to their spoken language systems as well as by universal factors in learning to spell. The problem of markedness is a case in point. A marked segment is deviant in both cases. However, Dutch-speaking children take an essentially grapho-phonemic approach to the problem, and start out by seeking a one-to-one mapping between what they hear and what they write, homing in on the unmarked segment. Hebrew-speaking children, in contrast, do not assume only a grapho-phonemic link, but are also sensitive to the deviant, salient information produced by the marked segment. The underpinnings of the specific language structure thus determine learning patterns in spelling development.

Notes

1. To facilitate comprehension, we use Latin capitals to represent Hebrew letters.
2. In this study we focus on the standard non-vowelled version of Hebrew orthography, in which consonants are represented fully, but vowels are represented only partially and ambiguously.
3. Hebrew roots consist only of consonants. Stems contain vowels.

References

Berman, R. 1987. "Productivity in the lexicon: New-word formation in Modern Hebrew". *Folia Linguistica* 21.225–54.

——and D. Ravid. In press. "Acquisition of Israeli Hebrew and Palestinian Arabic: A review of current research". *Hebrew Studies.*

Gillis, S. and D. Ravid. 2000. "Typological effects on spelling development: A crosslinguistic study of Hebrew and Dutch". Ms., Tel Aviv University and University of Antwerp.

Holes, C. 1995. *Modern Arabic: structures, functions, and varieties.* London: Longman.

Olson, D. 1994. *The world on paper.* Cambridge: Cambridge University Press.

Ravid, D. In press a. "Learning to spell in Hebrew: Phonological and morphological factors". *Reading and Writing.*

——In press b. "A developmental perspective on root perception in Hebrew and Palestinian Arabic". In Y. Shimron (ed.) *The processing and acquisition of root-based morphology.* Amsterdam: Benjamins.

Chapter 11

Graded semantic and phonological similarity effects in morphologically complex words

Laura M. Gonnerman and Elaine S. Andersen
Carnegie Mellon University and University of Southern California

1. Introduction

Classically, the lexicon has been thought of as a set of word forms, somewhat like a dictionary, with separate access mechanisms that allow language users to retrieve stored information. In this tradition, complex words are thought to be formed and processed by rules that combine stored morphemic units, such that adding the agentive suffix *-er* to the verb stem *teach* forms *teacher*. Researchers interested in the representation and processing of the mental lexicon have asked two basic questions: (1) Are complex words decomposed in lexical processing (and/or storage) or not? and (2) What are the roles of semantic and phonological factors?

In response to the first question, some researchers have argued for decomposition of all complex words, often citing the savings in storage needs (for example, Taft 1988). Others have argued for whole word systems, accounting for experimental effects of morphological structure by positing explicit links between related words (Butterworth 1983, for instance). But most scholars now assume hybrid systems that store some types of words (irregulars or semantically opaque forms) as wholes and other types (regulars and semantically transparent forms) as separate stems and affixes (for instance, Marslen-Wilson, Tyler, Waksler, and Older 1994; Prasada and Pinker 1993). Thus, while current theories differ in important respects, most share the key assumption that morphological relationships are explicitly represented in the mental lexicon.

Regarding the second question, researchers who have examined semantic and formal factors have suggested that these factors cannot adequately account for morphological priming effects, and that therefore there must be an additional distinct morphological component (for example, Marslen-Wilson *et al.* 1994; Napps 1989). A basic problem with these studies is that they do not examine the two factors *jointly*, which we will argue is a crucial flaw. Our approach suggests that if examined in conjunction, the interaction of these factors will account for morphological priming effects without appealing to morphology as an independent factor in lexical processing or storage.

In contrast to these positions, a number of researchers have recently begun to explore a different approach that adopts the brain rather than the dictionary as its metaphor (Gonnerman 1999; Rueckl, Mikolinski, Raveh, Miner and Mars 1997). On the distributed connectionist account, words are not stored as separate lexical units or as decomposed parts. Rather, they are represented as patterns of activity distributed across simple, neuron-like processing units. Comprehending a word involves computing its semantic representation based on a phonological pattern, and producing a word involves mapping a semantic pattern onto the correct phonological output. Our lexical knowledge is stored in the weighted connections between units that develop through incremental weight changes made during learning and processing. Thus, the traditional strong distinction between access and storage does not apply.

Such a lexical network is schematized in Figure 1, where the external ovals contain banks of units that encode representations for semantics,

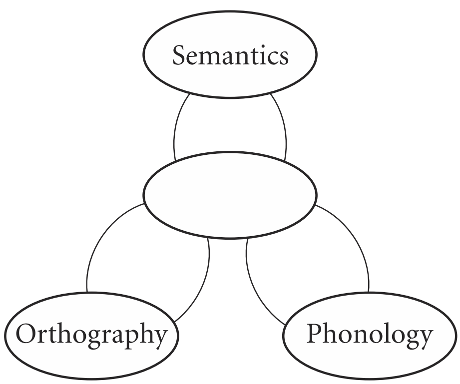


Figure 1. Scheme of the lexical processing system from a distributed connectionist perspective. Ovals represent banks of processing units, lines represent weighted connections between units. Morphological structure is reflected in the interlevel representations that develop in the course of learning the mappings between codes.

phonology, and orthography.[1] There is structure within each of these banks of units that the network can extract. For example, within phonology there are regularities such as the fact that an English syllable can end with '-ts', as in *cats*, but cannot start with this sound. Learning a language involves learning the mappings between codes — first between semantics and phonology, and eventually, for literate individuals, between orthography and phonology or semantics.

There is also structure in the mappings between the different codes. The network incorporates this structure to the extent that it is useful in solving tasks. Crucially, since representations vary in degree of overlap on all three dimensions (semantics, phonology, and orthography) the internal representations the system develops will reflect these graded relationships. Thus, morphology is a graded phenomenon because it reflects different degrees of convergence between these codes. Our approach therefore differs from other accounts in that we do not accept the notion that some words are decomposed (*departure*, for instance) while others are not (for example, *department*). Rather, morphological structure affects processing to varying degrees, depending on a full continuum of transparency (for instance, the degree of semantic similarity varies among *late* and *latent–lately–later*).

This chapter presents results from a series of four cross-modal lexical decision experiments that examine the roles of semantic and phonological relatedness, as well as morphological type, and provide support for this currently emerging view of the mental lexicon. While we recognize that orthographic relationships between words are also important to processing (in literate individuals), the role of this factor is presumably secondary to phonology, which emerges first in development. Therefore, in the studies presented here we focus on phonological surface forms. The first experiment examines priming for pairs of suffixed words and stems, where the degree of semantic relatedness is a continuous variable, and all forms are phonologically transparent. The second experiment investigates priming for semantically graded prefixed words and stems and compares the results to those found for suffixed-stem pairs. Experiment 3 explores the role of morphological type in priming, specifically testing whether semantic and phonological relatedness predict priming for pairs of suffixed words. And finally, the last experiment looks at degrees of phonological relatedness, while controlling for semantic similarity. In all four experiments we used the same task, with stimuli developed using semantic similarity ratings (for details see Experiment 1).

2. Graded semantic effects: Suffixing

Experiment 1 asks two questions: (1) Are subjects sensitive to gradations in the semantic similarity between related words? and (2) Can the degree of semantic relatedness predict the magnitude of priming effects, when phonological relatedness is held constant?

2.1 *Method*

Semantic relatedness pretest. To answer the first question, we collected semantic similarity ratings for word pairs from 133 USC undergraduates. On a seven point scale, some items were rated as unrelated (for example, *corner–corn* = 1.1), others as more highly related (*darken–dark* = 6.2, for example). Note that subjects did not just consider words as related or unrelated, but used the full scale, giving some pairs intermediate ratings (for instance, *shortage–short* = 3.4). Moreover, the items were fairly evenly distributed along the rating scale and there was strong cross-subject agreement, as demonstrated by low standard deviations for the items (1.4 on average).

Materials. We used the semantic similarity ratings to create a set of 140 prime-target pairs (see Table 1). These pairs were phonologically transparent "suffixed" forms and their stems that varied in their semantic relatedness, from highly related (*boldly–bold*), to moderately related (*lately–late*), to unrelated (*hardly–hard*). An additional semantically unrelated condition included pairs whose primes, unlike *hardly*, did not end in suffix-like phonological segments (*spinach–spin*). A final condition included pairs that were only semantically related (*idea–notion*).

For each test prime a control word was chosen that matched the test prime in frequency, grammatical class, and number of syllables. In addition, the test and control primes did not differ in frequency across the five experimental conditions. 140 non-word fillers were also created. Some ended with suffix-like syllables, such as *slither* and *slith*, others simply overlapped, like *bishop* and *bish*, and others were unrelated, like *basil* and *grook.* The stimuli were divided such that participants saw only half of the related prime-target pairs in any one condition (14 per condition). Thus, only 5 per cent of the items were both highly semantically and phonologically related.

Table 1. Experiment 1: Mean semantic similarity ratings†, reaction times and priming effects by condition. Sample stimulus items are also shown

Condition	Prime-target example	Mean semantic similarity rating	Mean reaction time Control	Test	Priming effect (msec)
1. lo sem, no 'affix'	*spinach–spin*	1.2	649	668	–19
2. lo sem	*hardly–hard*	1.9	607	631	–24
3. mid sem	*lately–late*	3.9	588	569	19*
4. hi sem	*boldly–bold*	6.1	613	573	40*
5. hi sem, no phon	*idea–notion*	6.0	593	580	13*

*p < .0513p
†Rating scale: 1 = unrelated, 7 = highly related.

Subjects. 58 USC undergraduates who learned English as their first language participated.

Procedure. Participants heard auditory primes and were required to make lexical decisions to visual targets, presented for 200 ms on a computer monitor immediately after prime offset. To ensure attention to the primes, participants were asked to repeat them on 15 per cent of the trials.

2.2 Results

Reaction times for correct trials (excluding extreme values) were entered into an analysis of variance with the factors of Prime Type (test or control) and Condition (1–5). Both participant and item analyses were calculated.[2] Analyses of the differences in decision latencies for targets following related primes versus controls were also conducted for each condition (see Table 1).[3] Results clearly

Table 2. Experiment 2: Mean semantic similarity ratings†, reaction times and priming effects by condition. Sample stimulus items are also shown

Condition	Prime-target example	Mean semantic similarity rating	Mean Reaction Time Control	Test	Priming effect (msec)
1. lo sem, no 'prefix'	*coffee–fee*	1.5	616	643	–27*
2. lo sem, pseudo prefix	*rehearse–hearse*	2.5	611	602	9
3. mid sem	*midstream–stream*	5.1	569	549	20*
4. hi sem	*preheat–heat*	7.3	559	517	42*
5. hi sem, no phon	*destiny–fate*	8.2	584	557	27*

*p < .05
†Rating scale: 1=unrelated, 9=highly related.

demonstrate that words related in meaning prime, and that the degree of relatedness affects the magnitude of the priming effects; moderately related words (*lately–late*, for example) prime half as much (19 vs. 40 ms) as highly related words (*boldly–bold*). Additionally, in the absence of phonological similarity, there is a reduced, yet significant, priming effect for highly semantically related words (namely, 13 ms for *idea–notion* pairs). Results for the semantically unrelated words (for example, *hardly–hard* or *spinach–spin*) indicate that morphemes may not play a role in the absence of semantic similarity; pairs in both Conditions 1 and 2 produced statistically insignificant results, and therefore these effects should be replicated, which we do in Experiment 2.

3. Graded semantic effects: Prefixing

Experiment 2 examines whether there are differences in processing for prefixed versus suffixed words. Some researchers have proposed different processing mechanisms depending on the time course of morphological information. That is, one type of mechanism is invoked when the affix is encountered before the stem, but a different type of mechanism is invoked when an affix is encountered after a stem (for instance, Andrews 1986; Colé, Beauvillain, and Segui 1989; Marslen-Wilson *et al.* 1994). On our account, both types of words, prefixed and suffixed, should be processed by the same mechanism—and thus both types of words should show graded effects of semantic similarity. The question then is: Will the degree of semantic relatedness predict the magnitude of priming effects in prefixed-stem pairs in a manner parallel to that found previously for suffixed-stem pairs?

Stimuli for this experiment parallel those of Experiment 1 (see Table 2). There are highly related prefix-stem pairs in Condition 4, moderately related pairs in Condition 3, and two types with low relatedness ratings, those with a prefix-like segment in Condition 2, and those without in Condition 1. Finally, Condition 5 is made up of highly semantically related, but phonologically unrelated items, such as *destiny* and *fate*. 42 CMU undergraduates participated.

Results

The semantically unrelated pairs in Condition 2 produced statistically insignificant effects (*rehearse–hearse*, for instance), while the semantically unrelated pairs in Condition 1 produced significant inhibition. It is unclear why the *coffee-fee* pairs produced strong inhibition and *rehearse-hearse* ones did not.

The results may be due to the fact that semantic similarity was slightly higher for the *rehearse-hearse* items (mean 2.5) compared to *coffee–fee* (mean 1.5).

The pattern of results for the remaining prefixed words is strikingly similar to the pattern found for suffixed stem pairs: highly related pairs (for instance, *preheat–heat*) prime twice as much (42 vs. 20 ms) as moderately related pairs (for example, *midstream–stream*). These results are inconsistent with theorists proposing different processing mechanisms for prefixed and suffixed words, including Colé *et al.* (1989) who claim that prefixed words are processed as whole forms while suffixed words are decomposed, as well as Marslen-Wilson *et al.* (1994) who argue that suffixes inhibit one another, while prefixes do not. Our findings suggest instead that semantic similarity is more crucial to lexical processing than the order of affix and stem.

4. Role of morphological type

Experiment 3 investigates the role of morphological type, asking the question: Is priming dependent on the morphological relationship between the prime and the target? In Experiments 1 and 2, we looked only at suffixed words and their stems. But there is some evidence suggesting that other types of morphologically related words do not prime. Marslen-Wilson and colleagues (1994) found that pairs of suffixed words, such as *observation* and *observant*, did not produce significant priming. They explained their result by positing inhibitory links between separately stored suffixes. However, there is an alternative explanation for their results. That is, the word pairs they used were not sufficiently related, both semantically and phonologically, to produce significant

Table 3. Experiment 3: Mean semantic similarity ratings†, reaction times and priming effects by condition. Sample stimulus items are also shown

Condition	Prime-target example	Mean semantic similarity rating	Mean reaction time (msec) Control	Test	Priming effect (msec)
1. low sem, hi phon	*useful–useless*	4.7	624	628	−4
2. hi sem, hi phon	*saintly–sainthood*	7.7	655	621	34*
3. hi sem, lo phon	*observation–observant*	7.4	652	638	14

*p < .05

†Rating scale: 1 = unrelated, 9 = highly related.

priming. Our approach predicts that highly semantically and phonologically related words should prime, regardless of their morphological structure. To test this hypothesis, Experiment 3 explores priming in suffixed-suffixed pairs.

Stimuli were divided into three conditions (see Table 3). Condition 2 is made up of highly related suffixed pairs, such as *saintly* and *sainthood*, which do not differ in the phonological realization of the stems. Condition 3 consists of pairs similar to those tested by Marslen-Wilson *et al.*, that is, slightly less semantically related than those in Condition 2, and with phonological modifications to the stems (*observation–observant*, for instance). Condition 1 includes items that are opposites, such as *useful* and *useless*. While these items are as highly phonologically related as those in Condition 2, they are less semantically related. In addition to these word pairs, 90 real-word filler items were added. The experiment therefore consisted of 150 real word pairs and 150 nonword pairs. As in Experiments 1 and 2, participants responded to each target only once, proceeded either by its related prime or its unrelated control. 51 USC undergraduates participated.

Results

The results of this experiment confirm our hypothesis. Suffixed pairs prime, but only when they are highly semantically and phonologically related. We got significant priming for *saintly–sainthood* pairs, and an intermediate, 14 msec effect that did not reach significance for the *observation–observant* pairs. The effect for the less related pairs is very similar to the 11 msec effect Marslen-Wilson *et al.* (1994) obtained for similar items. Interestingly, the opposites in Condition 1 (for example, *useful–useless*) did not prime. This effect is consistent with our account because the semantic similarity ratings are correspondingly low, suggesting that subjects are rating the whole word meanings in their comparisons. It may, however, be problematic for those semantic theories that see scalar opposites as highly semantically related (Katz 1964, for example). Thus, our results do not support the claim that pairs of suffixed words inhibit one another, and suggest instead that overlap in meaning and sound is more important than morphological type in lexical processing.

5. Graded phonological effects

The final experiment looks at phonological relatedness, asking the question: Does the degree of phonological relatedness between stems and derived forms predict the amount of priming when all forms are highly semantically related?

For this experiment, we created a phonological relatedness metric. We considered pairs to be the most phonologically related when there is no phonological change in the stem when a suffix is added, for example *absorbent–absorb*. Slightly less related are pairs such as *deletion* and *delete*, where the final consonant of the stem changes when a suffix is added. Even less phonologically related are forms with a vowel change, such as *criminal* and *crime*. And finally, the least related are pairs with both a consonant and a vowel change, such as *introduction* and *introduce*. Stress-shifted items were not excluded from the stimuli and are represented across conditions.

Stimuli were divided into six conditions (see Table 4), where Conditions 1–4 correspond to the phonological relatedness metric described above. Importantly, all the word pairs in Conditions 1–4 were matched on semantic similarity measures, being highly semantically related. Items in Condition 5 are phonologically, but not semantically, related, and items in condition 6 are semantically, but not phonologically, related. 51 USC students were tested. As in the earlier experiments, participants responded to only half the related prime-target pairs in each condition.

Results

The results from this study are generally consistent with our predictions, with the slight exception being that the items in Condition 1 did not prime more than those in Condition 2. For the other 3 conditions, the more phonologically related the items, the greater the priming effect, as predicted. Thus, pairs exhibiting only a consonant change (for example, *deletion–delete*: 65 ms) show greater priming than those with a vowel change (for instance, *criminal–crime*:

Table 4. Experiment 4: Mean semantic similarity ratings†, reaction times (RT) and priming effects by condition. Sample stimulus items are also shown

Condition	Prime-target example	Mean semantic similarity (S. D.)	Mean RT Control	Mean RT Test	Priming (msec)
1. no change	*acceptable–accept*	7.4 (.69)	623	576	47*
2. consonant change	*absorption–absorb*	7.6 (.52)	662	597	65*
3. vowel change	*criminal–crime*	7.5 (.36)	656	608	48*
4. consonant and vowel	*introduction–introduce*	7.4 (.55)	674	639	35*
5. lo semantic relatedness	*accordion–accord*	2.0	677	691	–14
6. hi sem, no phon	*porpoise–dolphin*	7.6	661	621	40*

*$p < .001$

†Rating scale: 1 = unrelated, 9 = highly related.

48 ms), which in turn prime more than pairs that contain both vowel and consonant changes (*introduction–introduce*: 35 ms). Furthermore, the effects are not contingent on the particular suffixes used in each condition; *deletion* is more closely related to *delete* and so it primes more than *introduction* primes *introduce*, although both words have the same suffix. In addition, the effects can not be attributed to other stimuli factors, such as frequency, because they are matched across conditions for relevant factors.

6. Discussion

The results presented in this chapter demonstrate that both semantic and phonological similarity are continuous dimensions and that this grading is reflected in processing: priming magnitudes vary systematically along the full continuum of relatedness. Furthermore, the effects we have shown generalize across morphological types, holding for suffixed-stem, prefixed-stem, and suffixed-suffixed pairs.

The pattern of results suggests different answers to the two traditional questions posed in the Introduction. Are complex words decomposed in lexical processing (and/or storage) or not? The intermediate effects seem to truly differentiate between a connectionist approach to morphology and more traditional, decomposition, or dual-route theories. Given the continuous nature of relatedness and priming, it is unclear how proponents of hybrid models might delimit the set of complex words to be decomposed from those that are stored as wholes (for example, Marslen-Wilson *et al.* 1994). Similarly, these results appear problematic for dual-route models, such as Frauenfelder and Schreuder's (1992) Morphological Race Model, where researchers assume that there is a race between two procedures, and that a word is either successfully decomposed or directly accessed (see also Libben and de Almeida, this volume). How would such models account for the intermediate effects reported here?

Thus, the graded priming effects are awkward for accounts in which morphological decomposition is an all-or-none phenomenon, but follow naturally from a distributed connectionist perspective. On the distributed connectionist account, there are no 'decomposition' nor 'whole word' procedures for lexical access. Rather, words are processed by activating the appropriate patterns across the input nodes and propagating activation through the weighted connections on the units.

What are the roles of semantic and formal factors in morphological processing? Clearly, our findings are different from those of psycholinguists who have consistently failed to find that semantic and formal factors can account for experimental effects and have therefore appealed to the additional notion of morphological structure. Why this difference? Our answer is that previous studies have been methodologically flawed, either by examining these interacting factors independently (Napps 1989, for example), or by ignoring the continuum of relatedness, focusing instead only on the extreme ends (for instance, Marslen-Wilson *et al.* 1994). If one considers interactions between semantics and phonology, controlling for one while investigating the other as in our work, then a very different view emerges, where morphology is not a necessary, independent, language module.

By our theory, morphological regularities influence the development of interlevel representations that mediate mappings between semantics and phonology and that emerge in the service of language acquisition and processing. Morphology reflects structure present in the world: language input contains patterns that are picked up on by language learners to the extent that they are useful in solving the primary tasks of competent speakers, that is comprehending and producing speech. Thus, although we assume these same principles operate across all languages, the system that emerges may differ depending on the reliability of phonological similarity as a cue to meaning, as well as other factors, such as the type and token frequencies of related complex forms and the nature of the orthographic system.

Notes

1. The figure is meant to be schematic only, and many theories might be compatible with this diagram. We use it here simply for ease of exposition.
2. For more information on the statistical analyses, see Gonnerman (1999).
3. Parallel analyses were conducted for each of the other experiments, details of which are available from the first author.

References

Andrews, S. 1986. “Morphological influences on lexical access: Lexical or nonlexical effects”. *Journal of Memory and Language* 25.726–40.

Butterworth, B. 1983. "Lexical representation". *Language Production* ed. by B. Butterworth, 257–94. San Diego, CA: Academic Press.

Colé, P., C. Beauvillain and J. Segui 1989. "On the representation and processing of prefixed and suffixed words: A differential frequency effect". *Journal of Memory and Language* 28.1–13.

Frauenfelder, U. and Schreuder, R. 1992. "Constraining psycholinguistic models of morphological processing and representation: The role of productivity". *Yearbook of Morphology 1993* ed. by G. E. Booij and J. van Marle, 165–83. Dordrecht: Kluwer.

Gonnerman, L. M. 1999. *Morphology and the lexicon: Exploring the semantics-phonology interface.* Ph.D. dissertation, University of Southern California.

Katz, J. J. 1964. "Analyticity and contradiction in natural language". *The Structure of Language: Readings in the Philosophy of Language.* ed. by J. A. Fodor and J. J. Katz. Englewood Cliffs, NJ: Prentice-Hall.

Marslen-Wilson, W., L. Tyler, R. Waksler and L. Older 1994. "Morphology and meaning in the English mental lexicon". *Psychological Review* 101.3–33.

Napps, S. E. 1989. "Morphemic relationships in the lexicon: Are they distinct from semantic and formal relationships"? *Memory and Cognition* 17.729–39.

Prasada, S. and S. Pinker 1993. "Generalizations of regular and irregular morphological patterns". *Language and Cognitive Processes* 8.1–56.

Rueckl, J., M. Mikolinski, M. Raveh, C. Miner and F. Mars 1997. "Morphological priming, fragment completion, and connectionist networks". *Journal of Memory and Language*, 36.382–405.

Taft, M. 1988. "A morphological-decomposition model of lexical access". *Linguistics* 26.657–67.

Chapter 12

Passive in Arabic and English

Peter Hallman
University of California, Los Angeles

1. Introduction

In this chapter, the morphological expression of passive in Classical Arabic, modern Lebanese Arabic, and English is compared. Passive participles in English are shown to be morphologically composed in the same way as in Arabic, entailing a novel analysis of passive in English and exposing a previously unnoticed cross-linguistic similarity.

2. Classical Arabic

The chart below shows the ten possible forms of the Arabic verb in the perfect and imperfect (the stems are slightly different in the two tenses) in the active and passive, and the related active and passive participles. The shaded areas are relevant later.

(1)	Perfect active	Perfect passive	Imperfect active	Imperfect passive	Active participle	Passive participle
I	faʕal	fuʕil	ya-fʕal	yu-fʕal	faaʕil	mafʕuul
II	faʕʕal	fuʕʕil	yu-faʕʕil	yu-faʕʕal	mu-faʕʕil	mu-faʕʕal
III	faaʕal	fuuʕil	yu-faaʕil	yu-faaʕal	mu-faaʕil	mu-faaʕal
IV	ʻafʕal	ʻufʕil	yu-fʕil	yu-fʕal	mu-fʕil	mu-fʕal
V	tafaʕʕal	tufuʕʕil	ya-tafaʕʕal	yu-tafaʕʕal	mu-tafaʕʕil	mu-tafaʕʕal
VI	tafaaʕal	tufuuʕil	ya-tafaaʕal	yu-tafaaʕal	mu-tafaaʕil	mu-tafaaʕal
VII	ʻinfaʕal	ʻunfuʕil	ya-nfaʕil	yu-nfaʕal	mu-nfaʕil	mu-nfaʕal
VIII	ʻiftaʕal	ʻuftuʕil	ya-ftaʕil	yu-ftaʕal	mu-ftaʕil	mu-ftaʕal
X	ʻistafʕal	ʻustufʕil	ya-stafʕil	yu-stafʕal	mu-stafʕil	mu-stafʕal
IX	ʻifʕall		ya-fʕall		mu-fʕall	

The prefix *ya*/*yu-* in the imperfect is accompanied by a suffix *-u* (not notated). These together form a default third person singular subject agreement circumfix. A suffix *-a* (also not notated) has the same role in the perfect. A striking aspect of the chart in (1) is the morphological expression of passive. It is expressed entirely in the vowel tier. /*u_i*/ appears in the perfect and /*u_a*/ in the imperfect. In what follows, I will refer to this morpheme using its perfect tense allomorph /*u_i*/.

2.1 Participle formation

The chart in (1) shows that participle formation is regular for the non-form I verbs. They are formed by prefixation of *mu-* to the imperfect stem. Since the active/passive distinction is expressed though the vowel melody of the stem, participle formation preserves the expression of active and passive in the stem.

The form I participles are not so transparent. The participles of the form I verbs seem to contain neither the participle forming prefix *mu-* nor, in the case of the passive participle, either of the allomorphs of the passive morpheme /*u_i*/ or *u_a*/. Instead, both participle formation and the active/passive distinction seem to be expressed non-transparently in the prosodic template itself: *faaʕil* for the active participle and *mafʕuul* for the passive. Neither of these forms preserve the prosodic structure of the verbal stem. The following section investigates the differences between Classical Arabic and modern Lebanese Arabic and shows how these differences elucidate certain important properties of the morphemic composition of passivization.

3. Lebanese Arabic

The shaded areas of the chart in (1) do not exist in Lebanese Arabic — all the passives except the passive participle of form I. The absence of the passive participles of forms II–X is explained by the absence of the passive imperfect, since the former are derived from the latter. But the absence of the passive imperfect seems to just be a lexical gap. The disappearance of it and the passive perfect indicate that the passive morpheme /*u_i*/ is missing from Lebanese Arabic.

Lebanese forms passive verbs using the prefixes *t-* and *n-* coopted from the Classical Arabic resultative and inchoative templates II and VII.

(2) a. *keteb* (write) *nketeb* (be written)
b. *kasar* (break) *nkasar* (be broken)
c. *na'al* (copy) *nna'al* (be copied)
d. *badal* (replace) *nbadal* (be replaced)

(3) a. *HaDDar* (prepare) *tHaDDar* (be prepared)
b. *ballaT* (pave) *tballaT* (be paved)
c. *kassar* (smash) *tkassar* (be smashed)
d. *xarrab* (destroy) *txarrab* (be destroyed)

3.1 Participle formation

Lebanese also expresses passive through auxiliary-plus-passive-participle constructions inherited from Classical Arabic. Participles can be formed from the morphologically complex expressions in (2) and (3) by prefixation of *mi-*, the Lebanese descendant of Classical Arabic *mu-*. Here, like in Classical Arabic, the active/passive distinction is expressed internal to the participial morpheme.

(4) a. *mHaDDar* (preparing)
b. *mkassar* (smashing)

(5) d. *mitHaDDar* (prepared)
e. *mitkassar* (smashed)

(6) a. *minketeb* (written)
b. *minkasir* (broken)

The participial template *mafʕuul* is retained from Classical Arabic, and, like in Classical Arabic, forms passive participles of form I verbs. So in addition to the participles of the *n-* derived passive of form I, *mafʕuul* builds passive participles of form I with the same function.

(7) a. *keteb* (write) *maktuub* (written)
b. *kasar* (break) *maksuur* (broken)
c. *na'al* (copy) *man'uul* (copied)
d. *badal* (replace) *mabduul* (replaced)

The internal structure of *mafʕuul* is not as transparent as *minfeʕil.* The following section teases apart the internal structure of *mafʕuul* by comparing it to other classes of verb-related adjectives in Lebanese Arabic.

3.1.1 *The structure of* mafʕuul

Mafʕuul does not display the vowel melody /u_i/ or /u_a/, which the very fact of its existence in Lebanese Arabic corroborates (this morpheme is missing in Lebanese Arabic). But it also does not display the passive morphemes *n*- or *t*- either. It does contain a prefix not clearly evidenced in the other participles, however, namely *ma*-. It is at first glance tempting to analyze the *ma*- of *mafʕuul* as some form of the participle forming *mi*-. But several considerations cast doubt on such a construal. First, if *ma*- of *mafʕuul* is actually *mi*-, there is no evident explanation for the difference in vowel quality between the *ma*- of *mafʕuul* and the *mi*- of the other participles. Further, the vowel of *mi*- evolved from the Classical Arabic back vowel /u/ in *mu*-. This diachronic change did not affect the vowel of the form I passive participle, however. It was *ma*- in Classical Arabic as in modern Lebanese Arabic. The fact that the diachronic vowel change failed to affect *mafʕuul* indicates that it is truly a different vowel from that of the participle forming morpheme, suggesting that *ma*- of *mafʕuul* is a different creature altogether from the participle forming morpheme.

Another way in which *mafʕuul* is different from the other participles is that its internal prosodic structure is different. Final consonants in Arabic are extrametrical (McCarthy and Prince 1990), so for example form I (*faʕal*) consists of two light syllables, and form II (*faʕʕal*) consists of a heavy syllable followed by a light syllable. Participle formation through prefixation of *mi*- preserves the prosodic structure of the stem: a sequence of two light syllables in the verbal stem (notated [LL]) stays [LL] (*nketeb* → *minketeb*) and a heavy-light sequence ([HL]) stays [HL] (*tkassar* → *mitkassar*). But *mafʕuul* formation changes [LL] to [HH] (*keteb* → *maktuub*). This change in prosodic structure turns out to be a crucial aspect of the morphemic composition of the expression. The following section explains why.

3.1.1.1 *A broader look at related verb/adjective pairs in Lebanese Arabic* The relation between active form I *faʕal* and the passive participle *mafʕuul* is one of several morphological alternations that relate an adjective to a verb. This section reviews three other sets of related verb-adjective pairs. Comparing the similarities and differences among them will serve to isolate what aspects of morphological form correlate with what semantico-syntactic properties across verb-adjective relations, shedding light on the morphemic composition of the form I participles.

3.1.1.2 *fiʕleen* The first set of adjectives surveyed here occur in the template-suffix combination *fiʕl-een*, forming resultative adjectives.

(8) a. *'eleb* (fall) *'ilbeen* (fallen)
b. *gheri'* (sink) *ghir'aan* (sunken)
c. *fehim* (understand) *fihmeen* (having understood)
d. *zaʕil* (become upset) *zaʕleen* (upset)

A striking property of the *fiʕleen* template is that it can only form an adjective related to a verb that is non-agentive, such as unaccusatives like *fall* and *sink* as in (8a-b), or experiencer predicates like *understand* as in (8c), or simple states as in (8d). It cannot form adjectives from clearly agentive verbs like *write*, *hit*, *kill*, etc., as the ungrammaticality of the hypothetical forms in (9) indicates.

(9) a. *keteb* (write) **kitbeen* (writing)
b. *Darab* (hit) **Darbeen* (hitting)
c. '*etel* (kill) *'*etleen* (killing)

Furthermore, when an adjective in the template *fiʕleen* is related to a verb which is ambiguous between an agentive and non-agentive denotation, the adjective expresses the non-agentive denotation, that is, it's related to the non-agentive version of the verb, as in example (10). The verb "wreck" in Lebanese Arabic (*xarab*) displays an intransitive alternation illustrated in the pair (10a, b). But the related adjective *xirbeen* can only pattern after the non-agentive use of the verb in (10b), as the contrast (10c, d) shows, again demonstrating the sensitivity of the *fiʕleen* template to non-agentivity.

(10) a. *l-wleed xarab-o l-rasmeet*
the-children wrecked-P the-drawings
b. *l-rasmeet xerb-o*
the-drawings were.wrecked-P
c. *l-wleed xerbeen-iin l-rasmeet*
the-children (are) wrecking-P the-drawings
d. *l-rasmeet xerbeen-iin*
the-drawings (are) wrecked-P

That said, adjectives formed by *fiʕleen* never differ in argument structure from the related verb. So here, unlike a passive transformation, whatever arguments the verb licenses, the adjective licenses also, whether the verb is intransitive as in (11a, d), or transitive, as in (11b, c).

(11) a. *l-kitaab 'eleb.* *l-kitaab 'ilbeen.*
the-book fell the-book (has) fallen

b. *kariim fehim l-mishkle.* *kariim fihmeen l-mishkle.*
kariim understood the-problem k. (has) understood the-problem

c. *kariim kereh l-film.* *kariim kirheen l-film.*
kariim hated the-movie kariim (has) hated the-movie

d. *l-'irseel ʕele'.* *l-'irseel ʕal'een.*
the-transmission jammed the-transmission (has) jammed

But the verb-adjective pairs in (8) do share a commonality with the verb-passive participle pairs in (7), namely the change in prosodic structure from [LL] in the verb to [HH] in the adjective. So *fiʕleen* has a prosodic alternation in common with the passive participle *mafʕuul*.

3.1.1.3 *faʕiil* Another set of adjectives with related verbs occur in the template *faʕiil*.

(12) a. *'arib* (become near) *ariib* (near)
b. *ʕati'* (wear out) *ʕatii'* (worn out)
c. *raxiS* (become cheap) *raxiiS* (cheap)
d. *kabir* (become large) *kabiir* (large)

Like the *fiʕleen* template, adjectives in the *faʕiil* template share the argument structure of the related verb, as in (13).

(13) a. *l-treen 'arib ʕa l-mHaTTa.* *l-treen 'ariib ʕa l-mHaTTa.*
the-train approached to the-station the-train (is) near to the-station

b. *l-siyyaara ʕat'-et.* *l-siyyaara ʕatii'-i.*
the-car wore.out-3F the-car (is) worn.out-FS

c. *l-wleed marD-o.* *l-wleed mariiD-iin.*
the-children became.sick-3P the-children (are) sick-P

Also like the *fiʕleen* template, they cannot be related to an agentive verb. The verbs in (12) are unaccusative and hypothetical agentive forms as in (14) are ungrammatical.

(14) a. *keteb* (write) **katiib* (writing)
b. *Darab* (hit) **Dariib* (hitting)
c. *'etel* (kill) **'atiil* (killing)

In the case of the *faʕiil* template, the verb-adjective relation correlates with a change in prosodic structure from [LL] to [LH], which has the heaviness of the final syllable in common with the *fiʕleen* template and the passive *mafʕuul* template.

3.1.1.4 *faʕl* Lastly, a set of adjectives with related verbs exist in the template *faʕl*.

(15)	a.	*Saʕib* (become difficult)	*Saʕb* (difficult)
	b.	*Saxan* (become hot)	*Sexn* (hot)
	c.	*Heli* (become beautiful)	*Helw* (beautiful)

Here again, the arguments licensed by the adjective are the same as those licensed by the verb.

(16) a. *l-mishkle Saʕb-et.* *l-mishkle saʕb-e.*
the-problem became.difficult-3F the-problem (is) difficult-F
b. *l-mayy Saxn-et.* *l-mayy Sexn-e.*
the-water became.hot-3F the-water (is) hot-F

And again, the template cannot be related to an agentive verb.

(17)	a.	*keteb* (write)	**katb* (writing)
	b.	*Darab* (hit)	**Darb* (hitting)
	c.	'*etel* (kill)	*'*atl* (killing)

Again, the adjective differs from the verb prosodically in the heaviness of the final syllable, in this case the only syllable. So the *faʕl* template shares the heaviness of the final syllable with the other adjectival templates *faʕiil*, *fiʕleen* and the passive participle *mafʕuul*.

3.2 Summary

The previous section reviewed the behavior of three adjectival templates that occur in related verb-adjective pairs. A comparison of the commonalities and non-commonalities with the passive *mafʕuul* template is revealing. Semantico-syntactically, all four templates (*mafʕuul*, *fiʕleen*, *faʕiil*, and *faʕl*) form non-agentive adjectives. Morphologically, all end in a heavy syllable. Again semantico-syntactically, *mafʕuul* differs from the other templates in that its valency is reduced with respect to the verb it is paired with. Morphologically, *mafʕuul* differs from the others in the presence of the prefix *ma*-. The comparison across the four templates reveals that the heavy final syllable correlates with non-agentive adjective formation and the prefix *ma*- with valency reduction.

The prediction here is that no agentive adjective can end in a heavy syllable. The agentive adjectives are the active participles (see (1)). The active participles of the non-basic forms satisfy the restriction vacuously, since the participial prefix preserves the prosody of the underlying verb, which ends in a light syllable anyway. But the non-paradigmatic form I active participle does not preserve the prosodic structure of the related verb, but still satisfies the generalization that only non-agentive predicates end in a heavy syllable. Because the form I active participle is not forced into the form *faaʕil* with its light final syllable by a morphological paradigm, the fact that the form it has obeys the generalization supports the linguistic relevance of the generalization.

The end result of this investigation into the morphemic composition of *mafʕuul* is that *mafʕuul* is morphologically complex just like participles of the non-form I verbs. So passive participle formation in Arabic is consistently 'spread out' over two morphemes, one morpheme which absorbs the external argument of the related verb and a derivational morpheme which forms an adjective from the valency reduced verb.

4. English

This section shows that English is like Arabic in that passivization is morphologically spread out over two morphemes. Passivization in English is not standardly analyzed as morphologically complex. The standard analysis of passive in the generative linguistic tradition follows Jaeggli (1986), and Baker, Johnson and Roberts (1989) to the effect that a suffix *-en* (with allomorphes *-ed* and others) combines with a transitive verb to yield a passive participle, in some way absorbing the external theta role and the accusative case licensing property of the verb. This participle then does not license a syntactic object (does not assign accusative case) and does not license an agent (does not assign the agent theta-role). It has the distribution of an adjective, modulo certain fine-grained distinctions on which see Wasow (1977). The data in (18) seem to support the standard analysis of passivization.

(18) a. (i) John wrote the message. (ii) The message was written.
b. (i) John filed the reports. (ii) The reports were filed.

The sentences in (ii) bear the passive relation to those in (i), and differ morphologically in the presence of *-en* (and the auxiliary obligatory for adjectival predicates). The conclusion that participle forming *-en* is itself the valency reducing morpheme seems straightforward.

However, participles built from *-en* are not restricted to transitive bases. *-en* also applies to intransitive unaccusative verbs, and it preserves their argument structure when it does so.

(19) a. (i) The passengers arrived. (ii) The arrived passengers
b. (i) The snow fell. (ii) The fallen snow

In (19), *-en* looses its passivizing function, and merely forms an adjective out of the corresponding verb. The argument licensed by the intransitive verb in (i) is also licensed by the 'passive' participle in (ii). The behavior of *-en* in (19) is therefore different from its behavior in (18), where it has the additional effect of removing an argument from the predication.

The behavior of the *-en* affix in (18) (passives) is therefore only one part of its phenomenological playing field. The one characteristic that all the occurrences of *-en* have in common is the verb-to-adjective derivation. Valency reduction does not seem to be an inherent property of *-en*, but rather comes from some aspect of the syntactic context in (18) that is not there in (19).

Whatever licenses valency reduction in (18) then would seem to not have any morphological reflex at all. If *-en* is only adjective-deriving, then what is responsible for valency reduction in passives does not correspond to any morpheme visible in the (ii)-sentences in (18). Passive nominalizations support this claim.

Nominalizations of transitive verbs typically have the form in (20a), where the agent appears prenominally in the genitive case and the patient postnominally as the object of the preposition *of*.

(20) a. The Romans' destruction of the city
b. The destruction of the city by the Romans

Noun phrases like (20a) display an alternation with expressions of the form in (20b), which parallels the passive operation in verb phrases. The subject disappears from its canonical (pre-nominal) position and may optionally surface in a *by*-phrase. In the case of the nominals, object preposing to subject position is possible but not obligatory, since objects of nominalizations are not dependent on the nominal for case or whatever licenses syntactic objects, since the preposition *of* may step in to play this role. Arguments with pleonastic prepositional case are given to disappearing acts, just like the *by*-phrase, but the mapping of arguments to case positions is consistent in English, their optionality notwithstanding. Also note that languages such as German, where genitive is not so clearly canonically associated with agentivity, are languages with relative freedom of word order, i.e., the mapping of arguments to surface positions follows a less rigid pattern across clause types.

There is no morphological reflex of the alternation between (20a) and (20b). I.e., the noun bears no morphology, least of all *-en*, that morphologically signals that its argument licensing properties differ in (20b) from their canonical form in (20a). Further, the nominal that heads the phrase in both (20a) and (20b) already bears derivational morphology, namely the nominalizing suffix *-ion*. Since *-en*, in the proposal being fleshed out here, is a derivational affix that sends a verb to an adjective, we do not expect to find it in nominalizations. The nominalizing morphology plays the role of lending the verbal base its surface syntactic character (noun), which is just the role that *-en* plays in the adjectival passives in (18) and (19). Postulating that *-en* is a verb-to-adjective derivational affix that is not responsible for valency reduction explains the properties of (18)–(20) in one analytical swoop. We do not expect *-en* in (20) because the derivational affix *-ion* excludes it. We do not expect any overt reflex of valency reduction (the alternation (20a, b)), because valency reduction has no morphological reflex in English.

The standard analysis of *-en* as a valency reducing morpheme therefore makes the standard passive construction in (18) quite exceptional. Nowhere else in English is it the case that valency reduction has any morphological reflex. This exceptionality, and the exclusion of *-en* in the context of other derivational morphology, as in (20), indicates that *-en* is a purely derivational affix not involved in valency reduction, and that valency reduction itself is non-overt.

4.1 The distribution of *-en*

If *-en* is not valency reducing, the fact that passive participles must occur with valency reduction is puzzling. We saw in (19) that *-en* may apply to an unaccusative verb and preserve its argument structure in the derived adjective. Why can't *-en* apply to a transitive verb and preserve its argument structure in the derived adjective?

(21) a. *John was written the message.
 b. *Mary was filed the reports.

The ungrammatical strings in (21) demonstrate that participle formation seems to require valency reduction. These data suggest that there is some connection between *-en* and passivization after all.

What these data show, in particular, is that *-en* cannot appear in the environment of an agent. Though it is not directly responsible for valency reduction, it is excluded by agentivity. It may attach to an agentive verb only in the context of valency reduction, since valency reduction removes agentivity from the picture. It may attach to an unaccusative verb as such (see (19)), since unaccusatives are already non-agentive. But the context that licenses *-en* in transitives is passive.

But we have seen this pattern before. These are just the licensing conditions for the heavy final syllable in Arabic. Recall that the heavy final syllable acts like a derivational affix that sends predicates to adjectives. There is a restriction on its distribution, however, which is that it can only apply to non-agentive predicates. Therefore, *-en* shares the non-agentivity restriction of the Arabic heavy final syllable. This makes the morphological composition of passive participles in English and Arabic entirely isomorphic, down to the non-agentivity restriction on the derivational affix.

5. Conclusion

This analysis offers a novel understanding of how passivization works in both English and Arabic, and insight into a certain cross linguistic uniformity that may be quite widespread. A very cursory look at other Germanic and Romance languages seems to indicate at least at first glance that the contexts for participial morphology are like in English. I am tentatively suggesting that valency reduction can never be compounded with derivational morphology; they are always separate. This hypothesis may lead to a rather different and possibly more insightful understanding of what valency reduction is than is currently held. The contribution of the present study is to cast the passive phenomenon in this new light.

References

Baker, Mark, Kyle Johnson and Ian Roberts. 1989. "Passive Arguments Raised". *Linguistic Inquiry* 20: 2.219–51.

Jaeggli, Osvaldo. 1986. "Passive". *Linguistic Inquiry* 17:4.587–622.

McCarthy, John and Alan Prince. 1990. "Prosodic Morphology and Templatic Morphology". In *Perspectives on Arabic Linguistics II: Papers from the Second Annual Symposium on Arabic Linguistics*, ed. by Mushira Eid and John McCarthy, 1–54. Amsterdam: John Benjamins Publishing Company.

Wasow, Thomas. 1977. “Transformations and the Lexicon”. In *Formal Syntax: Papers from the MSSB-UC Irvine Conference on the Formal Syntax of Natural Language*, *Newport Beach*, *CA*, *1976*, ed. by Peter W. Culicover, Thomas Wasow and Adrian Akmajian, 327–60. New York: Academic Press.

Chapter 13

Lexical access in Bulgarian perfective vs. imperfective verbs

Georgi Jetchev and Pier Marco Bertinetto
University of Sofia and Scuola Normale Superiore, Pisa

1. Introduction[1]

One of the major issues in contemporary research on lexical access is the contrast compositionality vs. non-compositionality in the processing of morphologically complex forms. This corresponds to either accessing the individual morphemes that constitute the intended form, or directly accessing the whole form. Most scholars would now agree that both routes of access are viable, the difference lying in the particular subset of the lexicon involved as well as in the typological properties of the language considered (for a review, see Bertinetto 1995).

The challenge consists in accumulating diverse pieces of evidence, from as many languages and as many subsets of the lexicon as possible. The present chapter presents evidence from Bulgarian, a language seldom addressed in experimental psycholinguistics (but see Bertinetto and Jetchev 1996; Slabakova 1999; Nikolova and Jarema 2000). The special interest of Bulgarian is that, like all Slavic languages, it presents two types of verbs — traditionally called perfectives (PFs)/imperfectives (IPFs) — forming derivationally related pairs. Actually, the label "derivationally related" should be interpreted with caution in this case. First, there is no part of speech shift, since both elements are verbs, and this is not what one finds in prototypical cases of derivation. Second, the verbs belonging to an aspectual pair form a sort of hyperparadigm, so that some scholars would rather consider them inflectionally, rather than derivationally related. However, the latter view could hardly apply to Bulgarian. In this language both PF and IPF verbs exhibit a full tense-paradigm, where both perfective and imperfective tenses appear, namely:

Present, Imperfect, Aorist, Perfect, Pluperfect, Future (not to consider the system of so-called 'non-testimonial' tenses, or the moods other than the Indicative). This sharply differs from other Slavic languages, where the tense-paradigm has undergone a dramatic reduction. In Russian, for example, each verb presents in the Indicative mood no more than two/three tenses, namely: Present, Past and (with IPF verbs only) Future. Consequently, it is not unreasonable to assume that the paradigms of two verbs belonging to an aspectual pair may be jointly regarded as a sort of hyperlexeme, where all aspectual values are expressed without redundance (Breu 1984). In any case, although we do not adhere to this view, we are perfectly aware that the conclusions to be drawn from our materials are not directly applicable to other, more prototypical cases of derivation.

On the other hand, Slavic verbs offer some advantages, on the formal ground, for experimental investigation. In particular, the competing PF and IPF forms may occasionally share the same number of phonemes and/or syllables, and may exhibit no stress shift (cf. Rus. *slušat'*/*slyšat'* 'listen/hear'), as opposed to prototypical cases of derivation (cf. It. *tradire*/*tradimento* 'betray/betrayal'). In addition, since there is a variety of morphophonological means to obtain the IPF counterpart of a PF verb (or vice versa), it is possible to finely modulate the parameter of formal complexity, which is one of the most revealing in the experimental research concerning lexical access.

Precisely for these reasons, the Slavic verb system has already attracted the attention of Feldman (1994), who compared the behaviour of formally equivalent (in the sense just described) Serbian aspectual pairs. Her results indicate that inflected, as opposed to derived, primes, produce a significant facilitation (where **INF** and **DER** should be interpreted as specified below). In this chapter we report the results of two experiments performed on Bulgarian materials, with an aim at replicating Feldman's findings. In each experiment we compared two classes of verbs, differing in terms of the morphophonological process deriving IPFs from PFs. Note that in Feldman's work, derivationally related primes were also inflectionally different from their targets. Specifically, her targets were 3rd pl. Present forms, while both INF and DER primes were 1st sg. Present forms. This complicates the interpretation of the findings, because DER primes (unlike INF ones) differ from targets by two factors, instead of just one. To remedy this possible source of confusion, in our experiments both INF and DER primes differed by one factor only (inflection or derivation, respectively). See the following set of examples, based on *obelja* 'to peel', where *šte* is the Future (invariable) particle. Note that our targets, as well as identical primes (henceforth **IDE**) could not coincide with the citation form — which in Bulgarian (a language without the Infinitive) is the 1st sg. Present Indicative — because with PF verbs the latter is a non-autonomous form, being necessarily employed in dependent clauses introduced by a conjunction:

Primes	Targets
IDE: 2nd sg. Future PF (*šte obeliš*)	
INF: 3rd pl. Future PF (*šte obeljat*)	2nd sg. Future PF (*šte obeliš*)
DER: 2nd sg. Future IPF (*šte obelvaš*)	

2. Experiment I

2.1 Introduction

We selected two classes of Bulgarian verbs, differing in terms of the morphophonological process deriving IPFs from PFs. PFs of class 1 belong to the /i/ conjugation, while IPFs, derived by inserting the infix /v/, belong to the /a/ conjugation. PFs of class 2 belong to the /e/ conjugation and present the infix /n/, while (derived) IPFs, again belonging to the /a/ conjugation, change /n/ into /v/:

Class 1: PF (2nd sg/3rd pl) = *šte obeliš/obeljat* IPF (2nd sg) = *šte obelvaš*
Class 2: PF (2nd sg/3rd pl) = *šte omekneš/omeknat* IPF (2nd sg) = *šte omekvaš*

To control the frequency factor, a number of candidates from each class were submitted to a panel of native speakers for subjective evaluation. We thus selected four perfectly balanced subclasses of 6 elements each, cross-cutting the Aspect and Frequency factors (**class 1**: overall = 2.23; PF frequent = 2.61, PF rare = 1.91; IPF frequent = 2.58, IPF rare = 1.99; **class 2**: overall = 2.27; PF frequent = 2.51, PF rare = 1.94; IPF frequent = 2.55, IPF rare = 1.93). The complete list of forms is reported in the Appendix of Jetchev and Bertinetto (2000).

All forms were trisyllabic and stressed on the penult. As to orthography, the average number of graphemes in each subclass was as indicated below. Given the shallow nature of the Bulgarian orthography, there is a fair correspondence between graphemes and phonemes. The only exception in our examples is the transliteration ⟨ja⟩ (as in the above examples), corresponding to a single grapheme in the native orthography (**class 1**: overall = 7.8; PF frequent=7, PF rare=7.6; IPF frequent=8, IPF rare=8.6; **class 2**: overall=8,4; PF frequent=8.6, PF rare=8.2; IPF frequent=8.6, IPF rare=8.2).

The experiment consisted in a repetition priming task with visual input lexical decision. Subjects had to decide as fast as possible, by pressing one of two buttons (YES/NO), whether the stimulus on the screen was a word or a non-word (henceforth **W/NW**).

Our expectations were: (A) If morphological complexity is a relevant factor, there should be an advantage of INF over DER targets[2]; (B) This effect could possibly be larger in class 2 than class 1, due to the increased complexity of the morphophonological process involved. The design of the experiment is thus likely to provide useful information as to the problem of lexical access with morphologically complex Bulgarian words.

2.2 Method

Each class included 72 items (12 IDE primes, 12 INF primes, 12 DER primes, plus 36 targets). Although all targets were exactly the same for each verb, they were conventionally divided into IDE, INF and DER targets, depending on the type of primes they were associated with. Each class was evenly divided into frequent and rare. All in all, there were 144 W items (72 for each class). NW items (phonotactically legal and in the same number as Ws), were obtained by modifying a single consonant of real verbs belonging to each class, and exhibiting exactly the same morphological endings as our Ws.

The average prime/target distance was 10 words (ranging from 8 to 12). Since each subject could only respond to one target for each prime, we composed three partial lists, evenly distributing the various subclasses. In the statistical analysis, we randomly grouped subjects from each partial list, thus obtaining a set of 'supersubjects' composed of one subject per group. Each partial list consisted of 96 pseudo-randomized test stimuli (48 Ws, 48 NWs), plus 7 fillers.

The (paid) subjects were 75, i.e. 25 in each group, all students at Sofia University and different from those who had taken part in the rating procedure. Six of them had to be discarded because of unsatisfactory performance (the number of errors exceeded the mean by more than twice the standard deviation). The final number of 'supersubjects' was thus 23. The hardware for the experiment consisted in a portable Mac computer and in a Superlab response box. For more details about the experimental procedure, see Jetchev and Bertinetto (2000).

Responses slower than 1000 msec. were automatically eliminated; in addition, in the analysis we discarded any response relating to unrecognized primes (i.e. Ws judged as NWs or vice versa) and to their corresponding targets. In all, 6.8 per cent responses were eliminated, while 1.2 per cent responses were lost because of occasional hardware malfunctioning.

2.3 Results

The mean reaction time (henceforth **RT**) for Ws, as opposed to NWs, was 685.6 vs. 756.7. Table 1 reports the mean RTs for the various subsets of W stimuli alone. The following general tendencies appeared (with << standing

Table 1. Number of valid responses (*italics*) and mean RTs for W items of experiment I

		N	RT		*N*	RT		*N*	RT
PRIMES *N=1418* RT=710.8	IDE	*487*	704.3	class 1	*248*	691.2	Freq	*128*	669.7
							Rare	*120*	714.1
				class 2	*239*	717.8	Freq	*123*	705.0
							Rare	*116*	731.4
	INF	*477*	711.5	class 1	*251*	694.8	Freq	*130*	677.9
							Rare	*121*	712.9
				class 2	*226*	730.1	Freq	*117*	728.3
							Rare	*109*	732.0
	DER	*454*	717.2	class 1	*232*	715.3	Freq	*122*	689.1
							Rare	*110*	744.3
				class 2	*222*	719.2	Freq	*111*	713.9
							Rare	*111*	724.6
TARGETS *N=1387* RT=659.9	IDE	*475*	659.0	class 1	*243*	648.5	Freq	*126*	634.4
							Rare	*117*	663.8
				class 2	*232*	670.0	Freq	*117*	657.0
							Rare	*115*	683.3
	INF	*465*	659.2	class 1	*245*	645.5	Freq	*128*	636.8
							Rare	*117*	654.9
				class 2	*220*	674.5	Freq	*116*	667.1
							Rare	*104*	682.7
	DER	*447*	661.4	class 1	*229*	658.5	Freq	*120*	641.7
							Rare	*109*	677.0
				class 2	*218*	664.5	Freq	*111*	653.5
							Rare	*107*	675.9

for "faster than", and < standing for "negligibly faster than"): targets << primes (659.9–710.8), frequent << rare (672.4–699.8); class 1 << class 2 (675.6–696.3); IDE < INF, INF < DER (681.9–685.7–689.5); the last tendencies were mainly due to primes (704.2–711.5–717.2) rather than targets (659.0–659.2–661.4).

The main factors of the ANOVA were: Status=W/NW; Function=prime/target; Type=IDE/INF/DER; CLASS=class 1/class 2; Frequency=frequent/rare. The contrast W/NW was highly significant (Pr < 0.0001). As to Ws alone, the factors Function (by SS [=supersubjects]: 1, 44=17.57, Pr < 0.000; by items: 1, 142=55.47, Pr < 0.000) and Frequency (by SS: 1, 44=5.04, Pr=0.030; by items: 1, 142=12.23, Pr=0.001) were highly significant. Class was significant by items (1, 142=6.57, Pr=0.011) but not by SS (1, 44=2.56, Pr=0.116), while Type was non-significant altogether, as well as all the interactions. Of special relevance is the lack of significance of the Function * Type interaction; see the next section.

A series of pair-wise *t*-tests showed that all comparisons between primes and targets were highly significant (Pr < 0.0001). Besides, these tests reassessed the irrelevance of the Type factor. The differences between IDE , INF and DER was constantly non-significant, in contrast to Feldman (1994), where INF and DER targets showed a significant divergence. On the other hand, a number of comparisons involving the two classes turned out to be significant: primes of class 1 vs. primes of class 2 (Pr=0.001); targets of class 1 vs. targets of class 2 (Pr=0.002); IDE items (both primes and targets) of class 1 vs. IDE items of class 2 (Pr < 0.0001); INF items of class 1 vs. INF items of class 2 (Pr=0.002); IDE primes of class 1 vs. IDE primes of class 2 (Pr=0.022). By contrast, the comparison between DER items of class 1 vs. DER items of class 2 turned out to be non-significant.

The error analysis yielded a pattern of results fairly similar to the one observed for the RT analysis.

2.4 Discussion

We aimed at analysing the role of the following variables: (i) morphological complexity, opposing DER vs. INF forms; (ii) morphophonological complexity, opposing classes 1 and 2; (iii) frequency, opposing frequent vs. rare verbs.

The statistical analyses show that the first variable was not effective. Indeed, we did not find the expected interaction between Function and Type, yielding the facilitation of INF over DER, as in Feldman (1994). On the other hand, the high relevance of variable (iii) was predicted. As to variable (ii), it turned out to be marginally significant. Interestingly, the significant contrast of IDE primes of class 1 vs. 2 indicates that the two classes differed already at 'baseline'. By contrast, INF and DER primes tended to converge, as suggested by the lack of significance in the comparisons of INF (or DER) primes of class1 1 vs. 2.

However, the facilitation enjoyed by class 1 may be due to: (a) morphophonological complexity; (b) length, as measured in phonemes/graphemes. In terms of (a), it should be noted that class 2 words, although involving a more complicated derivational process, exhibited a more transparently 'motivated' morphophonological structure, for these PF items contain the infix /n/ defining a sufficiently clearly identifiable set of verbs (Radanova-Kuševa 1995). As to (b), recall that class 1 items are shorter than class 2 ones (7.8 vs. 8.4). A multiple regression analysis of RT and Length of PF primes (both IDE and INF) vs. IPF primes (DER) of both classes showed that the correlation between these two factors was very high (0.74; Pr=0.0363).

Both morphophonological complexity and length may therefore have had an impact on the results concerning classes 1 and 2. The problem needs thus to be re-examined (cf. exp. II). One may already note, however, that Length does not account for all results: indeed, INF primes of class 2 took longer to respond to, as compared with both IDE and DER primes of the same class, although the items within each 'aspectual' pair of class 2 presented the same length.

3. Experiment II

3.1 Introduction

In experiment II, class 2 was preserved, while class 1 was replaced by class 3. PF forms of class 3 belong to the /e/ conjugation like those of class 2, but the stress falls on the inflectional ending. The IPF (i.e. DER) forms, belonging to the /a/ conjugation, present an array of morphophonological changes: seven items change the second vowel, while five items add one phoneme/grapheme. See the examples below. Note that the same design of exp. I was retained (see Section 1): PFs were at the second person singular and third person plural of the Future, IPFs at the second person singular of the Future (the stress location is explicitly marked for ease of the reader):

/e/ -> /ˈi/:	PF=*šte premetéš/premetát*	IPF=*šte premítaš*	(6 items)
/e/ -> /ˈa/:	PF=*šte vəzeséš/vəznesát*	IPF=*šte vəznásjaš*	(1 items)
/ø/ -> /ˈi/:	PF=*šte provréš/provrát*	IPF=*šte províraš*	(2 items)
/ø/ -> /ʒ/:	PF=*šte navedéš/navedát*	IPF=*šte navéʒdaš*	(3 items).

Thus, PF forms of classes 2 and 3 belonged to one and the same conjugation but differed in that those of class 3 were stressed on the last syllable. Moreover, class 3 included two disyllables. As to IPFs of class 3, they were trisyllabic and stressed on the penult, like those of class 2, but differed from the latter because of their highly idiosyncratic derivational process.

The frequency factor was controlled in the same way as in exp. I (class 3: overall=2.35; PF=2.26; IPF= 2.44). However, we did not further subdivide the items into frequent and rare, given the straightforward results obtained in exp. I. As to orthography, the average number of graphemes/phonemes in each set was as follows: class 3: overall=7.16; PF=6.66; IPF= 7.66.

Our main expectations were: (A) If Length is a relevant factor, there should be an advantage of class 3 over class 2; (B) If morphological complexity is a relevant factor, there should be an advantage of INF over DER targets; (C) If morphophonological complexity is a relevant factor, there should be an advantage of class 2 over class 3.

3.2 Method

All details are as in exp. I. We had 45 (paid) subjects, 15 in each group, all students at Sofia University and different from those who took part in the frequency scaling judgement or in exp. I. No subject was discarded on the basis of unsatisfactory performance. The only difference in experimental procedure was that the RT limit was raised to 1,200 msec., reducing the missed responses to 3.8 per cent. As in exp. I, we further eliminated all data points concerning unrecognized primes, with their corresponding targets (3.9 per cent responses). Finally, 2.3 per cent responses were lost because of occasional malfunctionings.

3.3 Results

The mean RT for Ws, as opposed to NWs, was 714.2 vs. 775.7. Table 2 reports the figures for the various subsets of W stimuli. This time we observed practically no difference between classes 2 and 3 (712.5 vs. 715.7 msec.). By contrast, besides the advantage of targets over primes (682 vs. 745.5 msec.), there was again a tendential advantage for IDE items over INF ones, and of

INF over DER items (703.2–716.6–723.3). In contrast to exp. I, this tendency was almost equally strong for primes (733.2–747.9–756.5) and for targets (672.5–684.6–689.5).

The ANOVA tests were performed on the main factors and their interactions. The contrast W/NW was highly significant (Pr < 0.0001). Turning to Words only, the only significant factor was Function (by SS: 1, 28=12.108, Pr=0.002; by items: 1, 142=69.916, Pr < 0.000). No other main factor or interaction was significant, including the interaction Function * Type.

A series of *t*-tests showed that all comparisons between primes and targets were highly significant (Pr < 0.0001), with the partial exception of the comparison between INF primes and INF targets of class 2 (Pr=0.045). By contrast, no comparison involving the two classes was significant, just as no significant result was found in any of the pair-wise comparisons between the three types of target (considering Classes 2 and 3 together). However, taking class 3 alone, there was significance in the comparison between IDE and DER targets (Pr=0.036), while the comparison between INF and DER targets only approached significance (Pr=0.061). Details aside, the error analysis confirmed this picture.

3.4 Discussion

The main differences, with respect to the findings of exp. I, were: (a) there was no tendency towards significance in the contrast between the two classes;

Table 2. Number of valid responses (*italics*) and mean RTs for W items of experiment II

		N	RT		*N*	RT
PRIMES *N=864* RT=659.9	IDE	*297*	733.2	class 2	*149*	743.9
				class 3	*148*	722.4
	INF	*292*	747.9	class 2	*150*	731.6
				class 3	*142*	765.1
	DER	*275*	756.5	class 2	*139*	757.5
				class 3	*136*	755.4
TARGETSs *N=845* RT=659.9	IDE	*290*	672.6	class 2	*146*	678.5
				class 3	*144*	666.5
	INF	*285*	684.6	class 2	*145*	699.5
				class 3	*140*	669.3
	DER	*270*	689.5	class 2	*137*	682.3
				class 3	*133*	696.8

(b) considering class 3 alone, DER targets were significantly slower than IDE targets, and close to significantly slower than INF targets. This seems to be initial evidence that the degree of morphophonological complexity of class 3 is sufficiently high as to slow down the processing time needed to access these IPF verbs from their PF cognates.

Thus, there seems to be no simple answer to the issues raised by points (B–C) of Section 3.1. The morphological and morphophonological factors intertwine to produce the observed pattern of results. Namely, it seems to be the case that morphophonological complexity has to overcome a certain threshold (as in class 3) in order for morphological complexity, as measured by the contrast INF vs. DER, to yield significant effects.

As to point (A), by contrast, it is very unlikely that the disadvantage of DER targets of class 3 depends on Length. First, in class 3 the difference between IPFs and PFs is exactly the same as in class 1; yet, in the latter case no significant disadvantage was observed for DER primes. Second, if Length were relevant, we should observe a statistically significant contrast between Classes 2 and 3, just as we did find it between classes 1 and 2: indeed, the mean length difference between class 2 and 3 is even larger than between 1 and 2. Since this was not the case, the different behaviour of DER targets of class 3 vs. 2 must depend on the different degree of morphophonological complexity. Third, a multiple regression analysis on RT and Length showed no statistically reliable correlation (0.146; Pr=0.853). Thus, the role of Length, despite its apparent effect in exp. I, was not of primary importance.

4. General discussion

Three classes of frequency-controlled Bulgarian verbs were examined. In exp. I, class 1 appeared to have a marginally significant advantage over class 2, while in exp. II no overall difference was observed between classes 2 and 3. On the other hand, DER targets of class 3, as opposed to classes 1 and 2, exhibited a significant disadvantage with respect to IDE targets and a close to significant disadvantage with respecto to INF ones. These findings suggest the relevance of the variable 'morphophonological complexity': DER forms of class 3 were in fact obtained through a variety of processes (see Section 3.1), in contrast to the unique and regular process applied in Classes 1 and 2. On the other hand, the morphological contrast between inflection and derivation (as implemented in our materials), was not significant per se.

As to the difference between classes 1 and 2, the most probable explanation — considering the very limited impact of the Length factor, as shown by the results of exp. II — is that it depended on the different degree of morphological compositionality of PF verbs in these two classes. The presence of the semantically fairly transparent /n/ infix in PF verbs of class 2 yielded a longer processing time, possibly because they tended to be perceived as morphologically complex (see Table 1). On the other hand, since the derivational process involved in IPFs of classes 1 and 2 is very regular and productive, it did not yield a significant disadvantage for DER vs. INF targets.

By contrast, non-productive and irregular derivational processes, such as those employed in DER (i.e. IPF) targets of class 3, are expected to induce a disadvantage, unless the degree of irregularity is such as to make direct access preferable for the speakers. But note that in the case of Bulgarian verbal morphology this would not necessarily produce a benefit, for the number of forms to be stored would be quite remarkable. On the other hand, in noun morphology we do observe situations where direct access of morphophonologically complex plurals might be advantageous, as noted in Bertinetto and Jetchev (1996).

One possible objection is that no contrast was found between IDE primes of classes 2 and 3. Indeed, while IDE primes of class 2 showed some degree of morphological compositionality (due to the /n/ infix), there is no reason to consider the corresponding items of class 3 as morphologically complex. The explanation we would like to propose is that the RTs of class 3 IDE primes were somewhat slowed down by the paradigmatic relation that ties them to their highly irregular IPF cognates. This is not implausible, for Slavic verbs do come in pairs (or even, not infrequently, in triples), which native speakers must be perfectly well aware of. Thus, a paradigmatic effect of this sort might have been at work in class 3.

In conclusion, although we did not replicate Feldman's (1994) findings concerning the morphological contrast of inflection vs. derivation in the lexicon of Slavic languages, we found initial evidence of the possible interaction between morphological and morphophonological complexity in one class of Bulgarian verbs. Among the questions that remain to be answered by future research, we would like to single out the following two. First, it is possible that the limited impact of the contrast inflection vs. derivation in our materials was due to the non-prototypical nature of derivational processes in Slavic aspectual pairs. Second, it is also possible that the use of different targets (closer to the default form of Bulgarian verbs) might increase the priming effect. Finally, it is not unlikely that other experimental techniques (such as immediate priming, with the appropriate Stimulus Onset Asynchrony) yield the expected contrast between INF and DER items. We are planning further investigations in this direction.

Notes

1. We wish to thank Maddalena Agonigi, who assisted us with the experimental software and with the statistical analyses. We are also indebted to Cristina Burani and Alessandro Laudanna for their useful comments and guidance in the early phase of this research. A special thank is due to Laurie Feldman, who provided us with the experimental list of her Serbo-Croatian experiment, allowing us to exploit the guidelines of her research. The first author acknowledges the Research Support Scheme of the Open Society Support Foundation (grant No.: 669/1998).

Abbreviations used: IDE=identical; INF=inflected; DER=derived; PF=perfective; IPF=imperfective; W=word; NW=non-word; RT=reaction time; SS=supersubjects.

2. By INF and DER targets, one should understand targets connected with INF and DER primes, respectively. In fact, as shown by the diagram in Section 1, all targets consisted in one and the same form for each verb.

References.

Bertinetto, Pier Marco. 1995. "Compositionality and non-compositionality in morphology". *Cross-Disciplinary Approaches to Morphology*. Wien: Österreichische Akademie der Wissenschaften. ed. by Wolfgang U. Dressler and Cristina Burani. 9–36.

——and Georgi Jetchev. 1996. "Lexical access in Bulgarian: Words with and without floating vowels". *Quaderni del Laboratorio di Linguistica della SNS* 10.

Breu, Walter. 1984b. "Zur Rolle der Lexik in der Aspektologie". *Die Welt der Slaven* 29. 123–148.

Feldman, Laurie Beth. 1994. "Beyond orthography and phonology: Differences between inflections and derivations". *Journal of Memory and Language* 33.442–470.

——and Carol A. Fowler. 1987. "The inflected noun system in Serbo-Croatian: Lexical representation of morphological structure". *Memory and Cognition* 15.1–12.

Jetchev, Georgi. To appear. *Ghost Vowels and Syllabification. Evidence from Bulgarian and Frech*. Bloomington, Ind: Slavica Publishers.

——and Pier Marco Bertinetto. 2000. "Lexical access in Bulgarian perfective vs. imperfective verbs (extended version)". *Quaderni del Laboratorio di Linguistica della SNS* 14.

Kehayia, Eva and Gonia Jarema. 1994. "Morphological priming (or *priming*?) of inflected verb forms: A comparative study". *Journal of Neurolinguistics* 8.83–94.

Lukatela, Georgije, Claudia Carello, Michael T. Turvey. 1987. "Lexical representation of regular and irregular inflected nouns". *Language and Cognitive Processes* 2.1–17.

——B. Gligorijevič, A. Kostič and Michael T. Turvey. 1980. "Representation of inflected nouns in the internal lexicon". *Memory and Cognition* 8.415–423.

Nikolova, Rossitza and Gonia Jarema. 2000. "The interaction of morphological structure and prefix transparency in the processing of Bulgarian verbs". Poster presented at the Second Conference on the Mental Lexicon. Montréal, October 2000.

Radanova-Kuševa, Neli. 1995. "L'interdipendenza tra azione e aspetto in bulgaro". *Ricerche Slavistiche* 42.401–442.

Slabakova, Roumyana. 1999. "Aspectual constraints in the lexicon of Bulgarian speakers". *CLASNET Working Papers* Université de Montréal. 12.2–14.

Chapter 14

Inflectional morphemes as syntactic heads[1]

Marit Julien
University of Tromsø

1. Introduction

Most attempts to define the (grammatical) word list a collocation of properties which are claimed to characterise words, such as being the primes of syntax and the domain of morphology, without really explaining how words are identified in the first place. It appears, however, that the only theory-independent criteria which can be used to identify the grammatical words in any string of speech are distributional ones, such as (relative) freedom of position (Boas 1911) and the minimal free form and indivisibility criteria of Bloomfield (1933). It is these properties that cause certain morpheme sequences to be seen as words.

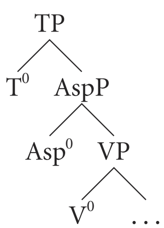
But crucially, this must mean that a word is simply a sequence of morphemes that regularly appear adjacent to each other and in a certain order. Nothing can be concluded from this about the mechanisms of grammar that have formed the words. In particular, it does not follow that a word must be a single terminal of syntax, impenetrable to all syntactic operations.

An argument in favour of the view that the word is a complex syntactic object is based on the fact that morphology normally deals with discrete morphs. The category of tense can serve as an example. Of the 530 languages surveyed in Julien (2000), not a single one expresses tense or aspect primarily by means of root alternations. In some languages the formal exponent of tense/aspect is not separate from the verb stem in the linear order. Instead, tense/aspect is expressed by the vocalic tier (Semitic) or by tones. The tense/aspect marker can however still be seen as structurally separate from the verb stem. That is, the normal way of expressing a grammatical category such as tense is to have a tense morpheme which is either pronounced as a separate word or else realised as an expansion of the verb stem. It follows that the simplest grammar is one where the tense morpheme is generated directly in the tense head. If the tense marker is included in a word with the verb, it must then be a consequence of syntax. For such aberrant cases as the Germanic strong verb conjugation, one could propose either that T^0 and V^0 are fused in the syntax, or else that a special allomorph of the root is combined with a null affix, as in Halle and Marantz (1993). Similar considerations apply to other functional categories.

I therefore assume that every morpheme, with the notable exception of agreement markers (see Julien 2000), represents a separate syntactic terminal node. In the following, with examples drawn from the domain of verbal inflection, I will deal with the syntactic mechanisms that are responsible for producing the morpheme strings that constitute complex words.

2. Patterns of verbal inflection

It is widely assumed that the functional heads which encode tense are generated above the functional heads that encode aspect. That is, the universal base order is Tense-Aspect-Verb, as shown in (1). (I ignore here other functional heads which are also probably present in the clause, cf. Cinque 1999.)

(1)


Given this basic structure, and assuming, with Kayne (1994), that movement and adjunction are always to the left, any given surface ordering of tense marker, aspect marker, and verb root is expected to correlate with a certain syntactic configuration. It appears that this is borne out. In the following sections, I will deal with each of these configurations in turn.

2.1 The base-generated order: Tense–Aspect–Verb

The first option is to have no movement at all, so that tense, aspect, and verb appear in the base-generated order. This is arguably the case in examples (2)–(3), where the tense and aspect markers are free elements preceding the verb.[2]

(2) Jicaltepec Mixtec (Bradley 1970)
ča nú čákuda rá
PAST PERF sit.down he
'He has already sat down.'

(3) Mauritian Creole (Adone 1994: 44)
lapli ti pe toñbe
rain PAST IMPF fall
'Rain was falling.'

The pattern illustrated above is what one would expect in a language where the structural arrangement of tense, aspect, and verb is as shown in (1). Since the inflectional markers and the verb do not form a constituent, there is no structural basis for including the tense and aspect markers in the verbal word. Nevertheless, it is a striking fact that prefixes show the same ordering as free preposed markers. An example is given in (4). Note that the language in (4) is closely related to the language in (2).

(4) Chalcatongo Mixtec (Macaulay 1993: 73)
a-ni-ndatu-rí uù órá
TENSE-COMPL-wait-I two hour
'I've already been waiting for two hours.'

This suggests that it is possible for the inflectional markers and the verb root to have the appearance of one word even in (1).[3] Since the relevant morphemes in the above examples always appear in a fixed order, the crucial questions would be whether there can be material in the intervening Spec positions, and whether individual markers can occur in isolation, for example as answers. And indeed, in the case of preverbal markers there appears to be a correlation between these distributional properties and the perceived word status of the preverbal morpheme sequence (see Julien 2000).

I conclude that prefixes are structurally similar to free preposed markers. This claim is further supported by the fact that in some languages, one and the same element is sometimes a free preposed marker and sometimes a prefix. One example is the completive marker in Jacaltec, shown in (5ab).

(5) Jacaltec (Craig 1977: 9, 90)
a. *xc-ach w-il-a*
COMPL-2ABS 1ERG-see-TRANS
'I saw you.'

b. *x-Ø-in-mak* *metx tx'i*
COMPL-3ABS-1ERG-hit CL dog
'I hit the dog.'

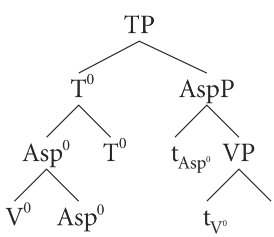
There is no obvious reason to assume different syntactic structures for the preverbal areas in (5a) and (5b). In both cases, the completive marker probably represents an aspectual head which retains its base-generated position relative to the verb. The grouping of morphemes that we see simply reflects the phonological constituency of the language. When the completive marker is followed by the absolutive agreement marker, the two elements together attain the minimal size of a phonological word, and accordingly, the inflectional markers form a preverbal word in (5a). In (5b), on the other hand, the completive marker cannot possibly form a phonological word on its own, so it is included in the verbal word phonologically.

More generally, all preposed inflectional markers, bound and free, represent heads that precede the verb in the surface structure as well as in the base-generated structure. Hence, preposed markers do not form a syntactic constituent with the verb root, although they sometimes form a word with the verb.

2.2 Head movement forms suffix sequences: Verb+Aspect+Tense

To the base structure shown in (1), head movement may apply so that the verb moves to Asp^0 and then the V^0+Asp^0 complex moves to T^0. If each moving head adjoins to the left of the next higher head, as I assume here, the result will always be a complex head where the order of elements is the reverse of the base order. This is illustrated in (6).

(6)



A complex head necessarily shows independent distribution and internal cohesion. Hence, morphemes that are contained in a complex head will always belong to one and the same word. That is, in a structure like (6), the tense and aspect markers will be suffixed to the verb root. An example is given in (7).

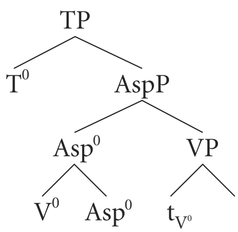
(7) Yagua (Payne and Payne 1990: 389)
rá-jų̈patya-y-muuy-siy niɨɨnu
INAN-fall-INTR-COMPL-PAST tree
'The trees all fell down a few weeks ago.'

In Yagua, the basic word order is VSO. This suggests that the verb has moved out of VP. It is likely that it has moved at least to T^0, and that it is this movement operation that creates the complex verbal word. The ordering of morphemes in the verbal word is Verb+Aspect+Tense, just as predicted by (6). The same pattern is also found in other languages where there is head movement of the verb to Asp^0 and T^0.[4]

2.3 V° moves only to Asp°: Tense(+)Verb+Aspect

In some languages, head movement takes the verb only to Asp^0. The resulting configuration is shown in (8).

(8)



In this configuration, the aspect marker is necessarily suffixed to the verb, since it is included in a complex head with the verb. As for the tense marker, which precedes the V^0+Asp^0 complex, its inclusion in the verbal word depends on phonology and whether or not it is strictly adjacent to V^0+Asp^0. This variation is illustrated in (9) and (10).

(9) Podoko (Jarvis 1991: 217)
Sa gəl-i udzəra.
PAST grow-IMPF child
'The child was growing up.'

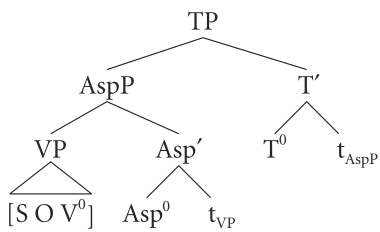
(10) Rukai (Li 1973)
wa-kani-ŋa
PAST-eat-COMPL
'He/she ate.'

More generally, when tense and aspect are situated on opposite sides of the verb root, the tense marker precedes and the aspect marker follows the root, as predicted by (8). Moreover, since the tense marker is not included in the complex verbal head, it may or may not be included in the verbal word.

2.4 Movement of complement to Spec: Verb+Aspect+Tense

Arguably, in some languages the morphologically complex verb is formed by phrasal movement. Phrasal movement may move a (verb-final) VP to Spec-AspP, and then AspP to Spec-TP. In the resulting configuration, V^0, Asp^0, and T^0 are linearly adjacent, as shown in (11).

(11)



If these movements are obligatory, the morpheme sequence Verb+Aspect+ Tense will be a recurring pattern, and it will tend to be perceived as a word. Notably, the ordering of morphemes is the same as in suffix sequences formed by head movement. Hence, for any suffixing language, it is only after examination of the overall clausal syntax that one can tell whether (6) or (11) applies.

For many SOV languages, however, there are several syntactic arguments in favour of (11). For example, it is often the case that subjects are not islands, and negative polarity items in subject position are licensed by the negation which is suffixed to the verb (see, for example, Kural 1997 on Turkish and Saito and Fukui 1998 on Japanese). Now, if the clausal structure of these languages is as shown in (11), so that the subject is dominated by VP and by every functional projection above VP, the properties just mentioned and many others can be explained (see Julien 2000).

Moreover, (11) provides an explanation of why the vast majority of SOV languages have inflectional *suffixes* only. To be sure, SOV languages with preposed inflectional markers do exist. Two examples of SOV languages with non-bound inflectional markers preceding the verb are given in (12) and (13).

(12) Nama (Hagman 1977)
píli ke //nããpá maríàsà xanísà kè-rè màa
Bill DECL there Mary letter PAST-IMPF give
'There Bill gave Mary a letter.'

(13) Bambara (Kastenholz 1989: 67)
ń fà yé báara kɛ
1SG father PAST work do
'My father worked.'

In both these cases, the word order is arguably the result of moving each argument individually. The subjects have moved to the front of the clause, while the objects have climbed over the tense and aspect marker in (12) but only moved to the left of the verb in (13).

However, verb-final languages have postposed tense markers nearly four times as frequently as they have preposed tense markers (see e.g. Julien 2000). This is unexpected if verb-final order is derived simply by moving the arguments high up in the clause. Then there should be no direct connection between having verb-final order and having tense suffixes. There is nevertheless a correlation between verb-final order and suffixing morphology. I will propose that this is because the majority of verb-final languages use the strategy of moving the complements to specifier positions. Consequently, they are characterised by verb-final word order and suffixing morphology.

3. Three possible but unattested orders

A priori, one might also expect to see languages where Asp^0 moves to T^0 while the verb stays in its base position, so that the surface order Aspect–Tense–Verb is created. Another possibility might be to move VP to the left of T^0, with the resulting order Verb–Tense–Aspect. Alternatively, even without movement of VP to the left of Asp^0, there could be movement of AspP to the left of T^0, which would then give the order Aspect–Verb–Tense. However, it is not clear to me whether any of these orders actually exist.

For space reasons, I cannot go into details here. Let it be noted, though, that in the sample of 530 languages discussed in Julien (2000), there are very few languages which are claimed to display the order Aspect-Tense-Verb.[5] And on closer inspection, it appears that in each case, some alternative analysis is available on which the language in question conforms to one of the patterns discussed in Section 2. Either the alleged aspect marker turns out not to be an aspect marker after all, or the alleged tense marker represents something other than tense (see Julien 2000).

Further, in the sample that I have looked at, there are no clear cases of the orders Verb–Tense–Aspect or Aspect–Verb–Tense. Where these orders are claimed to be attested, it appears again that the alleged aspect marker can also be interpreted in some other way (see Julien 2000).[6]

These fact suggest that movement of the heads or of the phrasal projections of IP must start from the bottom, i.e. with V^0 or VP, and it must be local, so that V^0 or VP cannot skip AspP and move instead to a position within TP.[7] The deeper explanation for this is a topic for further investigation.

4. Conclusion

We have seen in this chapter how various orderings of tense markers, aspect markers, and verbal roots can be accounted for by assuming that they result from a fairly restricted repertoire of syntactic operations. When apparent counterexamples to this syntactic approach to word formation are analysed in more detail, they turn out not to be genuine counterexamples after all. Although this is not conclusive evidence that words are formed in syntax, it nevertheless suggests that the syntactic approach to word formation gives the simplest grammar.

It also follows from the analyses given above that words are not necessarily constituents outside of phonology. This means that 'word' is not a grammatical concept; rather, wordhood is a matter of distribution. If two morphemes are linearly adjacent, there is always the possibility that they may be perceived as constituting a word. Whether this will actually happen does not directly depend on the syntactic configuration, but on other factors such as the regularity of that particular morpheme combination in the language in question, its distribution relative to other elements, and the direction of phonological word formation. The structural relation between the morphemes only matters insofar as some structural arrangements of morphemes may result in independent distribution and internal cohesion whereas others may not.

Notes

1. The research for this chapter was financially supported by the Research Council of Norway, grant no. 110928/520.

2. The following abbreviations are used in the glosses: ABS=absolutive, CL=classifier, COMPL=completive, DECL=declarative, ERG=ergative, IMPF=imperfective, INAN=inanimate, INTR=intransitive, PERF=perfective, S=singular, TRANS=transitive.

3. Myers (1990) gives a detailed analysis of Shona words which is fully compatible with this claim.

4. In many VSO languages, the verb does not move very high, so that tense and aspect markers precede it in the surface order.

5. One might suggest that constructions with the so-called aspectual auxiliaries 'be' and 'have' are examples of this order. However, in my view these auxiliaries represent V^0s and not Asp^0 heads (see Julien to appear).

6. An anonymous reviewer suggests, following Bok-Bennema (1994), that certain unseparable verbal prefixes in Dutch (and German) are aspect markers. If this is correct, Dutch does in fact have morphologically complex verb forms where the morpheme order is Aspect-Verb-Tense. However, Hoekstra (1992) suggested that the prefixes in question are particles which originate within the complement of the verb and subsequently incorporate into the verb. That is, they are not realisations of an Asp^0 head. On this analysis, the morpheme order Particle-Verb-Tense is exactly what we would expect to see after head movement of the particle to V^0 and of Particle+V^0 to T^0.

7. In many languages, the whole IP moves to the left of question markers and polarity markers. This may happen even in the absence of IP-internal movement, so that the elements inside IP may surface in their base position. Such cases do not necessarily constitute counterexamples to the generalisation stated in the text, however. Question markers and polarity markers are presumably generated within the CP-domain (Rizzi 1997). Apparently, the feature uniformity that seems to be required of the heads in the IP-domain does not extend to the heads of the CP-domain.

References

Adone, Danny. 1994. *The Acquisition of Mauritian Creole.* Amsterdam and Philadelphia: John Benjamins.

Bloomfield, Leonard. 1933. *Language.* New York: Holt.

Boas, Franz. 1911 [1969]. "Introduction". *Handbook of American Indian languages. Part 1.* (=*Smithsonian Institution. Bureau of American ethnology*, *Bulletin* 40.) ed. by Franz Boas, 1–83. Oosterhout: Anthropological Publications.

Bok-Bennema, Reineke. 1994. "Dutch Verbalization and the Theory of Morphology." *Language and Cognition* 4, ed. by Ale de Boer, Helen de Hoop and Hans de Swarts, 13–26. Groningen University.

Bradley, C. Henry. 1970. *A Linguistic Sketch of Jicaltepec Mixtec*. Norman, Okla.: Summer Institute of Linguistics of the University of Oklahoma.

Cinque, Guglielmo. 1999. *Adverbs and Functional Heads*. Oxford: Oxford University Press.

Craig, Colette Grinevald. 1977. *The Structure of Jacaltec*. Austin, Tex.: University of Texas Press.

Hagman, Roy S. 1977. *Nama Hottentot Grammar*. Bloomington, Ind.: Indiana University Research Center for Language and Semiotic Studies.

Halle, Morris and Alec Marantz. 1993. "Distributed Morphology and the Pieces of Inflection." *The View from Building 20*, ed. by Kenneth Hale and Samuel Jay Keyser, 111–76. Cambridge, Mass.: MIT Press.

Hoekstra, Teun. 1992. "Aspect and Theta Theory." *Thematic Structure: its role in grammar* ed. by Iggy M. Roca, 145–74. Dordrecht: Foris.

Jarvis, Elizabeth. 1991. "Tense and Aspect in Podoko Narrative and Procedural discourse". *Tense and Aspect in Eight Languages of Cameroon*. ed. by Stephen Anderson and Bernard Comrie, 213–37. Arlington, Tex.: Summer Institute of Linguistics/University of Texas.

Julien, Marit. 2000. *Syntactic Heads and Word Formation: A study of verbal inflection*. Doctoral dissertation, University of Tromsø.

——2001. "The Syntax of Complex Tenses." *The Linguistic Review* 18:2.123–65.

Kayne, Richard S. 1994. *The Antisymmetry of Syntax*. Cambridge, Mass.: MIT Press.

Kastenholz, Raimund. 1989. *Grundkurs Bambara* (*Manding*) *mit Texten*. Cologne: Rüdiger Köppe Verlag.

Kural, Murat. 1997. "Postverbal constituents in Turkish and the linear correspondence axiom". *Linguistic Inquiry* 28.498–519.

Li, Paul Jen-kuei. 1973. *Rukai structure*. Taipei: Institute of History and Philology, Academia Sinica.

Macaulay, Monica. 1993. "Argument status and constituent structure in Chalcatongo Mixtec". *Special session, Berkeley Linguistics Society* 19.73–85.

Myers, Scott. 1990. *Tone and the Structure of Words in Shona*. New York: Garland.

Payne, Doris L. and Thomas E. Payne. 1990. "Yagua". *Handbook of Amazonian languages*, vol. 2, ed. by Desmond C. Derbyshire and Geoffrey K. Pullum, 249–474. Berlin: De Gruyter.

Rizzi, Luigi. 1997. "The fine structure of the left periphery." *Elements of grammar* ed. by Liliane Haegeman, 281–337. Dordrecht: Kluwer.

Saito, Mamoru and Naoki Fukui. 1998. "Order in phrase structure and movement". *Linguistic Inquiry* 29.439–74.

Chapter 15

The problem of morphological description of verbal forms ambivalent between finite and nonfinite uses

Elena Kalinina
Moscow State University

1. The problem

Many languages have verbal forms that are ambivalent between finite and nonfinite uses: a form can function as both a noun modifier and/or verbal noun, on the one hand, and as the main clause predicate, on the other. In (1) and (2) from Kobon, the perfective form is shown to function as a participle (ex. (1)) and a finite form (ex. (2)).

Kobon (East New Guinea Highlands, Kalam)

(1) Pai **pak-öp** ñi au-ab.
girl hit-PF.3SG boy come-PRS.3SG
'Here comes the boy who hit the girl.' (Davies 1981: 29)

(2) Yad manö unbö nöŋ-eb iru **g-öp**.
1SG speak-NM so listen-NM much do-PF.3SG
'I am tired of listening to you speaking like this.' (=it does much (to) me) (Davies 1981: 27)

Morphologically, the distinction may not show up either: in Telugu, the participle, i.e., a form which heads a relative clause in (3), can be the finite predicate, and in this function person markers attach to the the participle directly (ex. (4)), while some supportive item is expected since it is a participle.

Telugu (Dravidian)

(3) Nēnu **cebu-t-unna** maata.
1SG say-CONV.PST-PART.IPF word
'The word I am saying.' (Krishnamurti and Gwynn 1985: 238).

(4) Nēnu **nidrapō-t-unnā-nā?**
1SG sleep-CONV.PST-PART.IPF-1SG
'Am I sleeping?' (Petruničeva 1960: 64)

Matters can become even more complicated: in Nanai (5) the participle in *-xam* can be the subordinate clause predicate and take case markers. At the same time it can function as the main clause predicate, combining freely with person markers.

Nanai (Tungusic)
(5) Mi nöani garpa-**xam-ba**-ni ičäde-xäm-bi.
I he shoot-PART.PF-ACC-3SG watch-PART.PF-1SG
'I watched him shoot.' (Avrorin 1961: 72)

The phenomenon can be observed in genetically and areally unrelated languages. Examples (6)–(9) illustrate the fact that many languages allow the same form to combine with person (or tense) markers in the finite function and case markers when functioning in non-finite clauses. In (6) from Khakas, the perfective participle takes the dative case marker in a headless relative clause, and the same form stands on its own as the main clause predicate.

Khakas (Altaic)
(6) Toğyn-**ğan-nar-ğa** azyral ağyl-ğan-nar-Ø.
work-PART.PF-PL-DAT lunch bring-PART.PF-PL-3
'They brought lunch to workers.' (=to those who worked) (Baskakov 1975: 231)

The Buryat future participle in (7) demonstrates the same pattern.

Buryat (Mongolian)
(7) Inžener bolo-**xo-d**-oo mädä-xä-bdi.
engineer become-PART.FUT-DAT-SS know-PART.FUT-1PL
'When we become engineers, we will know (it).' (Skribnik 1988: 90).

In (8) from Dargi the participle is shown to combine with the ergative case marker in a headless relative clause. In (9) it is heading the main clause, and person markers are attached to it.

Dargi (Nakh-Dagestanian)
(8) Digaj-li darg d-ic'ib-**si-ni** čilra če-x'e-ju.
love-ERG heart N-fill-PART-ERG anything NEG-see.IPF-NEG
'The one whose heart is filled with love does not see anything.' (Abdullaev 1971: 310).

(9) Nuni ručka kasib-**si-ra** kağar belk'-es.
1SG.ERG pen take.PF-PART-1SG.PST letter write-POT
'I took a pen to write a letter.' (Abdullaev 1971: 148)

The fact that both nominal (case) and verbal (person) morphology markers can be attached to the same form poses a problem for grammatical description. The examples suggest that morphological complications involved are due to the syncretism of word classes/parts of speech. This suggestion is confirmed by the behaviour of predicate nominals: person markers in the cited languages can be attached directly to predicate nominals as well as to the so-called participial forms — examples (10)–(13).

Nanai (cf. ex. (5))
(10) (Mi) naj-**i**.
1SG man-1SG
'I am a man.' (Sunik 1947: 181).

Khakas (cf. ex. (6))
(11) Min khakas-**pyn**.
1SG khakas-1SG
'I am Khakas.' (Baskakov 1975: 300)

Dargi (cf. ex. (9))
(12) Nu adam-**ra**/adam-**ri**.
1SG man-1SG.PRS/man-1SG.PST
'I am/was a man.' (Abdullaev 1971: 166)

Telugu (cf. ex. (4))
(13) Nēnu bīdaraŋ-**ni**.
1SG poor.man-1SG
'I am a poor man.' (Petruničeva 1960: 89)

There are two possible ways to handle the morphological ambivalence of this kind. First, it can be claimed that the word class of the stem does alter, though there might be no overt evidence of the change. Alternatively, the word class does not change; instead, grammatical rules are formulated so that the same grammatical marker is allowed to be attached to both nouns and verbs. In this chapter, I will show that the second approach more adequately treats morphological complications arising in connection with the verb forms, combining finite and nonfinite uses. First, I will argue that grammatical marking in the languages under analysis applies to phrases, not to just words. Second, I will try to demonstrate that this is possible because of the functional load of these grammar markers.

2. Word-class change

Ways of handling the lack of noun/verb distinction have been discussed with respect to a number of languages. For instance, in Abkhaz (14) tense and person markers can be directly attached to predicate nominals (cf. exx. (10)–(13)).

Abkhaz (North-West Caucasian)
(14) Sara **s**-durak-**wp** bguangyla?
1SG 1SG-fool-PRS to.your.opinion
'Do you think I am a fool?' (Šakryl 1981: 76)

The following quotation from Hewitt's Abkhaz grammar shows that for the author this is impossible unless the lexeme becomes verbalized:

> . . . in the case of copular sentences without an overt 'be'-copula the normal verbal categories (person, tense etc.) are expressed by attaching as prefix and suffix to the complement the stative verb markers (w+p' in the present, -n in the past), in other words, the complement becomes the root of a stative verb (Hewitt 1989: 47).

However, this quotation does not make it clear what made the nominal stem become verbalized. Two suggestions are possible regarding this type of noun/verb syncretism. One is that the verbal categories change the word class of the stem. The other is conversion hypothesis (Broschart 1997): word class is altered before category markers are attached to it.

2.1 Word-class changing inflection

The first solution has sometimes been adopted for treatment of verbal forms, lacking distinction between predicate and NP uses (examples (5)–(9)). In some grammars the finite form is claimed to be derived from the participial stem (the root+participial suffix) by means of person suffixes. This is not an uncontroversial decision. First, why should it not be the other way round that the verbal noun is derived from the verbal stem (the root+tense suffix) by means of case affixes? Second, this solution provokes a more general question: can a form be *derived* by means of *inflectional* category markers?

Traditional views on inflection/derivation unambiguously disallow a positive answer to this question:

> . . . derivational formations may exhibit changes in major class membership; inflectional formations exhibit no changes in major distribution class membership . . . (Nida 1946: 99)

> . . . derivational affixes have the potential to change the grammatical class of the elements to which they are attached. For example, the addition of the derivational suffix *ful* to the noun *care* results in an adjective. . . By contrast, an adjective inflected to agree in gender and number with the noun it modifies remains an adjective. (Langacker 1972: 75)

> Inflectional affixes are not "category-changing". (Selkirk 1982: 77)

> If an affix changes the part of speech of the base, then it is derivational. (Bauer 1988: 12).

> Derivational rules change the syntactic category of their base, while inflectional rules do not. (Scalise 1988: 562)

> Inflectional rules do not change word class . . ., while derivational ones can. (Anderson 1992: 78)

The authors are unanimous in the respect that only derivational affixes can be word-class changing, while inflectional ones cannot. However, according to Haspelmath (1996), there are inflectional (that is, productive, regular and general) rules which change the word class of the stem. These are affixes, that, for example, derive nouns from verbs in Lezgian (ex. 15)) and verbs from nouns in Blackfoot (ex. (16)).

V → N (masdar suffix)

Lezgian (Nakh-Dagestanian)

(15) Wun fad q̄arağ-**un**-i čun tažub iji-zwa.
you.ABS early get.up-MASD-ERG we.ABS surprise do-IPF
'That you are getting up early surprises us.'

N → V (predicativizer)

Blackfoot (Algonkian)

(16) Ít-aakii-**yi**-hpinnaan.
1-woman-PRED-PL.EXCL
'We (excl.) are women.'

The derived forms behave in some respect syntactically like the corresponding non-derived members of the word-class: the Lezgian masdar fills the argument position of the verb, like a prototypical noun, and the Blackfoot predicativizer produces forms which have the protytypical verbal function — that of a predicate. In other words, word-class changing inflection changes the external syntax of the category, while the internal syntax may remain intact: in (15), case marking of nouns, depending on the masdar, is in no way different from that in a clause, standing on its own.

So Haspelmath allows inflection to be word-class changing, and at first sight this could be the case with Nanai and similar languages.

Nevertheless, languages like Nanai are different from those considered by Haspelmath: the participles in (5)–(9) are not exactly like the Lezgian masdar and the predicate nominals do not fully follow the Blackfoot pattern in (16). First, in Lezgian and Blackfoot the marker which triggers the change of external syntax is distinct from the usual verbal and nominal inflectional markers: the masdar suffix licenses its combination with nominal categories — case, and the predicativizer makes it possible for a noun to be combined with person markers. In examples (5)–(9) and (10)–(13) there is nothing to license the combination of an element with the markers of an alien category (or, to put it differently, to change its external syntax). Second, word-class changing inflection markers in Lezgian and Blackfoot make it possible to say in which direction the change is taking place: with the masdar it is definitely V → N, in Blackfoot it is N → V. But it is hardly so straightforward with grammar markers in examples (5)–(9) and (10)–(13). One cannot say that person markers change the class of the lexeme from noun to verb, for it would mean that all words are nouns. Likewise, case cannot be said to change word class from V to N since true nouns then have to be regarded as verbs, too. It can seem possible to make the decision basing on the fact that in all languages under analysis (Nanai, Telugu, Khakas, Dargi and Buryat) there are items that function only as verbs, while any noun can function as a verb. This might seem a reasonable basis to assume that ambivalent items involve derivation from noun to verb, which in turn leads to a conclusion that predicative verb forms in (5)–(9) are derived from verbal nouns by means of word-class changing inflection (person). This is contradicted by the data, because these verbal forms have verbal internal syntax in nominal use (cf. examples 5, 7, 8) and thus do not behave like non-derived members of the noun class. So, the languages in question do not have word-class changing inflection in Haspelmath's sense.

2.2 The conversion hypothesis

The conversion hypothesis was discussed by Broschart (1997) with regard to Tongan, which is another language where nearly any lexeme is allowed to occur in verbal contexts as well as in nominal ones. Examples (17)–(18) show a noun occuring first with a tense marker and then with an article.

Tongan (Austronesian, Polynesian)

(17) **Na'e** kei tamasi'i.
PST still boy
'He was still a boy.' (Broschart 1997: 135)

(18) Ko **e** ta'ahine.
PCL ART girl
'It is/was a girl.' (Broschart 1997: 133)

The same way a verb in (19) is preceeded by the prototypically verbal tense marker, but in (20) an article is placed in front of it.

(19) **Na'e** kei lele.
PST still run
'He was still running.' (Broschart 1997: 126)

(20) **Ko e** '**alu** 'a sione ki kolo.
PCL ART go ABS Sione ALL town
'Sione is presently/visibly going to town.' (Broschart 1997: 140)

The idea behind the conversion hypothesis is that the distinct lexical word-classes *noun* and *verb* are only identifiable in the phrasal context. In other words, before the item receives category marking, it is converted to a noun or a verb. This echoes the 1984 article by Hopper and Thompson where "categoriality — the realization of a form as either a N or V" is claimed to be "imposed on the form by discourse" (Hopper and Thompson 1984: 707–8). Broschart refutes the conversion hypothesis with the following arguments: first, verbal slots in Tongan are occupied by nominal phrases and not just single nominals. The nominal having been verbalized, can even retain its prototypically nominal markers. In (21) the noun, though occuring in the context of a verbal category, has a plural marker which it has in nominal contexts too, see (22).

(21) **Na'e kau** faiako´ ('a) e Siasi´.
Pst HPL teacher.DEF ABS ART Church
'The Church provided teachers.' (=the-teacher-s-ed) (Broschart 1997: 136)

(22) Ko **e** **kau** faiako´.
PRS ART HPL teacher
'It is the teachers.' (Broschart 1997: 136)

On the other hand, there is Šakryl's work on Abkhaz, where she argues against the view that Abkhaz predicate nouns become verbalized. First, it is actually an NP and not simply a noun, which is inflected for tense and person (ex. (23)); an NP is not a word, but a constituent, and constituents are not supposed to belong to a word-class (though their heads do).

Abkhaz
(23) Nina ex'a d-daara-zp'ab-t'ynč-wp.
Nina today 3SG-very-girl-quiet-PRS
'Today Nina is a very quiet girl.' (Šakryl 1981: 21)

Second, the predicate noun retains nominal morphology markers even in the context of tense and person:

(24) I-š'la-bzia-**ḳuo**-wp.
3.PL-[tree-good]-PL-PRS
'These are good trees.' (Šakryl 1981: 19)

Third, any lexeme can go into this frame (exx. (25)–(26)), and it is difficult to imagine that all these words shall enter the dictionary as verbs.

(25) I-**ax'o**-wp.
3SG-today-PRS
'It is today.' (Šakryl 1981: 20)

(26) L-**zo**-wp.
3SG-for-PRS
'It is for (something).' (Šakryl 1981: 20)

The common idea in Šakryl's and Broschart's works is that internal syntax and/or morphology preservation is really a strong argument favouring the view that the word-class does not change. These criteria are really helpful in arguing that the word-class in the examples under investigation does not change.

As to the first point, in Buryat a predicate nominal can have a nominal possessive suffix:

(27) Ši inag.durataj xʊbʊʊ-mni-š.
2SG beloved son-1SG.POSS-2SG
'You are My Beloved Son" (Hajn Mädääsäl 1996: 8)

In Telugu, a predicate nominal can have an adjectival dependent, forming an NP:

(28) Nuvvu **manci**-dāni-vi.
2SG good-woman-2SG
'You are a good woman.' (Bhaskararao 1972: 199)

In Khakas, the formation of an NP involves some marking of the head nominal, according to the izafet pattern. The izafet construction can occur in the context of person markers, too (ex. (29)). Besides, in (29) the predicate nominal has a typically nominal dependent — a possessive pronoun.

Khakas
(29) Min anyŋ oolğ-y-byn, pekej.
1SG he.GEN son-IZ-1SG Pekey
'I am his son, Pekey.' (Baskakov 1975: 303)

Semantic criteria can also be of help in deciding whether predicate nouns are verbalized. For instance, (27) is taken from the Buryat translation of the Gospel of Mark. These are God's words addressed to Jesus, where Jesus is *identified* and not *characterized* as the Son of God. Example (29) is undoubtedly identificational, too, while verbs cannot be used to identify referents. So, semantics, morphology and internal syntax of predicate nominals with person markers clearly speak against the verbalization hypothesis.

Verbal forms in (5)–(9) appear not to be nominalized either. First, the suffixes which the grammars say to be participial have inherently verbal semantics — progressive in Telugu and Nanai (4) and (5), perfective in Khakas (6), future in Buryat (7), they are not basically and primarily participial. What is more, these suffixes are never found with nouns, and this is clear evidence for a noun/verb distinction. Morphosyntax of participial forms is verbal, too. Participles have person markers following case markers, which agree with the subordinate clause subject in (30)–(31). Besides, in (31) from Buryat the participle with the case marker has a typically verbal dependent — a converb.

Nanai
(30) Mi nöani garpa-**xam-ba-ni** ičäde-xäm-bi.
I he shoot-PART.PF-ACC-3SG watch-PART.PF-1SG
'I watched him shoot.' (Avrorin 1961: 72)

Buryat
(31) Namda duraa.guta-**ža** baj-**h-ye-šni** mädä-nä-b.
1SG.DAT [hate-CONV be-PART.FUT]-ACC-2SG know-PRS-1SG
'I know that you hate me.' (Bertagaev and Cydendambaev 1965: 153)

3. Category markers are attached to syntactic phrases

All this favours the view that the word class does not change, i.e., a noun combining with person markers is still a noun, and if a noun is not banned from the prototypically verbal context, why should a verb be banned from the prototypically nominal one? If a nominal can occur with “verbal” markers, why should a verb be incompatible with nominal morphology? So, the forms in (5)–(9) are verbs even though case markers are attached to them. However, it would still sound controversial to say that the verbal form can decline like a noun, and a noun be conjugated like a verb. There is a more sensible way to put it: that is to say that it is syntactic phrases and not lexical elements that take case or person markers (a related point has been made by Chr. Lehmann (1988) for agreement). So, tense and person mark predicates, whatever they are, whereas case markers are attached to the complements of the verb, be it a noun or a subordinate clause. This way of category marking should indeed be studied systematically for the following reasons. First, languages behave rather consistently in this respect: if a language allows syntactic marking of a category, most categories are marked in this way. In Abkhaz (ex. (31)) plural is marked on NPs, too: a plural marker follows the adjective, because an adjective follows a noun in a noun phrase, not because plural is marked on adjectives.

In Buryat (ex. (32)) plural can be marked on any constituent of a noun phrase, either a noun or an adjective.

(32) a. gojo naadanxaj-**nuud**
nice toy-PL
b. gojo-**nuud** naadanxaj
nice-PL toy
‘nice toys’ (Bertagaev and Cydendambaev 1965: 85)

Second, this way of category marking — group inflection — is very widespread and is to be held responsible for many discrepancies between morphology and syntax — as, for example, in (33) from Diyari. In this language the case marker is attached to the noun phrase where the adjective follows a noun, therefore it looks like as though it were the adjective that is marked for case.

Diyari (Australian, Pama-Nyungan)
(33) Tana ngama-na wapa-yi mita muya-**ni**.
3PL live-PART AUX-PRS [country dry]-LOC
‘They lived in a dry country.’ (Austin 1981: 127)

4. The functions of the markers

At this point another hypothesis discussed by Broschart in connection with Tongan is to be refuted. This "nominal/verbal syntax hypothesis" states that there is no lexical N/V distinction, but that there is a distinction between nominal and verbal categories in syntax. To Broschart, it is unreasonable to speak of nominal/verbal syntax in a language with no true, prototypical nouns and verbs. To me, it does not explain the intercategorial character of the morphemes in question, i.e. why nominal syntax markers are attached to verbs and vice versa. I can see an explanation in the functioning of grammatical markers. For instance, in Dargi (ex. (34)) and Abkhaz (ex. (35)) person (and tense in Abkhaz) actually express discourse categories — new information, focus, so they can be shifted within a sentence to mark focus. In (34) from Dargi the personal marker has been shifted from the main verb 'sit down' (where it should be) onto the infinitive, because the latter is emphasized.

(34) Nu kajib-si kağar b-elk'-es-**ra**.
1SG sit.down.PF-PART letter N-write-POT-1SG.PRS
'I sat down TO WRITE A LETTER.' (Abdullaev 1971: 137)

In Abkhaz sentence (35) person and tense markers are not on the verb 'go' because the focus of the utterance is not the verb. In this case the markers get merged in an element usually termed copula, which follows the constituent in focus — in the example it is 'today'.

(35) Nina **ex'a a-wp** d-**an**-c-a.
Nina today 3SG.N-PRS 3SG.F-when-go-PST.NF
'It is TODAY that Nina went.' (Šakryl 1981: 43)

In Turkic and Mongolian languages the use of case markers is determined only by the verbal government which in turn is to a great extent determined by the semantics of the main verb: if a verb requires an accusative or dative case, its dependent (nominal or propositional) will be marked for it. As can be seen from the Buryat examples (36)–(37), perception verbs with negative semantics require the Dative complement — a noun or a clause.

(36) Doržo äsägä-**dää** sxuxalda-na.
Dorzho father-DAT.LOC be.angry-PRS
'Dorzho is angry with his father.' (Bertagaev *et al.* 1962: 275)

(37) Šʊʊdär-äj xat-aa-gʊj-**dä** urmaa.xuxar-aa-bdi
[dew-GEN dry.up-PART.IPF-NEG]-DAT.LOC be.annoyed-PART.IPF-1PL
'We were annoyed that the dew had not dried up.' (Čeremisina 1984: 94)

So, case markers can be viewed as denoting a certain type of semantic relation between the verb and its complements — both nouns (or noun phrases) and clauses.

5. Conclusion

In this chapter I deal with verbal forms that do not distinguish between finite and nonfinite uses. The fact that these forms take both verbal (person) and nominal (case) morphology markers renders them problematic for adequate description. However, some clues are provided by the behaviour of predicate nominals: in the languages under analysis, they can directly combine with verbal markers, like person and even tense. This set of related phenomena can be handled in two ways. On the one hand, the treatment can be designed so as to allow for the word class change. Under the alternative approach, word class remains unaltered, whereas grammar markers are permitted to be attached to both nouns and verbs.

I claim that the latter approach does better justice to the data. In the relevant instances grammar categories are expressed at the level of syntactic phrases rather than that of lexical units. Besides, the category markers are functionally loaded, and this functional load permits them to be intercategorial—that is, to be attached to both nouns and verbs.

Notes

1. Here I would like to thank Prof. W. Dressler (p.c.), who drew my attention to the striking similarity of the Kobon and Telugu examples, on the one hand, and the English relative clauses like *The man I saw*, on the other. (Indeed, in all examples in the absense of any overt markers only the position of the verbal phrase, the standard position of the relative clause, can help to identify a relative clause.) This is a really helpful and insightful comparison: first, it makes the examples look less exotic and more understandable; second, it makes it even more plausible to think that we have true verbs in the position of noun modifiers, as I am arguing.

Abbreviations

1	first person	F	feminine	PART	participle
2	second person	FUT	future	PCL	particle
3	third person	HPL	human plural	PF	perfective
ABS	absolutive (case)	IPF	imperfective	PL	plural
ACC	accusative (case)	IZ	izafet	POSS	possessive
ALL	allative (case)	GEN	genitive (case)	POT	potential
ART	article	LOC	locative (case)	PRED	predicativizer
AUX	auxiliary	M	masculine	PRS	present
CONV	converb	MASD	masdar	PST	past
DAT	dative	N	neutral	SG	singular
DEF	definite	NEG	negative	SS	same subject
ERG	ergative (case)	NF	nonfinite		
EXCL	exclusive	NM	nominalization		

References

Abdullaev, Zapir G. 1971. *Očerki po sintaksisu darginskogo jazyka* [Studies in the syntax of the Dargi language]. Moscow: Nauka.

Anderson, Stephen A. 1992. *A-morphous morphology*. Cambridge: Cambridge University Press.

Avrorin, Valentin A. 1961. *Grammatika nanajskogo jazyka* [The Grammar of the Nanai language]. Moscow-Leningrad: Izdatel′stvo AN SSSR.

Austin, Peter. 1981. *A Grammar of Diyari, South Australia*. Cambridge: Cambridge University Press.

Baskakov Nikolaj A. ed. 1975. *Grammatika xakasskogo jazyka* [The Grammar of the Khakass language]. Moscow: Nauka.

Bauer, Laurie 1988. *Introducing linguistic morphology*. Edinburgh: Edinburgh University Press.

Bertagaev, Trofim A., Sanžeev, G. D. and Cydendambaev, C. eds. 1962. *Grammatika burjatskogo jazyka*. Moscow: Izdatel′stvo vostočnoj literatury.

——and Cydendambaev, C. 1965. *Grammatika burjatskogo jazyka. Sintaksis* [The Grammar of the Buryat language. Syntax]. Moscow: Izdatel′stvo vostočnoj literatury.

Bhaskararao, P. 1972. "On the syntax of Telugu existential and copulative predication". *The verb "be" and its synonyms*, ed. by J. Verhaar, 153–206. Dordrecht: Reidel.

Broschart, Jürgen. 1997. "Why Tongan does it differently?" *Linguistic Typology* 1.123–64.

Čeremisina, Maja I. et al. 1984. *Predikativnoe sklonenie pričastij v altajskix jazykax*. Novosibirsk: Nauka.

Davies, John. 1981. *Kobon. Lingua Descriptive Studies*. Amsterdam: North Holland.

Gair James W. 1970. *Colloquial Sinhalese sentence structure*. The Hague: Mouton.

Haspelmath, Martin. 1996. “Word-class changing inflection and morphological theory”. *Yearbook of Morphology 1995* ed. by Geert Booji and Jaap van Marle, 43–66. Dordrecht: Kluwer.

Hewitt, Brian G. 1989. *Abkhaz*. London and New York: Routledge

Hopper, Paul and Thompson, Sandra. 1984. “The discourse basis for lexical categories in universal grammar”. *Language* 60.703–52.

Krishnamurti, Bhadriradju H. and Gwynn J. P. L. 1985. *A grammar of modern Telugu*. Oxford: Oxford University Press.

Langacker, Ronald W. 1972. *Fundamentals of linguistic analysis*. New York: Harcourt Brace Jovanovich.

Lehmann, Christian. 1988. “On the function of agreement”. Agreement in natural language, ed. by Charles Ferguson and Michael Barlow, 55–65. Stanford: CSLI.

Nida, Eugene. 1946. *Morphology*. Ann Arbor: University of Michigan Press.

Petruničeva, Zoja N. 1960. *Jazyk Telugu* [The Language of Telugu]. Moscow: Nauka.

Scalise, Sergio. 1988. “Inflection and Derivation”. *Linguistics* 26.561–81

Selkirk, Elizabeth O. 1982. *The syntax of words*. Cambridge/MA: MIT Press.

Skribnik, Elena K. 1988. “O statuse konstrukcij s infinitnymi glagol’nymi formami v sisteme polipredikativnogo sintaksisa” [On the status of non-finite verb form constructions within the syntax of complex sentences]. *Problemy mongol’skogo jazykoznanija* [The problems of Mongolian linguistics], ed. by Maja I. Čeremisina *et al.*, 85–94. Novosibirsk: Nauka.

Sunik, Oleg P. 1947. *Očerki po sintaksisu tunguso-man’čžurskix jazykov* [Studies in the syntax of Tungusic languages]. Leningrad: Nauka.

Šakryl, Tamara P. 1981. *Kategorija naklonenija v abxazskom jazyke* [The category of mood in the Abkhaz language]. Tbilisi.

Hajn Mädääsäl [The Good News — The Buryat translation of the Gospel of Mark]. 1996. Stokholm: Institute for Bible Translation.

Chapter 16

"Anomalies" of cross-reference marking

The Alutor case

A. E. Kibrik
Moscow State University

From the point of view of morphological analysis of cross-reference markers, it is natural to use grammatical categories such as Person and Number. This approach is strongly supported by the data from many languages, both those with monopersonal and those with polypersonal verbal inflection: usually cross-reference markers directly code person-number values of the respective arguments of the verb. However there are also some problematic cases spread all over the world. In this chapter I will discuss in some detail the intriguing data of one such language, namely Alutor, which has a mysterious system of person-number verb inflection.

1. Alutor cross-reference marking: the descriptive data

Alutor belongs to the Chukotko-Kamchatkan family. It has ergative nominal case marking, sg–du–pl number opposition, and polypersonal verbal inflection (see Kibrik *et al.* 2000). A traditional structuralist description of its verbal inflection (Mel'čuk 1973) presents this language as extremely complicated and unpredictable. Some markers code person/number of S/A/P-arguments

Table 1. The partial paradigm of intransitive verb *piŋku-* 'jump' (mood=potentialis, aspect=perfect)

	First person	Second person	Third person
Singular	tə-ta-piŋku-ŋ	Ø-ta-piŋku-ŋ	ta-piŋku-ŋ-Ø
Dual	mət-ta-piŋku-ŋ	ta-piŋku-ŋə-tək	ta-piŋku-ŋə-t
Plural	mət-ta-piŋku-la-ŋ	ta-piŋku-la-ŋ-tək	ta-piŋku-la-ŋə-t

Table 2. The partial paradigm of transitive verb (*t*)*kəpl*- 'hit' (mood = potentialis, aspect = perfect)

P-argument	A-argument		
	1 sg.A	1 du.A	1 pl.A
2 sg.P	tə-ta-tkəplə-γət	mət-ta-tkəplə-γət	mət-ta-tkəplə-la-γət
2 du.P	tə-ta-tkəplə-ŋ-tək	mət-ta-tkəplə-ŋ-tək	mət-ta-tkəplə-ŋ-tək
2 pl.P	tə-ta-tkəplə-la-ŋ-tək	mət-ta-tkəplə-la-ŋ-tək	mət-ta-tkəplə-la-ŋ-tək
3 sg.P	tə-ta-tkəplə-ŋə-n	mət-ta-tkəplə-ŋə-n	mət-ta-tkəplə-la-ŋə-n
3 du.P	tə-ta-tkəplə-ŋ-na-t	mət-ta-tkəplə-ŋ-na-t	mət-ta-tkəplə-ŋ-na-t
3 pl.P	tə-ta-tkəplə-ŋ-na-(wi)	mət-ta-tkəplə-ŋ-na-(wi)	mət-ta-tkəplə-ŋ-na-(wi)
	2 sg.A	2 du.A	2 pl.A
1 sg.P	t-**ina**-tkəplə-ŋ	t-**ina**-tkəplə-ŋ-***tək***	t-**ina**-tkəplə-la-ŋ-***tək***
1 du.P	**na**-ta-tkəplə-mək	**na**-ta-tkəplə-mək	**na**-ta-tkəplə-mək
1 pl.P	**na**-ta-tkəplə-la-mək	**na**-ta-tkəplə-la-mək	**na**-ta-tkəplə-la-mək
3 sg.P	Ø-ta-tkəplə-ŋə-n	ta-tkəplə-ŋə-**tki**	ta-tkəplə-la-ŋə-**tki**
3 du.P	Ø-ta-tkəplə-ŋ-na-t	ta-tkəplə-ŋə-**tki**	ta-tkəplə-ŋə-**tki**
3 pl.P	Ø-ta-tkəplə-ŋ-naw(wi)	ta-tkəplə-la-ŋə-**tki**	ta-tkəplə-la-ŋə-**tki**
	3 sg	3 du	3 pl
1 sg.P	t-**ina**-tkəpl-əŋ	**na**-ta-tkəplə-***γəm***	**na**-ta-tkəplə-***γəm***
1 du.P	**na**-ta-tkəplə-mək	**na**-ta-tkəplə-mək	**na**-ta-tkəplə-mək
1 pl.P	**na**-ta-tkəplə-la-mək	**na**-ta-tkəplə-la-mək	**na**-ta-tkəplə-la-mək
2 sg.P	**na**-ta-tkəplə-γət	**na**-ta-tkəplə-γət	**na**-ta-tkəplə-γət
2 du.P	**na**-ta-tkəplə-ŋ-tək	**na**-ta-tkəplə-tək	**na**-ta-tkəplə-tək
2 pl.P	**na**-ta-tkəplə-la-ŋ-tək	**na**-ta-tkəplə-la-tək	**na**-ta-tkəplə-la-tək
3 sg.P	ta-kəplə-ŋ-**ni**-n	**na**-ta-tkəplə-n	**na**-ta-tkəplə-n
3 du.P	ta-kəplə-ŋ-**ni**-na-t	**na**-ta-tkəplə-na-t	**na**-ta-tkəplə-na-t
3 pl.P	ta-kəplə-ŋ-**ni**-na-w(wi)	**na**-ta-tkəplə-na-w(wi)	**na**-ta-tkəplə-na-w(wi)

transparently, but there are several markers with vague distribution and uncertain person/number values. The partial paradigms of intransitive verb *piŋku*- 'jump' and transitive verb (*t*)*kəpl*- 'hit' are presented in Tables 1 and 2.

The opposition between dual and plural 1/2 persons is coded separately by the pluralizer -*la*- (see details of distribution in Kibrik *et al.* 2000), so it is enough to study the singular–non-singular opposition of A/P-arguments.

The cross-reference markers of intransitive verbs are controlled by the S-argument, and their values are transparent. Prefix S-markers coincide with A-markers, while in suffix position there are different types of specific S-markers, depending on mood and aspect of the verb form. (We will not discuss these properties of verbal inflection in this chapter, see details in Kibrik 1999, Kibrik *et al.* 2000.)

Table 3. Transparent markers

	1sg	1non-sg	2sg	2 non-sg	3sg	3du	3pl
S-markers	t-. . .-__	mət-. . .__	Ø-. . .__	__. . .-tək	__. . .-Ø	__. . .-t	__. . .-t
A-markers	t-. . .	mət-. . .	Ø-. . .	__. . .	__. . .	__. . .	__. . .
P-markers	. . .-[ɣəm]	. . .-mək	. . .-ɣət	. . .-tək	. . .-n	. . .-na-t	. . .-na-w

Much more problematic are cross-reference markers of transitive verbs. They can be divided into two sets. The set I includes regular cases with transparent markers, whose form directly predicts the person-number value of corresponding A/P-argument. *Transparent* A-markers are prefixes, while P-markers are suffixes. These markers are presented in Table 3. (The difference between zero markers and the absence of marker is out of the scope of this chapter.)

The markers of the set II (they are boldfaced in Table 2) are *non-transparent* in the sense that they do not have direct regular correspondence with these values. Among 63 forms of transitive verb 39 forms (about 60%) include non-transparent cross-reference markers. Let us consider the forms with transparent and not-transparent markers in more detail.

It can be easily seen that all forms with 1 person A-argument and some forms with 2sg person A-argument have only transparent markers. The transparent forms of transitive verb are presented in a schematic way in Table 4.

Table 4. Partial paradigm with transparent markers (I/we – HIT – you (sg/nsg)/him/them; You (sg) – HIT – hit him/them)

A-markers		P-markers	
Meaning	Form	Meaning	Form
I hit you/him/them	t-*hit*-. . .	I/we hit *you* (*sg*)	. . .-*hit*-ɣət
We hit you/him/them	mət-*hit*-. . .	I/we hit *you* (*nsg*)	. . . -*hit*-tək
You (*sg*) hit him/them	Ø-*hit*-. . .	I/we/you (sg) hit *him*/*them*	. . . -*hit*-n/nat/naw

Irregular cases are presented in Tables 5–7. Table 5 shows forms with 1sg P-argument. They differ from the regular cases in two respects. First, most of them have the prefix *ina-* marker, with the exception of the *na-* marker in the context of the 3nsg A-argument. In the latter case there is the suffix *-ɣəm*. So,

Table 5. Patientive = 1sg

Meaning	Form	Meaning	Form
You (sg) hit me	**ina**-*hit*	He hits me	**ina**-*hit*
You (nsg) hit me	**ina**-*hit*-tək	They hit me	**na**-*hit*-ɣəm

there are two markers in different positions that have the value '1sg.P'. Second, the linear position of markers is unusual in comparison with transparent markers: the P-oriented *ina-* marker takes the prefix position, and the A-oriented -*tək* marker is in the suffix position.[1]

In Table 6 there are presented irregular forms with 'we' and 'you' P-arguments. These arguments themself are coded with the transparent suffixes *-mək*, *-ɣət*, *-tək*; however, all forms have prefix *na-*, whose value is vague: it appears in the context of 2/3.A-arguments ('you, he, they'). We have already met this prefix in Table 5 ('They hit me').

Table 6. Patientive = 1nsg; 2sg, 2nsg (further forms)

Meaning	Form
You (sg/nsg)/he/they hit us	**na**-*hit*-mək
He/they hit you (sg)	**na**-*hit*-ɣət
He/they hit you (nsg)	**na**-*hit*-tək

In Table 7 the irregular forms with 3.P-arguments ('him, them') are presented. There are three non-transparent markers. First, we see again the marker *na-* in contexts 'They hit him/them'. Second, there is a new suffix *-tki* in the context 'You (many) hit him/them'. Third, in the context 'He hit him/them' there is a new suffix -*ni*, added by transparent P-markers -*n*, -*na-t*, *na-w*.

Table 7. Patientive = 3 (further forms)

Meaning	Form	Meaning	Form
He hit him	*hit*-**ni**-n	They (nsg) hit him	**na**-*hit*-n
He hit them (two)	*hit*-**ni**-na-t	They (nsg) hit them (two)	**na**-*hit*-na-t
He hit them (many)	*hit*-**ni**-na-w	They (nsg) hit them (many)	**na**-*hit*-na-w
You (nsg) hit him	*hit*-**tki**	You (nsg) hit them	*hit*-**tki**

The traditional description of the verbal paradigm is based on context-sensitive rules which restrict the usage of non-transparent cross-reference markers and present their values in a complicated and (most importantly) unpredictable way. Such a description cannot generalize the similarities of Alutor cross-reference marking with "anomalies" that are found in this domain in many other languages spread all over the world, such as Svan (Kartvelian family), Yimas (Papua New Guinea), Yukagir (Paleo-Siberian; see Kibrik 1997), Chamling (Tibeto-Burman family; see Ebert 1993), Cree (Algonquian family; see Payne 1999).

2. An explanatory model of non-transparent markers

2.1 Preliminary assumptions

Our alternative description of the Alutor verbal paradigm searches for its cognitive motivation. It is based on the following assumptions.

1. Descriptive: the "anomalies" of coding are not random, their motivation should be explained. There are different sources of motivation of linguistic form, and the most natural source is a cognive structure that underlies the linguistic form.
2. Typological: typological considerations are a natural key to descriptive problems.
3. Theoretical: language is not restricted to *mandatory* rules ('If X, then Y'). *Preferential*, or *default*, rules also exist ('If X, then, by default, Y'), as well as *conflict-resolving* rules (resolving conflicts between default rules that permit Y′ along with Y″).

2.2 The basic principles of cross-reference marking

The Animacy Hierarchy (Silverstein 1976) gives some hints for an interpretation of Alutor verbal paradigm. The first productive attempt of such an approach was proposed in Comrie 1980, but nevertheless many intriguing problems remained unresolved.

Different languages employ the Deictic hierarchy (the left part of the Animacy Hierarchy), distinguishing different numbers of its members. In Svan there are two members (1, 2 > others), some other languages have three members, for example, Yimas (1 > 2 > others), Yukagir (1, 2 > 3pronoun > others), Cree (2 > 1 > others), Chamling distinguishes four members (1 > 2 > 3sg > 3pl). Alutor turns out to employ a bulky Deictic hierarchy including six members, each of which is involved in specific grammatical Rules of cross-referencing. These Rules will be discussed below. Scheme 1 shows what Rules sharpen the boundaries between the members of the Hierarchy.

Scheme 1. Deictic Hierarchy

	R2		R3		R0,4		R4		R1,3,4	
1sg	>	1non-sg	>	2sg	>	2non-sg	>	3sg	>	3non-sg

← LOCUTORS → | ← NON-LOCUTORS →

This Hierarchy orders arguments in terms of their person-number values. It claims that first person is higher in the Hierarchy than second person, second person is higher than third person, and for each person the singular value is higher than non-singular one. Additionally, there is a specific distinction between locutors (speech act participants) and non-locutors (participants that are external to the speech act). It is important to emphasize that locutors include only the three first members of the Hierarchy, while non-singular 2 person belongs to non-locutors.

The principles of Alutor cross-reference can be described in terms of positions of A/P-arguments in the Hierarchy and locutor/non-locutor distinctions. The system of Rules governs the choice of cross-reference marking. If the properties of A/P-arguments are cognitively normal (unmarked), then transparent markers are used, otherwise specific Rules are applied and non-transparent markers are chosen. The normal cases are the following:

Principle A. NORM: A > P. That is, A-arguments normally outrank P-arguments.
Principle B. NORM: A = LOCUT. That is, A-arguments are normally locutors (i.e.1sg/non-sg, 2sg) **and vice versa** (i.e. locutors are normally A-arguments);
Principle C. NORM: P = nonLOCUT. That is, **P-arguments are normally non-locutors** (i.e. 2non-sg, 3) **and vice versa** (i.e. non-locutors are normally P-arguments).

The markedness of an A-argument increases from the left to the right in the Deictic hierarchy, while the markedness of a P-argument increases from the right to the left.

The Rules are organized on the basis of default rules, so they can be in conflict with each other. This means that these Rules should be also accompanied by a conflict-resolving Rule.

2.3 Conflict-resolving Rule

The conflict between default Rules is resolved in accordance with the Rules Hierarchy. The set of default Rules is ordered in such a way (see 2.4) that the relative weight of a Rule is determined by its rank in the Rules Hierarchy: if two Rules are in conflict, the Rule with higher rank is stronger.

Scheme 2. Rules Hierararchy
0, 1 > 2 > 3 > 4 > 5

The conflict-resolving Rule claims:

Conflict resolving rule: if two default rules are in conflict, then the rule which has a higher rank in the Rules Hierararchy is preferable and blocks the usage of the other Rule.

Rules with the highest rank — Rules (0) and (1) that are on the left edge of the Rules Hierarchy — are the strongest ones. They behave as obligatory rules. However from the point of view of the default principle they are no more than particular cases of a default rule. All other Rules — Rules (2), (3), (4), (5) — are optional: they can be blocked by stronger Rules which are higher in the Hierarchy. Table 8 shows what types of conflicts actually exist (see confirmation below in 2.4).

Table 8. Cases of conflict resolution

Preferable Rule	Blocked Rule
(1)	(2), (3), (4)
(2)	(3), (5)
(3)	(4)
(4a)	(5)

2.4 The system of default Rules

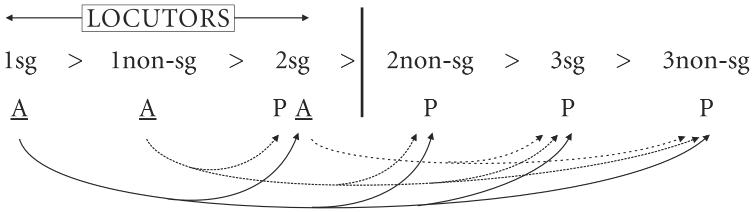
The Rules are presented below in verbal and schematic form. The verbal presentation is an explicit generalized formulation of the Rule. The schematic presentation is an obvious means of calculation of the cases that are in the scope of the default Rule, as well as of the conflict-resolving Rule. A-arguments are underlined. Those members of the Deictic Hierarchy that trigger the Rule are boxed. Arrows show the relationship between A- and P-arguments. They are oriented from A-argument to P-argument. A right-oriented arrow means that A outranks P, in accordance with the Principle A; a left-oriented arrow means that P outranks A, in contradiction with the Principle A. Crossed-out arrows are those that are blocked by the conflict-resolving Rule.

2.4.1 *Regular A-marking Rule*

Rule (0) is in line with the above mentioned Principles A–B, see Section 2.2.

Default Rule (0): If a locutor A-argument outranks the P-argument, then A-arguments require corresponding transparent markers (see Scheme 3).

Scheme 3. Transparent marking



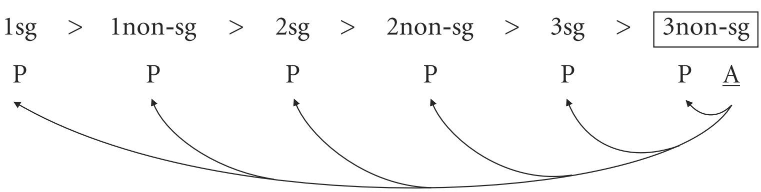
Note that this Rule presupposes the classification of 2 non-sg person as non-locutor. Scheme 3 shows A-arguments belonging to the first three ranks of the Deictic Hierarchy; all arrows are right-oriented.

2.4.2 *Terminal rank-oriented Rules*

The following Rules are sensitive to the cases of the most unnatural occupants of the terminal ranks of the Deictic Hierarchy. Rule (1) is used when the A-position is cognitively least compatible with the deictic properties of the corresponding participant of the event.

Default Rule (1): If the A-argument has the lowest rank, then, by default, it requires the ***na***-marker (see Scheme 4).

Scheme 4. 'They'-argument in A-position

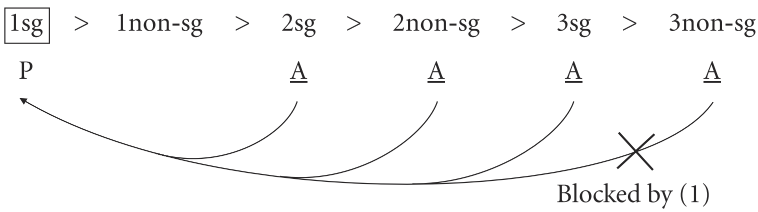


The scope of Rule (1) is the A-position when occupied by the rightmost member of the Deictic Hierarchy. In this case the arrows are left-oriented (in contradiction with Principle A), and the non-transparent *na-* marker encodes this situation.

Rule (2) is used when the P-position has the least natural occupant in terms of the deictic properties of the event's participant.

Default Rule (2): if the P-argument has the highest rank, then, by default, it requires the ***ina***-marker, accompanied by coding of A-argument with S-marker[2] (see Scheme 5).

Scheme 5. 'I'-argument in P-position



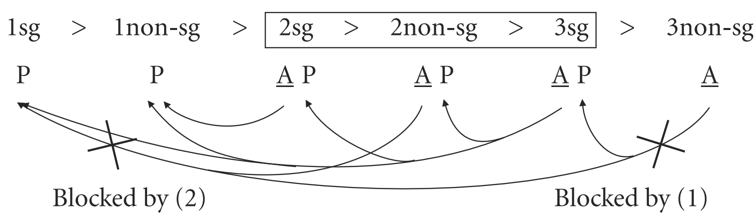
This Rule is in conflict with Rule (1) in the case of 3non-sg A-argument. The conflict-resolving Rule blocks Rule (2) in this case.

2.4.3 *Middle rank-oriented Rules*

There are two Rules whose scope is the middle part of the Deictic Hierarchy. Rule 3 has to do with A-arguments in non-terminal positions which are outranked by the P-argument (in contradiction with Principle A).

Default Rule (3): if the A-argument has a relatively low rank, then, by default, it requires the ***na***-marker (see Scheme 6).

Scheme 6. Low ranked A-argument



This Rule is blocked by Rules (2) and (1) when the terminal positions of a 1sg P-argument and a 3non-sg A-argument respectively are in the scope of this Rule.

Rule (4) is used in the case when both A- and P-arguments are in the right part of the Deictic Hierarchy, namely when they are non-locutors (in contradiction to Principle B). This Rule unifies 2non-sg argument with 3 person arguments, confirming the statement that this argument is non-locutor.

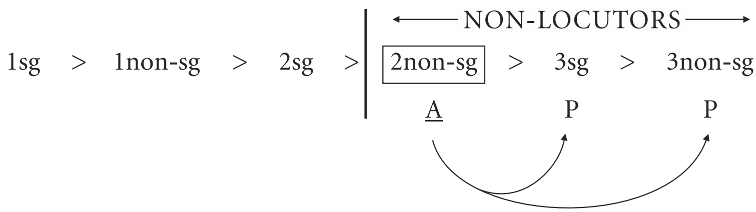
Default Rule (4): If both arguments are non-locutors, then, by default, the A-argument requires a specific (portmanteau) marker.

The choice of marker depends on the deictic specification of the A-argument.

Logically there are three options (2non-sg, 3sg, 3-non-sg A-argument), but only the first two of them are possible, because the third one is blocked by Rule (1).

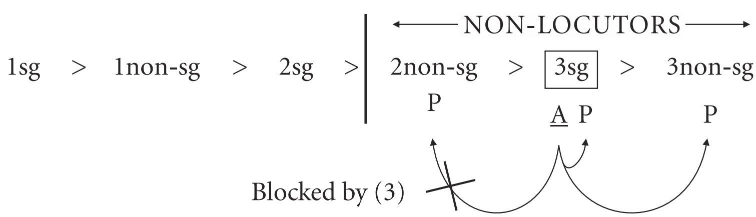
Default Rule (4a): if the A-argument is 2non-sg, then the strong portmanteau marker **-tki** is used (see Scheme 7).

Scheme 7. 2non-sg A-argument



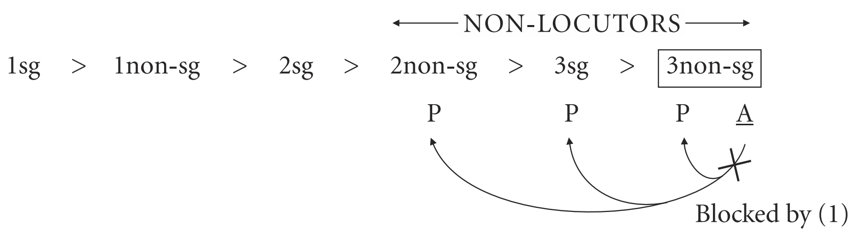
Default Rule (4b): if the A-argument is 3sg, then the weak portmanteau marker **-ni-** is used (see Scheme 8).

Scheme 8. 3sg A-argument



[*Default Rule (4c)*: if the A-argument is 3non-sg, then Rule (1) is available (see Scheme 9).]

Scheme 9. 3sg A-argument



It should be noted that Rules (4a-b) take place in the case of right-oriented arrows. This means that the A-argument outranks the P-argument, and

Principle A does not work. What is important is that there is no locutor argument in this case (Principle B).

Rule (4a) generates the strong portmanteau marker, i.e. the marker which is the only device of coding the values of A- and P-arguments simultaneously. Rule (4b) generates the weak portmanteau marker, i.e. the marker that is accompanied by an additional peculiar P-marker (*-n*/*-na*/*-naw*, depending on the number of 3 person P-argument).

2.4.4 *P-argument-oriented Rule*

The scope of the final default rule is the P-argument.

Rule (5). The P-argument has a transparent marker

This rule is the weakeast one. It is used when there are no rules that can block it. The relevant blocking rules are (2) and (4a). The prohibited cases are presented in Scheme 10.

Scheme 10. Prohibited transparent marking of P-argument

1sg > 1non-sg > 2sg > 2non-sg > 3sg > 3non-sg

P   <u>A</u>   <u>A</u>   P <u>A</u>   P

Blocked by (2)   Blocked by (4a)

2.5 Further data in addition to cross-reference marking

The cross-referential *ina-* marker coincides with the antipassive marker.

(1) ə-nannə tətɣəlav-ni-n epaŋa.
he-ERG warm-3sg.A+3P-3sg.P soup+NOM
'He warmed the soup.'

(2) ənnu ina-nətəəlav-i epa-ta.
he+NOM ANTI-warm-3sg.S soup-ERG
'He warmed the soup.'

In (1) the A-argument has ergative and the P-argument nominative case marking.[3] The verb has the weak portmanteau marker *-ni-* and the P-marker *-n*. In (2) antipassivisation takes place,[4] promoting the A-argument to nominative position and demoting the P-argument to oblique position (marked by ergative case). The antipassive verb is intransitive and has an S-marker, controlled by the nominative NP (*-i* '3sg.S' in perfective aspect indicative).

These two types of usage of the *ina-* marker are not random either. The general meaning of the *ina*-marker is 'The P-position is filled by a marked argument'. It does not code directly the meaning '1sg.P'.

3. Conclusion

Summarizing our analysis we can claim that the values of non-transparent markers are the following:

-tki ↔ '2nsg.A+3.P'
-ni- ↔ '3sg.A+3.P'
na- → 'LOWA' (some of 2sg.A, 2nsg.A, 3sg.A, 3pl.A)
ina- → 'marked P' (some of 1sg.P, ANTIPASSIVE)

From the point of view of the Rules presented above it can be also claimed that the meanings of the so-called transparent markers should not be reduced to the bare values of the categories 'Person' and 'Number'. These meanings include also the information that the A- and P-arguments occupy a natural position in the Deictic hierarchy.

So I hope that after our inspection, the previously mute morphology has become eloquent and informative. It should be emphasized that the Alutor data significantly enriches the typological interpretation of the Deictic hierarchy, in particular, its underlying structure, the functions of its members, and the cognitive logic of its use. A similar but less developed mechanism is found in many other languages, and this confirms the universal, extralinguistic cognitive organization of interaction between the deictic and role domains.

This phenomenon is no less essential from the point of view of more abstract principles of human categorization. We can suppose that the principle of markedness reversal, realized in our Alutor data, is in fact a general property of the human categorization of reality, opposing the normal, natural (in linguistic terms unmarked) and the abnormal, unnatural (= marked) co-occurence of mental items.

This investigation gives some clue to the search for many other analogous situations in different parts of the grammar. We have a similar situation when formal structural relationships between linguistic forms are not isomorphic to the structure of the concepts that the theory attaches to these forms. The presence of such an "anomalous" situation deviating from the linguistic norm signals the possible inconsistency of the theory. It is very probable that it is an apparent "anomaly" existing only in the system of concepts postulated by the linguist rather than in linguistic reality. In this case another theory is necessary to eliminate the apparent "anomalies" that have been found. The usual reason for such "anomalies" is theoretical logicism and apriorism, ignoring the cognitive roots of linguistic form and their intrinsic interrelations. The Alutor data support the thesis that linguistic form inherits much more from the cognitive structure than it is usually permitted by linguists. A distrust of the cognitive approach is usually based on the statement that cognitive structures are not given to us in immediate reality. But it has been said that there is nothing hidden that will not be made known, and linguistic analysis of linguistic form based on correct assumptions is the shortest way to make the hidden cognitive structure known.[5]

Notes

1. This tendency is supported in other aspect-mood forms where some other A-oriented suffixes appear. It is important that these markers coincide with suffix S-markers, see explanation in section 2.4.2.

2. Comrie (1980) calls these forms "pseudo-intransitive" (because the A-argument preserves its ergative case marking).

3. I strongly prefer to use *nominative* instead of *absolutive* as a label of surface case in ergative construction.

4. It should be noted that the use of *ina-* in cross-reference system does not lead to the construction becoming antipassive.

5. I am grateful to Barbara Partee and an anonymous reviewer for their careful reading of my chapter and many useful suggestions.

References

Comrie, Bernard. 1980. "Inverse verb forms in Siberia: Evidence from Chukchee, Koryak, and Kamchadal". *Folia Linguistica Historica* 1: 61–74.

Ebert, Karen H. 1993. "Inverse configurations in Chamling and Chukchi". *Allgemeine Sprachwissenschaft, Universität Zürich. Arbeitspapiere/Working Papers* 4, 1–16.

Kibrik, Aleksandr. 1997. "Ierarxii, roli, markirovannost' i "anomal'naja" upakovka grammaticheskoj semantiki [Hierarchies, roles, markedness, and "anomalous" packaging of grammatical semantics]". *Voprosy Jazykoznanija* 46:4.27–57.

Kibrik, Aleksandr. 1999. "Jazykovaja forma kak otrazhenie kognitivnoj struktury (svidetel'stva al'utorskogo jazyka [Linguistic form as a reflection of cognitive structure: Alutor evidence]". *Dialogue '99: Computational linguistics and its applications. International workshop. Proceedings, Vol.1. Theoretical issues.* Tarusa: 110–23.

——Sandro Kodzasov and Irina Muravyova. 2000. *Jazyk i folklor al'utorcev* [Language and folklor of the Alutor people]. Moskva: Nasledie.

Mel'čuk, Igor. 1973. "Model spr'azhenija v al'utorskom jazyke [The conjugation model of Alutor]. I-II". *Predvaritel'nye publikacii IRJa AN SSSR.* Vyp. 45, *46.* Moskva.

Payne, Thomas E. 1999. "A functional typology of inverse constructions". *Tipologija i teorija jazyka: Ot opisanija k objasneniju* [*Typology and the theory of language: From description to explanation*] ed. by Ekaterina V. Rakhilina and Yakov G. Testelec. Moskva: Languages of Russian Culture: 245–54.

Silverstein, Michael 1976. "Hierarchy of features and ergativity". R. M. W. Dixon (ed.) *Grammatical categories in Australian languages.* Canberra: 112–71.

CHAPTER 17

Is there a morphological parser?

Gary Libben and Roberto G. de Almeida
University of Alberta and Concordia University

In the psycholinguistic literature on lexical processing, the term "morphological parser" is most often used to refer to the hypothesized component of the human language processing system that is responsible for the isolation and identification of morphological constituents of multimorphemic words. This morphological parser makes it possible for language users to understand novel or infrequent multimorphemic words by breaking such words into their morphological constituents so that an interpretation of the novel form can be constructed on the basis of those constituents.

While it is relatively uncontroversial to assume that morphological parsing plays a key role in the processing of novel multimorphemic words, its status in the recognition of existing multimorphemic words is much less clear. Over the past quarter century, two opposing hypotheses about the role of morphological parsing in visual word recognition have dominated the lexical processing landscape. On the one hand, the morphological decomposition hypothesis (see, for example, Taft and Forster 1975) has claimed that complex word forms such as *unbelievable* gain access to the lexicon by a procedure that first extracts the word's affixes (*un-* and *-able*) and then uses the word's stem (*believe*) to find an entry in the mental lexicon. Under this hypothesis, parsing is claimed to be a pre-lexical morphological operation in that it occurs prior to the recognition of the whole word. The full-listing hypothesis, on the other hand (Butterworth 1983, for instance), has assumed that full forms are the basis for word recognition and that, if morphological analysis takes place at all, it occurs after a word has gained access to the lexicon. Thus, under this view, morphological analysis is a post-access process rather than a pre-lexical parsing procedure.

The two hypotheses make distinct claims concerning the nature of lexical representation codes. For the decomposition hypothesis, lexical entries are roots or stems, while for the full-listing hypothesis, most morphologically complex forms have independent entries in the mental lexicon. Thus far, both hypotheses have found some support. This has been a primary motivation in the elaboration of dual route models (see Baayen, Dijkstra and Schreuder 1997; Laudanna and Burani 1995; Schreuder and Baayen 1995) in which morphological decomposition procedures and whole word processing procedures yield separate and competing analyses. Such elaborations have allowed for a more adequate treatment of the diversity of morphological priming effects. However, the question of whether the primary locus of morphological effects in visual word recognition is pre- or post-access has remained unresolved (McQueen and Cutler 1998).

In this chapter, we take up the question of whether it is possible to determine the extent to which pre-lexical morphological parsing takes place in the recognition of existing words of English. We assume as a background to this investigation a dual route perspective in which a native speaker of English is in possession of a morphological parser that is certainly employed when novel or infrequent multimorphemic words are encountered (see Libben, Derwing and de Almeida 1999). We further assume that some form of post-lexical morphological analysis also takes place in the recognition of existing complex and compound words. This post-lexical analysis may result from connections among lexical representations or from structured information within representation (see Libben in press, for a discussion of these alternatives).

The two assumptions above are critical to the conceptual structure of our report. First, the assumption of routine morphological parsing for novel words suggests that pre-lexical morphological parsing is in principle available to the recognition of real words. Second, the assumption of post-lexical morphological processing for existing words suggests that morphological parsing is not necessary for the recognition of those words. Thus, our question becomes: Is morphological parsing employed even in cases where it is not required?

In our view, framing the question in this manner has a critical advantage in allowing us to tease apart pre-lexical and post-lexical morphological operations. A long-standing problem in this enterprise has been the equivocal nature of data from priming studies that yield evidence of constituent activation in multimorphemic word recognition (see Sandra 1994; McQueen and Cutler 1998). The essence of the problem is that both pre-lexical morphological parsing and post-lexical processes should yield the same results for most multimorphemic words. Both processes, for example, would generate activation of *black* and *board* in the recognition of *blackboard*. Because most psycholinguistic techniques measure the results of lexical activation after it has occurred, determining the sequence of whole-word and constituent activation is not an easy matter.

How then might it be possible to distinguish between pre-lexical and post-lexical morphological operations? One means would be to seek cases in which the two processes do not yield the same results, so that the information provided by each operation is in a sense 'tagged' with respect to its source.

Below, we present two sources of evidence that move us toward the satisfaction of this constraint. We first summarize a recent investigation of aphasic interpretation errors in the reading of semantically opaque compounds that points to the view that pre-lexical and post-lexical morphological analyses contribute independently to lexical comprehension. We follow this with the presentation of a new experimental technique that was designed to measure these independent contributions. The results that we report using this technique support the view that pre-lexical morphological parsing is an obligatory and automatic component of the lexical processing system. Thus, we conclude: "There is a morphological parser and it is always on". In the final section of this chapter, we discuss the consequences of this conclusion for our conceptions of the characteristics of morphological parsing and its place in the lexical processing system.

1. Semantically opaque compounds

Semantically opaque compounds have been the subject of attention in the psycholinguistic literature because evidence of decomposition for these forms points directly to the role of pre-lexical morphological parsing in multi-morphemic word recognition (Jarema, Busson, Nikolova, Tsapkini and Libben 1999; Sandra 1990; Zwitserlood 1994). As we have pointed out above, both pre-lexical and post-lexical morphological processing might yield activation of the constituents *lady* and *bug* in the compound *ladybug*. However, there seems little reason to expect that post-lexical operations would yield activation of the words *hum* and *bug* for the semantically opaque form *humbug*. Any such activation, therefore, would be due to the effects of a pre-lexical parser.

If, indeed, a pre-lexical morphological parser yields constituent activation for semantically opaque forms, this activation would need to be discarded or suppressed soon after whole-word activation. The reason for this is that the information supplied by pre-lexical morphological parsing and post-lexical morphological analysis is semantically incompatible.

Libben (1993, 1998) described the case of an aphasic patient, RS, whose reading and interpretation of semantically opaque compounds indicated the preservation of both sources of lexical activation. When asked, for example, what the word *butterfly* means, she responded "a pretty yellow fly". Note here that she was blending together both the meaning of the whole word and the meaning of the constituents. The word "pretty" in her response was assumed to be an associate of the whole word *butterfly* (because most flies are not perceived to be pretty). In contrast, the word "yellow" was assumed to be an associate of the constituent *butter*. It seems unlikely that this activation would result from post-lexical processing. Rather, Libben (1998) argued that it is the consequence of a morphological parse of the word, the results of which are not discarded or suppressed during interpretation. This conclusion is supported by similar interpretations that RS showed for other opaque words. For *summersault* she said "you roll on the grass in the summer" again blending together whole word and constituent meaning. Finally, when asked the meaning of the word *dumbbell*, she responded "stupid weights . . . Arnold". In this case she showed activation of the whole word meaning of *dumbbell*, which is a type of exercise weight, the constituent *dumb*, and the association to Arnold Schwarzenegger, the former bodybuilder.

Although RS's pattern of compound reading is unusual, it is apparently not unique. McEwen, Westbury, Buchanan and Libben (in press) describe a deep dyslexic, JO, who showed a similar error pattern or performance with these words. Her reading for *butterfly* was "bread, butter, ..fly". The word "bread" could again only be an associate of the constituent *butter* and not of the compound *butterfly*. Similarly when attempting to read the semantically opaque compound *pancake*, JO produced the associates "breakfast" and "birthday". The former is related to the meaning of the whole word, while the second is related only to the constituent *cake*.

In our view, error patterns such as these provide intriguing evidence for a dissociation of information provided by the morphological parser and information provided through the representation of the multimorphemic string in the mental lexicon. We use the term intriguing rather than conclusive, however, because there are alternative accounts of these data. Although compounds such as *butterfly* and *pancake* are described as semantically opaque, it is nevertheless possible that the activation of their constituents results from the nature of the representations of the compounds in the mental lexicon rather than from a pre-lexical morphological parser (see, for example, Zwitserlood 1994).

We return, therefore, to the desideratum expressed above. The most revealing stimuli in the study of pre-lexical morphological parsing for existing words are most likely those for which whole-word morphological analysis and pre-lexical parsing yield different information. In the section below, we report on an initial study in which we have attempted to isolate such stimuli and to investigate their processing patterns in a semantic priming experiment.

2. Suffixed ambiguous roots

In the experiment described below, we relied on findings in the lexical-semantic access literature — in particular, in the lexical ambiguity resolution literature — to investigate the nature and locus of the morphological parsing process. It is well known that when participants encounter an ambiguous word such as *bark* in isolation or in a neutral context, both of its meanings — the one associated with *tree* and the one associated with *dog* — are accessed in the early stages of lexical processing (see Onifer and Swinney 1981; Seidenberg, Tanenhaus, Leiman and Bienkowski 1982). Studies of lexical ambiguity also find effects of meaning dominance, with the meaning that is used more frequently yielding higher priming effects than the less frequent meaning, both in isolation and in sentential contexts (Hogaboam and Perfetti 1975; Holmes 1979; Tabossi, Colombo and Job 1987). In this study, we used these findings as the basis of an investigation of whether affixed words such as *barking* — composed of an ambiguous root such as *bark* and a suffix such as *-ing* — are decomposed prior to lexical access. We reasoned that if pre-lexical morphological parsing occurs, *barking* would prime both *tree* and *dog*, because both meanings of the root *bark* would be accessed. On the other hand, if morphological parsing does not occur (that is, if the entire lexical item is used for access), then a word such as *barking* should prime only *dog*, because the *-ing* suffix serves to disambiguate the root before the word's semantic representation is accessed. Thus, although the word *bark* in isolation is ambiguous, the suffixed form *barking* is not, because its internal representation ($[[\text{bark}]_V\text{ing}]$) can only contain the verb *bark*. This verb representation may be associated with the meaning *dog* but not with the meaning *tree*.

2.1 Participants

Thirty undergraduate students from the University of Alberta participated as volunteers in this experiment. They were all native speakers of English attending introductory linguistic courses and were not informed about the purposes of the experiment.

2.2 Materials and Design

Twenty-four suffixed ambiguous roots served as the core stimuli for this experiment. The selected roots had the following characteristics: they were all monomorphemic words that could either be understood as nouns or as semantically unrelated verbs (for example *bark*). The addition of the suffix *-ing* to these words selects only the verb reading and, thus, disambiguates the root both syntactically and semantically.

The uninflected form of each word had a dominant and a subordinate meaning. Meaning dominance was determined by an association task with 137 native speakers of English, all attending an introductory Psychology course at Rutgers University. In this task, participants were presented with a list of 106 ambiguous words and, for each one, they were asked to write down the first word that came to mind. Dominant meanings were selected based on the relative frequency with which words related to each meaning were given by the participants. This association task allowed us to choose 24 core stimuli which had two distinct and unrelated meanings — that is, they were homonyms rather than polysemes.

The core ambiguous stimuli were organized with their semantic associates into prime-target pairs. In each pair, the suffixed ambiguous root served as the prime and its associates (as determined by the association task described above) served as the targets. Thus each ambiguous root resulted in the creation of two prime-target pairs (*barking-dog*, *barking-tree*, for instance). These target pairs were matched to control stimulus pairs that consisted of frequency matched primes and identical targets (such as *buck-dog* and *buck-tree*). Of the 24 ambiguous roots, 12 selected the dominant meaning and 12 selected the subordinate meaning when affixed by *-ing*. So, for instance, while *barking* is related to *dog*, an associate of the dominant meaning of *bark*, *training* is related to *fitness*, an associate of the subordinate meaning of *train*. We reasoned that if pre-lexical decomposition occurs and is sensitive to meaning dominance, *training* should prime *station* (an associate of the dominant meaning of *train*) as much as *barking* primes *dog*. This manipulation was necessary also because if priming effects were not obtained between *barking* and *tree*, this could be due to the fact that *tree* is related to the subordinate meaning of *bark*. But in the case of *training-station*, priming effects can

Table 1. Prime and target pairs

Primes	Targets		Primes	Targets	
	Dom	Sub		Dom	Sub
banking	*teller*	river	interesting	money	*bore*
barking	*dog*	tree	jerking	stupid	*pull*
faning	*air*	sports	leaning	fat	*stand*
gagging	*choke*	joke	littering	cat	*garbage*
majoring	*minor*	army	lobbying	hotel	*congress*
partying	*fun*	political	matching	fire	*mix*
perching	*bird*	fish	ringing	finger	*phone*
pitching	*ball*	sound	sentencing	word	*judge*
slipping	*fall*	paper	shedding	garage	*hair*
spelling	*write*	witch	springing	summer	*jump*
stapling	*gun*	crop	squashing	vegetable	*flat*

Note: There are two targets for each prime. The first is a semantic associate of the dominant meaning. The second is a semantic associate of the subordinate meaning. In the left half of the table, the addition of the -*ing* affix biases interpretation toward the dominant meaning of the root (italicized). In the right half of the table, the addition of -*ing* biases toward the subordinate meaning (italicized).

only be attributed to pre-lexical decomposition. The entire set of core stimuli is presented in Table 1.

2.3 Procedure

We employed a visual masked priming lexical decision technique. Subjects saw a sequence of four events on the screen: (1) they saw a fixation point (an asterisk) for 1900 milliseconds (ms), (2) a mask composed by row of hash marks ("#") presented for 500 ms, (3) the prime presented in lowercase letters for 80 ms, and (4) the target presented in uppercase letters for 500 ms. Subjects were instructed to make a lexical decision (word or nonword) on the string of capital letters by pressing either a button labeled *yes* if the string formed an English word, or a button labeled *no* otherwise. They were not told that lowercase primes preceded the targets, but if they noticed the presence of the primes during the practice trials, they were instructed to pay attention only to the targets. A new trial began — with the fixation point — as soon as the subject pressed one of the buttons. Responses were timed from the onset of the target until the subject pressed a button. The stimuli were all presented sequentially on the middle of the screen, in white Courier New 24 font over black background. The experiment was run on Macintosh PowerBook 520 computers running PsyScope (Cohen, MacWhinney, Flatt and Provost 1993) equipped with external Apple monochromatic monitors and PsyScope button boxes.

2.4 Results and Conclusions

Prior to statistical analysis, all response latencies less than 300 milliseconds (ms) and greater than 1,200 ms (2 percent of the responses) were eliminated from the data set. The data were first analyzed in a 2 × 2 × 2 Analysis of Variance with repeated measures on all factors (prime type, association dominance, and affixation bias). The means and standard deviations for this analysis are provided in Table 2.

As can be seen in Table 2, there is no overall priming effect ($F(1,29)=.33$, $p=.56$). The absence of this priming effect results from an interaction in the data between the other two factors, 'association dominance' and 'affixation bias'. The pattern of this interaction may be described as follows: When there is consistency between the affixed prime and the target, a small priming effect of 16 ms is observed. These are cases such as *barking* priming *dog* and *ringing* priming *phone*. The opposite pattern occurs for cases in which the associate is inconsistent with the affixed form of the ambiguous root (for example, *barking-tree* and *ringing-finger*). Here we see negative priming effects the magnitude of which are related to the meaning dominance of the ambiguous root. Thus, the greatest negative priming effect (–34 ms) is seen in the case in which the semantic associate that is disallowed as a result of suffixation is also the dominant associate of the ambiguous root (*ringing-finger*, for instance).

Table 2. Mean response latencies and standard deviations (SD) for all prime-target relations

Example stimuli		Control prime		Exper. prime		Priming effect
Prime	Target	RT	SD	RT	SD	
Barking	*dog*	583	(86)	567	(104)	16
	tree	572	(93)	591	(125)	–19
Ringing	finger	549	(69)	583	(102)	–34
	phone	595	(98)	579	(95)	16
Average		574.7		580		–5

Note: The first two columns represent example stimuli for each condition. The final column shows the priming effect as the RT of the control prime condition minus the RT of the experimental prime condition.

Thus the results of this experiment show a significant effect of the consistency between the effects of suffixation and semantic association to the ambiguous root. This interaction effect is presented graphically in terms of priming effects in Figure 1. As can be seen in this figure, the data reveal no significant main effects of association dominance (F(1,29)=.227, p=.64) or affixation bias (F(1,29)=.316, p=.58), but a significant interaction between these two factors (F(1,29)=15.4, p=.0005).

In our view, these results point very strongly to the view that pre-lexical morphological parsing occurs for these relatively common suffixed words. This conclusion is based on the negative priming effect that was obtained for inconsistent prime-target pairs. If no pre-lexical parse of these stimuli occurred during the priming phase of each experiment trial, the inconsistent primes should have behaved exactly as their unrelated control words. The fact however, that they were significantly slower than their controls suggest that at some point during lexical processing, both meanings of the ambiguous roots were activated. As we have argued above, this double activation could only result from

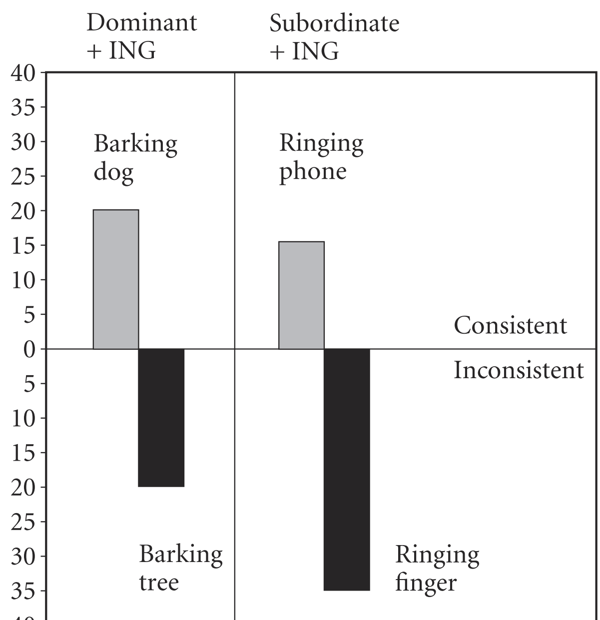


Figure 1. Response latency data viewed as priming effects (control primed condition minus experimental prime condition)

pre-lexical morphological parsing. Thus for prime-target pairs such as *barking-tree* and *ringing-finger*, participants received inconsistent information. This inconsistency, we reason, resulted in hesitation and the elevated response times observed in the data.

3. General Discussion

Our goal at the outset of this study was to address the question of whether pre-lexical morphological parsing occurs as a component of normal lexical processing. As we have noted, there have been significant methodological barriers to the treatment of this question because constituent activation — the normal result of pre-lexical parsing — can also occur as a result of post-access processes in the mental lexicon. In this chapter, we have argued that this difficulty can be overcome by isolating stimulus categories for which the information yielded by pre-lexical parsing is not identical to that which would be expected to obtain from post-lexical operations.

Semantically opaque compounds may be regarded as one such stimulus category. In our presentation of RS's interpretation of semantically opaque compounds, we argued that lexical processing impairment in aphasia can result from the inability to discard or suppress information arising from pre-lexical parsing when this information is inconsistent with information obtained from whole-word access. This line of reasoning suggests that for non-

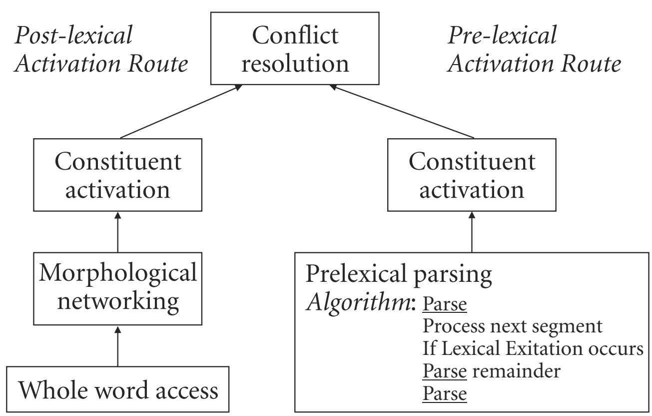


Figure 2. The interaction of pre-lexical parsing and whole-word access in visual word recognition

aphasic native speakers of English, these two sources of information also lead to inconsistencies and activation conflict that must be resolved. If indeed, pre-lexical morphological parsing plays an integral role in normal lexical processing, the process of conflict resolution would also be expected to play a key role in the lexical system's functional architecture. This claim is represented graphically in Figure 2.

The organization of the model in Figure 2 highlights the role of 'conflict resolution' against the background of a dual-route model. We assume that morphological parsing is an automatic and obligatory component of the word recognition process for both existing and novel multimorphemic forms. We expect that morphological parsing (shown on the right side of the figure) interacts with a generally faster whole-word recognition process (shown on the left side of the figure) that is also always "on". Both whole word access and pre-lexical decomposition typically result in constituent activation. However, in the case of whole word recognition, that constituent access derives from the representation for the complex word. It therefore always gets the right constituents. Pre-lexical decomposition, on the other hand, can both over-generate and mis-generate. This creates the need for conflict resolution (represented in the upper center of the model).[1]

Our interpretation of the data from the suffixed ambiguous root experiment is that the dominant result, the negative priming effect for inconsistent prime-target pairs, reflects a stage in processing before conflict resolution have been completed. The consequence of the unresolved conflict is an inhibition effect, rather than the priming effect we had originally predicted, or the null effect, which would be predicted by the full-listing hypothesis.

Finally, if this interpretation is correct and the representation in Figure 2 appropriately depicts the manner in which pre-lexical and post-lexical analysis interact, we are led to the prediction that the inhibition effect we observed with an 80 ms prime may be expected to dissipate with longer prime durations and prime-target intervals. Thus, in our view, further experimentation with stimuli such as these would have a promising role to play in increasing our understanding of the time-course of conflict resolution and ultimately our understanding of the functional architecture of morphological processing.

Note

1. The pre-lexical parsing algorithm provided in the model is based on the proposal in

Libben (1994) and essentially claims that pre-lexical morphological parsing can be described as a recursive procedure that isolates morphemes in a beginning-to-end manner across an input string (see also Andrews and Davis 1999; Hudson and Buis 1995). The role of morphological networking in post-lexical activation has been discussed in Libben (in press) where it is claimed that morphological constituency effects result from the architecture of the morphological networks for individual words and the manner in which components of those networks are activated.

References

Andrews, S. and Davis, C. 1999. "Interactive activation accounts of morphological decomposition: finding the trap in mousetrap". *Brain and Language* 68.355–61.

Baayen, R. H., Dijkstra, T. and Scheuder, R. 1997. "Singulars and plurals in Dutch: Evidence for a parallel dual-route model". *Journal of Memory and Language* 37.94–117.

Butterworth, B. 1983. "Lexical representation." *Language Production 2*. ed. by B. Butterworth (257–94). New York, Academic Press.

Cohen, J., MacWhinney, B., Flatt, M. and Provost, J. 1993. "PsyScope: An interactive graphical system for designing and controlling experiments in the psychology laboratory using Macintosh computers". *Behavior Methods, Research, Instruments, and Computers* 25.257–71.

Hogaboam, T. W. and Perfetti, C. A. 1975. "Lexical ambiguity and sentence comprehension". *Journal of Verbal Learning and Verbal Behavior* 14.265–74.

Holmes, V. M. 1979. "Accessing ambiguous words during sentence comprehension". *Quarterly Journal of Experimental Psychology* 31.569–89.

Hudson, P. T. W. and Buis, D. 1995. "Left-to-right processing of derivational morphology". *Morphological aspects of language processing*. ed. by L. B. Feldman (383–96). Hillsdale, NJ: Lawrence Erlbaum.

Jarema, G., Busson, C., Nikolova, R., Tsapkini, K. and Libben, G. 1999. "Processing compounds: A cross-linguistic study". *Brain and Language* 68.362–9.

Laudanna, A. and Burani, C. 1995. "Distributional properties of derivational affixes: Implications for processing." *Morphological aspects of language processing*. ed. by L. B. Feldman (345–64). Hillsdale, NJ: Lawrence Erlbaum.

Libben, G. 1993. "A case of obligatory access to morphological constituents". *The Nordic Journal of Linguistics* 16.111–21.

——1994. "How is morphological decomposition achieved?" *Language and Cognitive Processes* 9.369–91.

——1998. "Semantic transparency in the processing of compounds: consequences for representation, processing, and impairment". *Brain and Language* 61.30–44.

——in press. "Morphological Parsing and Morphological Structure". *Reading complex words*, ed. by A. Egbert and D. Sandra. Amsterdam: Kluwer.

——Derwing B. and de Almeida, R. G. 1999. "Ambiguous novel compounds and models of morphological parsing". *Brain and Language* 68.378–86.

McEwen, S., Westbury, C., Buchanan, L. and Libben, G. in press. "Semantic information is used by a deep dyslexic to parse compounds". *Brain and Cognition.*

McQueen, J. and Cutler, A. 1998. "Morphology in word recognition." In: A. Spencer and A. Zwicky (eds.), The handbook of morphology (406–27). Oxford: Blackwell.

Onifer, W. and Swinney, D. A. 1981. "Accessing lexical ambiguities during sentence comprehension: Effects of frequency of meaning and contextual bias". *Memory and Cognition* 9.225–36.

Sandra, D. 1990. "On the representation and processing of compound words: automatic access to constituent morphemes does not occur". *Quarterly Journal of Experimental Psychology* 42.529–67.

——1994. "The morphology of the mental lexicon. Internal word structure viewed from a psycholinguistic perspective". *Language and Cognitive Processes* 9.227–69.

Seidenberg, M. S., Tanenhaus, M. K., Leiman, J. M. and Bienkowski, M. 1982. "Automatic access of the meanings of ambiguous words in context: Some limitations of knowledge based processing". *Cognitive Psychology* 14.489–537.

Schreuder, R. and Baayen, R. H. 1995. "Modelling morphological processing." *Morphological aspects of language processing.* ed. by L. B. Feldman (131–56). Hillsdale, NJ: Lawrence Erlbaum.

Tabossi, P., Colombo, L. and Job, R. 1987. "Accessing lexical ambiguity: Effects of context and dominance". *Psychological Research* 49.161–7.

Taft, M. 1981. "Prefix stripping revisited." *Journal of Verbal Learning and Verbal Behavior* 20.289–97.

——and Forster, K. I. 1975. "Lexical storage and the retrieval of prefixed words." *Journal of Verbal Learning and Verbal Behavior* 14.630–47.

Zwitserlood, P. 1994. "The role of semantic transparency in the processing and representation of Dutch compounds". *Language and Cognitive Processes* 9.341–68.

Chapter 18

External and internal causation in morphological change

Evidence from Italo-Romance dialects[1]

Michele Loporcaro

1. Internal and external explanation for language change

The difference between internal and external explanation for language change is often regarded as a matter of theoretical inclination or intellectual style. Formal linguists working within theoretical frameworks of the conventionalist type tend to prefer the former, while functionalists are rather inclined to practice the latter.

The formalist stance was recently synthesized most effectively by Morris Halle, in the discussion following the presentation of a brilliant plenary paper on the change in the stress accent system from Indo-European to Balto-Slavic at the DGfS Conference in Konstanz, in February 1999 (Halle 1999). After presenting an account making use of the metrical grid, he was asked by the discussant, Bernard Comrie, whether that particular notation was indeed essential to his explanation. The answer was: "Theory and notation are one". One of the consequences of this tenet is the preference accorded to explanations of change that are strictly internal to the component in which the change itself applies: on this view, there is a strong tendency to explain morphological change with the vocabulary of morphology (e.g. morphological features, etc.).

In this chapter, I argue that the choice between internal and external explanation cannot be regarded as a matter of intellectual preferences. Rather, it is an empirical question, to be decided in each specific case, based on the evidence available. Depending on the evidence, some changes will be best explained in internal terms, while for others external or multiple causation will have to be recognized. As Dressler (1997: 109) puts it: "I oppose mutual exclusion of functional and formal explanation also in the realm of diachronic linguistics".

In what follows, I will compare two alternative explanations which have been developed to account for some changes which took place in the pronominal clitic systems of several southern Italian dialects. Section 2 briefly describes the basic data, Section 3 summarizes the account proposed within the framework of Distributed Morphology by Calabrese (1995, 1998a, b), Section 4 presents the account of the same changes put forward in Loporcaro (1995, 1998). The two approaches differ substantially. While the former assumes that the morphological changes at issue were internally motivated, the latter argues that they were triggered by factors external to morphology. Comparison of the two will serve to illustrate the general theoretical point.

2. The empirical issue: first person plural object clitics in Italo-Romance

Consider the data in (1):

(1)		Gallipolino	Italian	Gloss	Function
	a.	*nde*	*ne*	'of it/him/her'	genitive
	b.	*nde*	*ci*/†*ne*	'(to) us'	(in)direct object, 1PL
	c.	*nde*	*gli*	'to him/her'	indirect object, 3SG/PL

As shown in (1a–c), the dialect of Gallipoli, spoken on the western coast of Salento (see map in appendix), displays a syncretism by which one and the same clitic form, *nde*, assumes the three functions in (1a–c): genitive, 1pl object and third person indirect object (henceforth **IO**). The standard etymology for this clitic traces it back to the Latin locative adverb INDE, which acquired genitive functions (partitive and adnominal) already in Late Latin, and which is purported to have spread to the functions (1b–c) in this dialect. A similar explanation is postulated, by a majority of scholars, for the Old Italian 1pl object clitic *ne* ((1b), which is documented from the time of the earliest extant Tuscan texts (see (2a)):[2]

(2) a. e dene pagare (8)
'and he must pay us'
b. no diono dare (1)
'they must give us'
c. ci à dato (3)
'he gave us'

As apparent from (2), this clitic was in competition with two other forms: *no*

((2b)), the regular outcome of Latin NOS (continued into Romance by object clitics such as French *nous*, Spanish *nos*, etc.), which disappeared in Florentine by the second half of the thirteenth century, and *ci* ((2c)), deriving from the locative adverb HINC(E), which is the only form to survive in the modern standard language.

The OIt object clitic *ne* is homophonous with the genitive *ne* still preserved in standard Italian — for example, *ne vedo molti* 'I see many of them'. This homophony has led a majority of scholars to claim that the former is etymologically identical with the latter (cf. e.g. D'Ovidio 1886: 78, DEI 2558, REW 4368).[3] In arguing for this account, Rohlfs (1968: 158–9) mentions dialects such as Gallipolino as providing crucial supporting evidence. In the varieties of central Salento, as well as in central-southern Calabrian (see Loporcaro 1995: 18ff for details), the 1pl object clitic is *nde* (or *ndi*), which would witness in the clearest way its derivation from Latin INDE.

In the next sections (Sections 3–4) I will review the explanations which have been developed recently, to account for the syncretisms observed in Salentino.

3. Calabrese (1995, 1998a, b): internal explanation

Calabrese (1995, 1998a, b) provides a formalization of the traditional account summarized in Section 2, by restating it within the framework of Distributed Morphology (cf. Halle and Marantz 1993, Halle 1994). The explanation developed is presented as an illustration of the insights that formal morphological theory can contribute to the study of language change: the title of Calabrese (1995), in fact, establishes an explicit link between the account of these syncretisms and "the notion of morphological change'.

Calabrese assumes the binary feature inventory in (3), which defines case systems universally:

(3)	Nom	Acc	Gen	Dat	Loc	Abl	Instr
Subject	+	−	−	−	−	−	−
Direct	+	+	−	−	−	−	−
Possessor	−	−	+	+	−	−	−
Location	−	−	−	+	+	+	−
Source	−	−	+	−	−	+	+
Association	−	−	−	−	−	+	+

Syncretism consists in the merger of one or more (adjacent) cases in (3), and is expressed formally through the neutralization of the corresponding contrast(s) in feature value. If the contrast [±subject] is neutralized, for instance, a nominative-accusative syncretism follows, such as that found in the neuter declension of Indo-European: here the common feature value is [+direct], which distinguishes syncretic nominative-accusative from the other cases. Furthermore, some feature value combinations are disallowed universally, a fact which is reflected in the list of inviolable constraints in (4).

(4) a. *[+direct,+location]
b. *[+direct,+possessor]
c. *[+direct,+source]
d. *[−location, −source]/[+possessor, __]
e. *[−direct, −possessor]/[−location, __]

Finally, a set of universal Case Restrictions is assumed. These are ordered hierarchically, and each of them identifies a morphological case:

(5)	a.	[+subject, +direct]	nominative
	b.	[−subject,+direct]	accusative
	c.	[+possessor, −location]	genitive
	d.	[+possessor, +location]	dative
	e.	[−possessor, −source]/[__+location]	locative
	f.	[+location, +source]	ablative
	g.	[+source,+association]	instrumental

The activation of one of these restrictions in a given language system makes a distinct morphological exponent for the corresponding case unavailable. Thus, this activation is the formal pre-requisite for syncretism.

Given the hierarchical ranking of the conventions, the activation of those higher up in the scale necessarily implies activation of the lower ones. For instance, if (5a) is activated, this rules out a distinct accusative case, but this also means that all the conventions in (5b–g) are activated as well. As a result, the non-existence of a distinct exponent for the accusative case entails the absence of any morphological case distinctions whatsoever. Conversely, if only (5a) is not activated, a two-case system such as that found in Old French will arise, viz. nominative vs. accusative, with the latter assuming the remaining non-nominative functions.

Elaborating on these premises, Calabrese proposes the explanation summarized in (6a–c) to account for the change which has brought the Gallipolino outcome of INDE (cf. (1)), originally genitive, to assume dative functions in the first plural and in the third singular and plural.[4]

(6) a. *[+possessor, +location] (= (5d) ⊃ *dative)

b. $[+\text{location}] \rightarrow [-\text{location}] \;/\; \begin{bmatrix} \rule{1.5em}{0.4pt} \\ +\text{possessor} \end{bmatrix}$ Repair rule

c. $[-\text{source}] \rightarrow [+\text{source}] \;/\; \begin{bmatrix} \rule{1.5em}{0.4pt} \\ +\text{possessor} \\ -\text{location} \end{bmatrix}$ Adjustment (by 4d)

First, the case restriction (5d) is activated and the combination [+possessor, +location] becomes ungrammatical: consequently, dative case cannot have any separate formal exponent. Hence, IO functions, previously expressed by the dative, must be reallocated to some other pre-existing form. The syncretism which thereby arises is expressed formally in (6b), a repair rule by which the value for the [location] feature switches to minus, when combined with [+possessor], in obeyance of the case restriction (5d). The resulting feature specification, however, would violate constraint (4d), and is hence further modified through application of the readjustment rule (6c). As a result, the genitive form (Gallipolino *nde*, (1a-i)) syncretically accrues both genitive and dative functions.

This elegant account surely grasps the essence of the synchronic system of the dialect concerned. In fact, there is little doubt that native speakers identify their *nde* clitics, serving different syntactic functions, as a single morphological entity. In other words, psychological reality can be claimed for the syncretism, as formalized in (6).

Calabrese, however, argues that (6) also mirrors the diachronic change which has brought the syncretism into being, which implies the claim that the change had an internal motivation: it was a change in the morphology, triggered by purely morphological factors, expressed in the form of feature value resettings.

4. Loporcaro (1995, 1998): external determinants for a morphological change

In Loporcaro (1995, 1998) I developed an alternative account of the Gallipolino facts. The starting point is comparison between the Gallipolino system (see (1)) and the system found in the nearby dialect of Lecce. The two are illustrated, respectively, by the examples in (7)–(8):[5]

(7)	a.	*idda nnu bbole mai nde senta nudda* 'she doesn't want to hear anything thereof'	genitive (Gallipoli) clitic
	b.	*l'angiulu ci nde 'ssiste* 'the angel who assists us'	1st person plural object clitic
	c.	*e nnu nde fare male* 'and don't do him/her/them any harm'	3rd person indirect object clitic
(8)	a.	*cu nu' sse nde ccorga* '. . . so that he does not become aware of it'	genitive (Lecce) clitic
	b.	*se ni tròanu* 'if they find us'	1st person plural object clitic
	c.	*ni lu nduce a sirma* 'he brings it to him, to my father'	3rd person indirect object clitic

As is apparent from (8), the Leccese system differs from Gallipolino in that the 1pl object clitic is not *nde* but rather *ni* (8b). This crucial difference is diagrammed in (9).

(9)			Lecce	Gallipoli	
	a.	'thereof'	*nde*	*nde*	In both dialects:
	b.	'us'	*ni*	*nde*	-ND- > -*nd*-
	c.	'him'/'her'/'them'	*ni*	*nde*	-E > -*e*

As is also shown in (9), in Lecce as well as in Gallipoli only the clitic *nde* can possibly be a phonetically regular outcome of Latin INDE. On the one hand, in these dialects Latin final -E is preserved as such, as opposed to dialects further north, which merge it with final -I (see Isogloss 2 on the map in the Appendix). On the other hand, the consonant cluster -ND- is preserved, rather than assimilated to *nn* as is the case in many other dialects of Salento (see Isogloss 1) as well as in the overwhelming majority of the dialects of central-southern Italy.

Now, if the only regular outcome of INDE is *nde*, in these dialects, the other Leccese clitic *ni* 'us' (8b), (9b) is obviously in need of etymological explanation. Its source cannot be INDE for two reasons: firstly, this assumes an *ad hoc* split of the same etymological form INDE into two distinct outcomes (viz. genitive *nde* (8a) vs. object *ni* (8b)), in the absence of any independent evidence. Secondly, a better solution is at hand, given the fact that, in archaic Latin, forms of the first person plural pronoun with a front vowel are documented (cf. Negri 1977): *cosmis iam cousiad nes* 'may he listen to us benevolently' (Carmen Saliare), *vae* [= *ve*] *vobis dicebatur ab antiquis, et ni nobis* (P. Fest. 379) 'the ancients used to say *vae* for *vobis* and *ni* for *nobis*', *callim antiqui dicebant pro clam*, *ut nis pro nobis*, *sam pro suam*, *im pro eum* (P. Fest. 47) 'the ancients used to say *callim* instead of *clam*, just like *nis* instead of *nobis*, etc.' A pronoun form with front vowel may well have survived into Romance in this area, which was colonized by Romans as early as the third century BC.

Thus, comparison of the two systems in (9) clearly shows that the Leccese system cannot be a later development of the Gallipolino system, contrary to what is claimed by the traditional reconstruction (cf. Rohlfs 1968: 158–9 and Section 2): *ni* (meaning 'us' in Lecce) cannot possibly derive from *nde*. Unless we want to claim that the two neighboring systems are totally unrelated (which would be undesirable, of course), we have to conclude that, among the dialects of this region, Leccese is conservative and Gallipolino is a later development of a system of the Leccese type.

To further elaborate on this point, consider now another piece of evidence already introduced in (9c) (and, earlier, in (7c)/(8c)): the third person IO clitic is *ni* in Lecce vs. *nde* in Gallipoli. Again, both of these clitics derive from INDE, according to Rohlfs (1968: Sect. 458, VDS 391). Once more, Rohlfs' and Calabrese's accounts coincide: a further, quite ancient, syncretism is assumed, by which INDE is supposed to have substituted for ILLI(S) in the third person.

However, the Leccese clitic *ni* in (9c) cannot be traced back to Latin INDE, for the same phonetic reasons already discussed with respect to the homophonous first plural clitic *ni* in (9b). And here, too, there is a better explanation, as shown in (10), which portrays the variation in the outcomes of Lat. ILLI(S) in the province of Lecce:

(10)	a. ILLI(S) >	b. *li* >	c. *li/ni* >	d. *ni*
		Leuca, Alesano, Salve, Maglie, Melpignano	Galàtone	Lecce, Arnesano

The regular outcome of the dative ILLI(S) ((10a)) is *li* (as in *li skriu* 'I write him/her/them'), still preserved in the southernmost part of the province (10b)). The further step is variation of *li* and the innovative *ni* as found in the dialect of Galàtone ((10c)), with the latter eventually ousting the former (Lecce, (10d)). The change (*li* > *ni*) has a straightforward phonetic explanation: *ni* derives from *li* via assimilatory nasalisation of the initial *l*, induced by very frequent syntagmatic contact with the final nasal of the negation (*n*)*un* < Lat. NON: *un li* > *un ni*. The same change is observed independently elsewhere, such as in Tuscan vernaculars in which the third person IO clitic is *ni*

(Pisa) or *ɲi* (Florence, Lucca). For these, Rohlfs (1968: Sect. 457) himself proposes such a phonetic explanation, viz. *un li* > *un ni*, *un ʎi* > *uɲ ɲi*, respectively.[6] Note that for these Tuscan dialects, unlike for Salentino, an alternative morphological explanation à la Calabrese is not available, as there is no previously existing clitic of the form *ni*/*ɲi*, which could have extended to third person IO functions.

Considering the third person IO clitic forms allows us to develop a further reconstructive argument. In fact, under the hypothesis (now diagrammed in (11a)) that Gallipolino is more conservative than Leccese, we would be forced to assume that INDE substituted for two distinct forms in the pronominal paradigm, viz. first person plural NOS and third person dative ILLI(S), which have nothing to do with each other formally.[7]

(11)

	a. Gallipolino is conservative		b. Gallipolino innovates		
	Gallipoli	Lecce		Lecce	Gallipoli
INDE	> INDE > *nde*	> *nde*	INDE	> *nde*	> *nde*
NOS	> INDE > *nde*	?(> *ni*)	N(O)S	> *ni*	*nde*
ILLI	> INDE > *nde*	?(> *ni*)	ILLI	> (*li* >) *ni*	*nde*

Conversely, if we adopt the alternative hypothesis (11b), according to which Gallipolino innovates with respect to Leccese, we need to assume only one substitution. The Gallipolino outcome of INDE (> *nde*) must have replaced a previous syncretic *ni*, still retained in Leccese.

At this point, Calabrese's internal explanation (and Rohlfs' reconstruction) can be discarded as less economical. But we cannot yet exclude that the changes at issue might receive some other explanation internal to morphology: after all, in Gallipolino, the clitic *nde* did substitute the clitic *ni*.

To understand why external factors played a crucial role in this change, we now have to consider closely the map of Salento provided in the appendix. On the map, squares mark towns like Lecce, whose dialects retain the distinction in form between a genitive clitic *nde* (or *ndi*, north of isogloss 2) and a first plural object clitic *ni*; black circles, on the other hand, mark towns, like Gallipoli, whose dialects have neutralized the morphological contrast, merging the two clitics into one single form *nde* (or *ndi*, north of isogloss 2). As specified in the phonetic legend below the map, both squares and black circles lie within the dotted area, which is defined by isogloss 1. Quite obviously, for a clitic to have the form *nde*, the corresponding dialect must have preserved the Latin -ND- cluster. Much less trivial, however, is the circumstance that the black-circle dialects (those with *nde* for 'us') are all spoken *along the borders* of the dotted area. (One of them even lies in the striped zone, a transition area to which we will briefly return in Section 5.) Conversely, in the middle of the dotted, -ND- preserving, area we find Lecce, Galatina, Aradeo etc., all dialects in which first plural *ni* was not changed to *nde*.

The geographical distribution of the two kinds of varieties, which would remain a mystery under Calabrese's approach, readily makes sense if we take into account the sociolinguistic dynamics of Salento.[8] There is evidence that in Lecce, the most important center, the -ND- cluster was preserved throughout and never assimilated to *nn*. Ergo, preserved *nd*, associated with a prestigious center, enjoys prestige. The prestige gradient is oriented northwards: Salentino has a specific derogatory label for 'those from further south', who are dubbed *li ppòppiti* (cf. Fanciullo 1993: 443). This term carries the usual implications: *li ppòppiti* are supposed to be coarse people, a bit thick-headed, and — specifically — to speak in a rather ridiculous fashion. Needless to say, for any inhabitant of Salento, the *ppòppiti* area begins a couple of miles south of his or her own village. The *ppòppiti* par excellance are people from the Regione del Capo di Lèuca, the southernmost corner of the Peninsula. As shown on the map, -ND- is assimilated here. This implies that saying *munnu* 'world' instead of *mundu*, in Salento, is the worst you can do for your social prestige. Actually, this is a phonetic feature people explicitly comment on and stigmatize: in other words, it is a stereotype, in the Labovian sense.

By now it will have become clear why the innovative dialects like Gallipoli, Nardò, Otranto are all located precisely on the border of the -ND- preserving area. Sociolinguistically speaking, their speakers are the most seriously menaced. Since they border on the *nd*-assimilating people, the *ppòppiti*, they have to distinguish themselves. And they do through hypercorrection, a classical response in similar contexts (cf. Labov 1973: 122 ff.).

Substitution of *nd* for an original nasal consonant in the first person plural clitic was, then, an instance of hypercorrection, much like other hypercorrective changes observed elsewhere in the lexicon of dialects spoken in the *nd*-preserving area of Salento, for example, *kapanda* 'hay storehouse' (in Nardò, Aradeo, Seclì, Neviano; cf. D'Elia 1956: 154), from an earlier *kapanna* (< CAPANNA(M)). Under this account, moreover, the phonetic similarity between the two clitics involved in the change, *nde* and *ni*, is no accident, unlike under Calabrese's approach. A potential phonetic difficulty concerns the input to the hypercorrective change, which should consist of a geminate *nn*. However, while the *ni* clitic has a lexical singleton consonant, this frequently undergoes gemination in sandhi, for example, [ɛ ˈčč ɛ nni ˈtiːku] ←

/ɛ ˈččɛ ni ˈtiːku/ 'and what shall I tell him?' (where /ˈččɛ/, from Lat. QUID, triggers syntactic doubling because of its etymological final consonant).

Of course, since the final result of the change in Gallipoli is *nde* 'us', with final *-e*, we acknowledge that the phonetic shape of the pre-existing genitive clitic *nde* (from INDE) could have played a role. Genitive *nde*, already existing in the system, was a sort of attractor, which may well have polarized the change, leading it towards its eventual goal. But the change itself cannot be understood solely within morphology. Attempts to do so, such as Calabrese's, fail to account for the phonetic similarity between the input (*ni*) and the output (*nde*) of the change, as well as for the fact that spread of *nde* has occurred precisely in the dialects along the periphery of the dotted area (e.g. Gallipoli, Nardò) and not in others (e.g. Lecce). In my account, on the other hand, a straightforward explanation is available, one which is attained by widening the scope of inquiry beyond morphology proper and situating the change in a plausible external "scenario" (in Dressler's 1997 technical sense).

As Dressler (1997: 111) puts it: "the concept of 'scenario' may be an important help for interrelating the often distinguished 'internal' and 'external' factors of language change."

5. Postscript and conclusion

Limitations of space preclude full discussion here of the fact that the hypercorrective change I have reconstructed for Gallipolino has indeed been recorded in real time for other neighboring varieties (cf. Loporcaro 2000: 410–12 for data and discussion), but a quick glance at just two points serves to illustrate. In the dialect of Mesagne — which lies in the striped area, where assimilated *nn* (< -ND-) recently yielded to the prestige variant *nd*, spreading westwards from Brindisi and Lecce — the first plural clitic was *nni* at the beginning of the twentieth century (cf. Ribezzo 1912: 143), but had changed to *ndi* by the time Rohlfs collected his fieldnotes for the VDS (cf. VDS 397), a few decades later. Similarly, mediaeval Salentino texts consistently contrast *nde* (genitive clitic), *ni* (first plural object clitic), and *li* (third person IO clitic): e.g. *sì nde abe gran ioya* 's/he had great joy out of it', *ni insegna* 's/he teaches us', *li disse* 's/he told him' (cf. Sgrilli 1983: 116–19). This picture coincides perfectly with the reconstruction provided in (11b).[9]

With this, we have reached a desirable goal: internal evidence, from reconstruction, and external evidence, from sociolinguistics and the inspection of ancient texts, converge to yield a coherent account of an otherwise puzzling morphological change. The moral of this, as stated at the outset, is the following: the choice between internal and external explanation for morphological change, as in any other domain of historical linguistics, is an empirical issue, not a matter of *a priori* theoretical convictions.

Notes

1. Different versions of this chapter were presented in Ascona (September 1999), Naples and Padua (February 2000), Madison, WI (September 2000). I am indebted to Tom Cravens, Elvira Glaser, Alberto Mioni, Rosanna Sornicola, Alberto Varvaro and Alberto Zamboni for comments and suggestions. A larger version, to which the reader is referred for more extensive discussion of the dialectological and historical-philological data, has appeared in the Ascona proceedings (as a special issue of *Sprachwissenschaft*). I am grateful to both editors, Elvira Glaser and Wolfgang U. Dressler respectively, for permitting this.

2. The examples in (2) are from the most ancient Florentine text, the *Frammento di un libro di conti di banchieri fiorentini*, dated 1211. Numbers refer to paragraphs in Castellani's (1982: 23–40) edition.

3. That the genitive *ne* clitic derives from Lat. INDE is undoubtedly true. The irregular phonetic reduction of the Latin consonant cluster -ND- cannot be regarded as an obstacle to this etymology, since clitics are prone to phonetic attrition.

4. A further problem here concerns the asymmetry between the two persons involved: in Gallipoli, 1st plural *nde* is not only IO but also DO, whereas *nde* in the 3rd person is only IO (cf. the exemplification in (7)). Calabrese (1995: 167; 1998a: 118) accounts for this difference by developing an accessory explanation, which makes use of person-related features (cf. fn. 6).

5. The Salentino data in (7)–(8) are drawn from folk poetry (cf. Loporcaro 1995: 25 for references). Further information on pronominal clitics in Salentino is available in the relevant entries of Rohlfs' VDS.

6. The assumption of rightward assimilation of nasality may be felt to be problematic (I owe this suggestion to Alberto Zamboni), in view of the usual development of Italo-Romance -NL- clusters: e.g. It. *culla* 'cradle' < CUN(U)LA, *pialla* 'plane' < PLAN(U)LA. However, at word boundary progressive nasalization affecting sonorants is well attested: in Servigliano (Camilli 1929: 222), underlying /non ˈji/ 'don't go' changes into [noˈɲ:i]; similarly, in Pantelleria (Tropea 1975: 243), /un ˈjivi/ 'I didn't go' turns into [uˈɲ:i:vi]. Such assimilations are also found in NEG + clitic clusters, e.g. in Romanesco: /(nu)n je ˈda ˈrɛt:a/ 'don't trust him' → [(nu)ɲ:e ˈda ˈrɛt:a]. A comparable phenomenon from a distant language family is reported by Hyman (1998: 13) for ci-Yao (Bantu): here, nasality spreads rightwards across a morphological boundary in e.g. *ku-N-jíima* → *kuu-ɲíima* 'to begrudge me', *ku-N-lápa* → *kuu-nápa* 'to admire me'.

7. Calabrese unifies them under the dative case function. However, NOS is also accusative, which forces Calabrese (1995: 167; 1998a: 118) to keep them distinct anyway, by having recourse to an additional matrix of person-related features ([±participant, ±proximate, ±inclusive of speaker]).

8. Cf. Loporcaro (2000: 405–9) for more historical and sociolinguistic background information, as well as for information about the extensive dialectological literature on the outcomes of Lat. -ND- in southern Italian dialects.

9. Thus, even a quick look at ancient texts would have sufficed alone to conclusively bury Rohlfs' proposal (sect. 2) (whose conclusions are assumed by Calabrese), according to which dialects of the Gallipolino or Brindisino type (with *nde* or *ndi* meaning 'us') would testify to a very ancient late Latin syncretism. Note that in the most ancient Florentine text (see (2)), a parallel contrast between genitive (variably *nde* or *ne*) and 1st plural object clitic (always *ne*) still obtains, a fact which has been overlooked by proponents of the etymological identity between the two in Old Tuscan (cf. Loporcaro 1995: 39 f for discussion).

References

Calabrese, Andrea. 1995. "Syncretism Phenomena in the Clitic Systems of Italian and Sardinian Dialects and the Notion of Morphological Change." *NELS* 25,2.151–173.

——1998a. "I sincretismi fra pronominali clitici nei dialetti italiani e sardi e la teoria della morfologia distribuita". Ruffino 1998, vol. II. *Morfologia e sintassi delle lingue romanze*. 107–122.

——1998b. "Some remarks on the Latin case system and its development in Romance". *Theoretical Analyses on Romance Languages*. LSRL XXVI ed. by José Lema and Esthela Treviño, 71–126. Amsterdam and Philadelphia: John Benjamins.

Camilli, Amerindo. 1929. "Il dialetto di Servigliano". *Archivum Romanicum* 13.220–271.

Castellani, Arrigo. 1982. *La prosa italiana delle origini. I. Testi toscani di carattere pratico*. Bologna: Pàtron.

DEI: Battisti, Carlo and Giovanni Alessio. 1950–1957. *Dizionario etimologico italiano*. Florence: Barbera.

D'Elia, Mario. 1956. "Ricerche sui dialetti salentini". *Atti e memorie del'Accademia toscana di Scienze e Lettere "La Colombaria"* 21.131–73.

D'Ovidio, Francesco. 1886. "Ricerche sui pronomi personali e possessivi neolatini". *Archivio Glottologico Italiano* 9.25–101.

Dressler, Wolfgang U. 1997. "'Scenario' as a concept for the functional explanation of language change". *Language Change and Functional Explanations* ed. by Jadranka Gvozdanović, 109–142. Berlin and New York: Mouton de Gruyter.

Fanciullo, Franco. 1993. "Latino e greco nel Salento". *Storia di Lecce dai Bizantini agli Aragonesi* ed. by Benedetto Vetere, 421–86. Rome-Bari: Laterza.

Halle, Morris. 1994. "The Russian Declension: An Illustration of the Theory of Distributed Morphology". *Perspectives in Phonology* ed. by Jennifer Cole and Charles Kisseberth, 29–60. Stanford: Center for the Study of Language and Information.

——1999. "On the Accentual System of Indo-European and its Evolution". Paper read at DGfS 21, Konstanz, February, 24–26.

——and Alec Marantz. 1993. "Distributed Morphology and the Pieces of Inflection". *The View from Building 20: Essays in Honor of Sylvain Bromberger* ed. by Kenneth Hale and Samuel Jay Keyser, 111–76. Cambridge, MA: MIT Press.

Hyman, Larry M. 1998. *The Limits of Phonetic Determinism in Phonology: *NC Revisited.* Ms., University of California, Berkeley.

Labov, William. 1973. *Sociolinguistic patterns.* Philadelphia: University of Pennsylvania Press.

Loporcaro, Michele. 1995. "Un capitolo di morfologia storica italo-romanza: it. ant. *ne* 'ci' e forme meridionali congeneri". *L'Italia dialettale* 58.1–48.

——1998. "Ancora sull'etimo della particella pronominale *ne* di I plurale: la testimonianza dei dialetti del Meridione". Ruffino 1998, vol. I. *Grammatica storica delle lingue romanze.* 161–72.

——2000. "Dialect variation across time and space and the explanation of language change." *Sprachwissenschaft* 4.387–418.

Negri, Mario. 1977. "Una questione di morfologia dell'italiano". *Rendiconti dell'Ist. Lombardo di Scienze e Lettere* 111.222–27.

REW: Meyer-Lübke, Wilhelm. 1935. *Romanisches Etymologisches Wörterbuch*, Heidelberg: Winter.

Ribezzo, Francesco. 1912. *Il dialetto apulo-salentino di Francavilla Fontana.* Martina Franca.

Rohlfs, Gerhard. 1968. *Grammatica storica della lingua italiana e dei suoi dialetti*, vol. II. *Morfologia.* Turin: Einaudi.

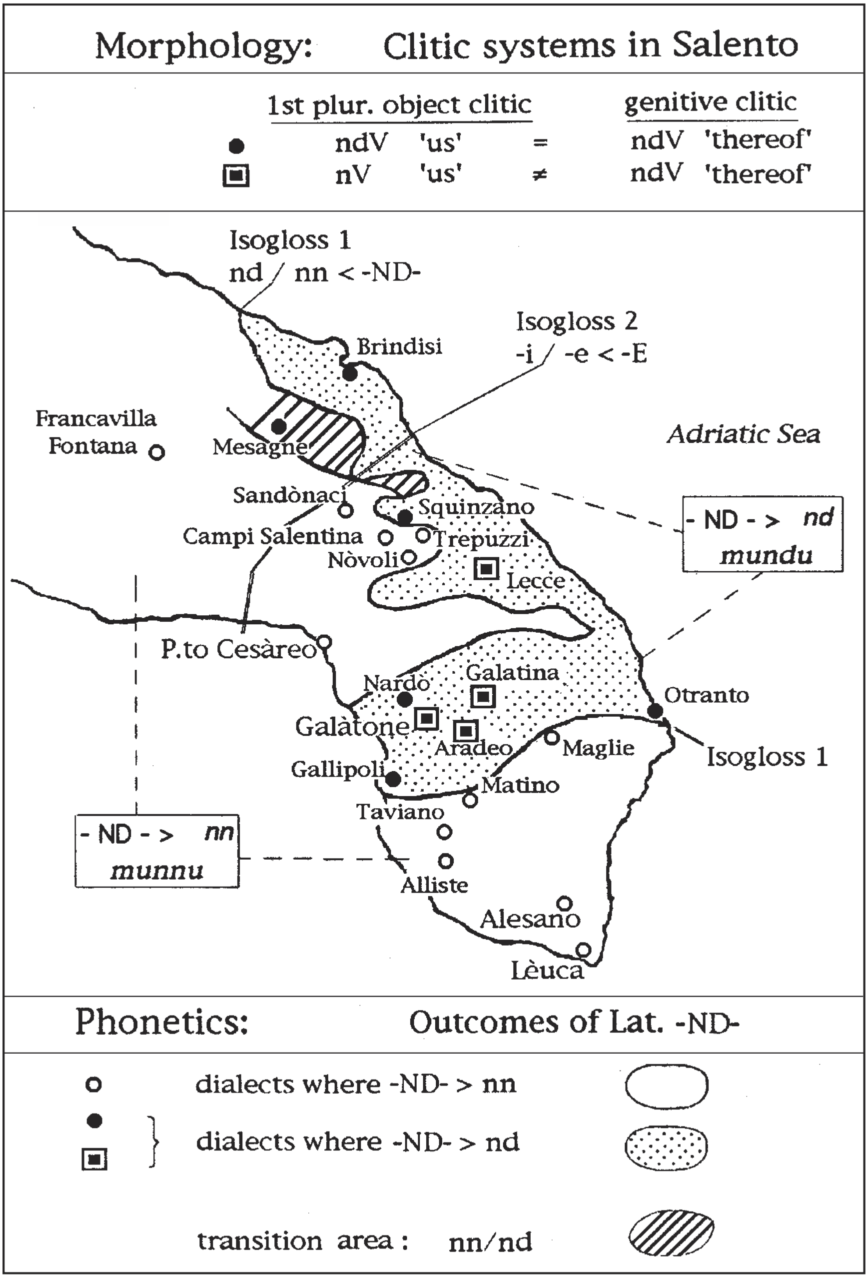
Ruffino, Giovanni, ed. 1998. *Atti del XXI Congresso di Linguistica e Filologia Romanza, Palermo, 18–24 Settembre 1995.* Tübingen: Max Niemeyer.

Sgrilli, Paola. 1983. *Il "Libro di Sidrac" salentino.* Pisa: Pacini.

Tropea, Giovanni. 1975. "Per una monografia sul dialetto dell'isola di Pantelleria". *La ricerca dialettale I*, 223–77. Pisa: Pacini.

VDS: Rohlfs, Gerhard. 1956–59. *Vocabolario dei dialetti salentini* (*Terra d'Otranto*). 3 vols. München: Verlag der Bayerischen Akademie der Wissenschaften.

Appendix. Map: the geographical (and sociolinguistic) scenario



Chapter 19

Towards a formal concept 'zero linguistic sign'

Applications in typology

Igor Mel'čuk
Observatory of Meaning-Text Linguistics, University of Montreal

1. The principle behind the introduction of zero linguistic signs

The concept 'zero sign in language' is based on the more general concept of linguistic sign. A linguistic sign is an ordered triplet **X** $=\langle$'X' ; /X/ ; $\Sigma_X\rangle$, where 'X' is the signified (=signatum, *signifié*) and /X/ is the signifier (=signans, *signifiant*) taken in their Saussurian sense; Σ_X is the syntactics, i.e. the set of combinatorial properties of the sign that are determined neither by the signified nor by the signifier (these properties are such features as part of speech, grammatical gender, government pattern, etc.). The zero linguistic sign is defined by allowing one of the components of the sign, namely the signifier, to be empty; a zero sign is thus but a particular case of linguistic sign. Formally (Λ stands for the empty set):

A *zero linguistic sign* **X** is a sign whose signifier is empty: **X**$=\langle$'X' ; /Λ/ ; $\Sigma_X\rangle$. A zero sign will be written as **Ø**.
(For more on zero linguistic signs, see Mel'čuk 1974, 1982: 48–50, 1988, 1993–2000 [vol. 4]: 21 ff.)

However, this definition, although clear and rigorous, is in itself insufficient: it does not constrain the use of zero signs by linguists. An unrestricted use of zeroes empties them of any positive content; they become a sort of a convenient stopgap used to salvage a theory-driven analysis — *linguist's* zeroes, instead of being genuine linguistic signs, that is, *language* zeroes. Therefore, we need a stringent principle to guide the introduction of zeroes, so that some presumed zeroes would not be admitted. Such a principle, proposed below, is especially important in typological research: for a linguist to be in a position to compare zero signs in different languages, these signs have to be introduced according to the same guidelines. Note that all the elements of this principle have been discussed in linguistics; but, as far as I know, no explicit general formulation is available.

The Zero Sign Introduction Principle [=**ZSI Principle**]
Let there be an expression **E** — a clause or a wordform — of language **L**; a zero sign at the clause level is a zero wordform, while a zero sign at the wordform level is either a zero morph or a zero morphological operation.

A zero linguistic sign **X** in **E** is admitted if, and only if, the following three conditions are simultaneously satisfied:

1. Expressiveness: **E** carries a meaning 'X' or the value γ of a syntactic feature Σ such that this 'X' or γ has to be ascribed to **X** as (a part of) **X**'s signified or as (a part of) **X**'s syntactics;
2. Exclusiveness: **E** does not contain a non-zero signifier to which 'X' or γ could be ascribed in a regular and natural way at any level of representation;
3. Contrastiveness: **E** admits, in the corresponding position, a semantic contrast between **X** and another non-zero sign **X′** which carries a meaning 'X′' of the same category as 'X' [in other words, **X** has a distinctive value].

A zero sign must always do a clearly circumscribed job, that is, carry an information payload; it must do so in the absence of other contenders, that is, it must be the very last resort of our description;[1] and it must be opposed to non-zero signs, that is, participate in a perceptible semantic — that is, PARADIGMATIC — contrast with overt signs. Informally, a linguistic zero must be an absence of any overt sign in a particular position, this absence being meaningful for the speaker/the hearer. For instance, in Rus. *ruk+a* 'hand'SG.NOM ~ *ruk* ('hand', PL.GEN), we see a legitimate zero suffix -$Ø_{\text{PL.GEN}}$, so that the wordform **ruk** is morphically **ruk** + $Ø_{\text{PL.GEN}}$. Here, the absence of an overt suffix after the stem **ruk**- expresses/signals the plural and the genitive case, while nothing else does. But I do not agree with Bloch (1947) that, for example, in the verb forms *spring* ~ *sprang* the past is expressed by the zero suffix *-$Ø_{\text{PAST}}$, while the observable /ɪ/ ⇒ /æ/ replacement is an automatic alternation in the context of this suffix: *-$Ø_{\text{PAST}}$ is neither exclusive (there is the /ɪ/ ⇒ /æ/ alternation) nor contrastive (no overt suffix is possible in this position).

2. Different types of zero signs

The above formulation of the ZSI Principle allows for various types of linguistic zeroes. I will limit myself here to mentioning just three of its most 'exotic' types.

• *Non-morphological zeroes*, that is, zero wordforms or zero lexemes. An example of a zero wordform is the Russian copula BYT´ '[to] be' in the present indicative: $Ø^{\mathrm{BYT'}}_{\mathrm{PRES.IND}}$; cf. *Ivan bolen* 'Ivan [is] sick' vs. *Ivan byl* ⟨*budet*⟩ *bolen* 'Ivan was ⟨will be⟩ sick'. Zero lexemes include, for example, Rus. $Ø^{\mathrm{PEOPLE}}$ and $Ø^{\mathrm{ELEMENTS}}$, which appear as Subjects in the syntactic structure of sentences such as *Ivana ubili* 'They [indefinite people] killed Ivan' vs. *Ivana ubilo* 'Something killed Ivan' (Mel'čuk 1974/1995: 178 ff). Another example of a zero lexeme is Sp. $Ø^{\mathrm{impers}}$, seen in $Ø^{\mathrm{impers}}_{\mathrm{3SG}}$ *llueve* 'It rains'.

• Morphological zeroes include, first, well-known grammatical zeroes (e.g. zero affixes), and second, *non-grammatical zeroes*, i.e. *zero radicals* in wordforms having non-zero affixal parts. I will cite three examples of zero radicals.

(1) Deictic demonstratives in Kirundi (Bantu) in different noun classes:

Noun class:	I	II	III	IV	V	VI . . .
1. 'this – close to the 1st p.' (Sp. *este*)	: *uwu*	*aba*	*uwu*	*iyi*	*iri*	*aya* . . .
2. 'this – close to the 2nd p.' (Sp. *ese*)	: *uw+o*	*ab+o*	*uw+o*	*iy+o*	*iry+o*	*ay+o* . . .
3. 'this – close to the 3rd p.' (Sp. *aquel*)	: *u+ryá*	*bá+rya*	*u+ryá*	*i+ryá*	*rí+rya*	*a+ryá* . . .
4. 'that – very far from the 1st and 2nd p.'	: *u+ríiya*	*bá+ríiya*	*u+ríiya*	*i+ríiya*	*rí+ríiya*	*a+ríiya* . . .

In lines 2–4, we see the radicals **-o**, **-rya** and **-ríiya**, preceded by class prefixes **u-**, **ba-**, **u-**, **i-**, **ri-** and **a-**, which mark the agreement with the modified noun. The actual forms show the following three alternations: (1) consonantization /i/ ⇒ /j/ (spelled *y*) and (2) truncation of /a/-, both before a vowel; (3) epenthesis of /w/ and /j/ between vowels. Moreover, if the form obtained is monosyllabic, the class prefix is preceded by an epenthetic vowel identical to its own vowel, for instance: *ba+o* ⇒ *bo* ⇒ *abo* (class II); *ri+o* ⇒ *ryo* ⇒ *iryo* (class V); etc.

Now, what is the radical of the wordforms in line 1? They consist of a class prefix preceded by an epenthetic vowel (because of forbidden monosyllabicity of wordforms in Kirundi): *u* ⇒ *uu* ⇒ *uwu*, *ba* ⇒ *aba*, etc. But a class prefix is a prefix — it must be followed by a radical. Therefore, these wordforms have to contain a zero radical: **-Ø**$^{\mathrm{THIS}}$, a sign of the following structure:

-Ø$^{\mathrm{THIS}}$= ⟨'this — close to the first person' ; /Λ/ ; Σ=radical, demonstrative Adj, . . .⟩

(2) Genitive-accusative and dative forms of the third person pronominal clitics in Serbo-Croatian (Milićević 1999):

	Singular (masculine and neuter)		Plural	
	Full form	Clitic	Full form	Clitic
Genitive=accusative	*nj+ega*	*ga*	*nj+ih*	*ih*
Dative	*nj+emu*	*mu*	*nj+ima*	*im*

The radical of the pronoun ON 'he' in the full forms is **nj-** /ɲ/; **-ega**, **-emu**, **-ih** /ix/ and **-ima** are cumulative suffixes of gender, number and adjectival case (the same suffixes as those found in all adjectives of the corresponding declensional type). The morphic representation of the clitic forms of this pronoun is as follows:

ga=Ø$^{\text{HE}}$ = ⟨'he'; /Λ/ ; Σ=radical, clitic pronoun, third person, . . .⟩
⊕
ga=⟨'MASC, SG, ACC'; /ga/ ; Σ=suffix, of a clitic pronoun of third person, . . .⟩; etc.

I reject a logically possible description of **ga** as a single megamorph with the global signified 'he, MASC, SG, ACC' because on this account the near-identity of **-ga** with the inflectional suffix -(**e**)**ga** [**-mu** ~ -(**e**)**mu**, **-ih** ~ **-ih**, **-im** ~ **-im**(**a**)] remains unexpressed.

(3) The verb '[to] give' in Awa (Papuan):

a. **Ø** +*nuw* +*éhq* =*Nuwéhq*
give mine PAST.3SG
'[He] gave something mine.'

b. *Keki* +*nuw* +*éhq* =*Kekinuwéhq*
burn mine PAST.3SG
'[He] burnt something mine.'

c. *Néne sòn* **Ø** +*nuwéhq*
my garden give mine.PAST.3SG
'[He] gave my garden.'

d. *Néne sòn* *keki* +*nuwéhq*
my garden burn mine.PAST.3SG
'[He] burnt my garden.'

Comparing (3a, c) to (3b, d), we see that the meaning 'give' is expressed by the absence of a radical before the inflectional ending **-nuwéhk**; this means a zero radical.

• Zero operation signs: zero reduplications, zero apophonies and zero conversions. These are operations whose output is identical to their input; such '*null-modifications*' are introduced in opposition to non-zero operations: compare, for instance, *foot*, where the singular is expressed by a zero apophony $\mathbf{A}_{\mathrm{SG}}^{/\text{ʊ}/\Rightarrow/\text{ʊ}/}$ opposed to the $\mathbf{A}_{\mathrm{PL}}^{/\text{ʊ}/\Rightarrow/\bar{\imath}/}$ apophony, which expresses the plural in *feet*. (For more on zero morphological operations, see Mel'čuk 1982: 101–2 and 1993–2000 [vol. 4]: 286, 304, 321.)

3. The requirement of non-zero alternants

The ZSI Principle does not require that a zero sign necessarily have a non-zero alternant, that is, a fully synonymous non-zero partner; a zero sign can be a unique allomorph of its morpheme or a unique lex of its lexeme. What is required is a paradigmatic contrast with overt signs. Thus, in the wordform *book* the singular is expressed by a zero suffix **-Ø**$_{\mathrm{SG}}$, paradigmatically opposed to the plural suffix **-s**. I am ready to maintain this even without having recourse to such exotic foreign overt singulars as *alumn*+**us**, *phenomen*+**on**, or *virtuos*+**o**, which can be quoted as non-zero alternants of **-Ø**$_{\mathrm{SG}}$ in English.

Haas 1957: 45–7 rejects 'unsupported' zero signs: for him, the only justification for associating a meaning with a zero must be that the same meaning is also associated with a non-zero; since the meaning 'singular' is never expressed by an overt form in English, 'we should leave it merged in the total semantic values of forms like *cat*, *boy*, etc.' (p. 47). Although this position is common enough, I think it is wrong. Thus, Haas' last statement raises two serious objections:

• First, if the meaning 'singular' is included in the signified of the radical **cat**, then the meaning 'plural' of the suffix **-s** must be *replacive* for all English nouns: when the suffix is added to the stem, this meaning will have to push out the meaning 'singular', which (presumably) already is in the stem, and take its place. 'Unsupported' zeroes are really widespread: **-Ø**$_{\mathrm{3SG}}$ in Serbo-Croatian and Spanish (verb: *čita*+**Ø**, *lee*+Ø '[he/she] reads'); **-Ø**$_{\mathrm{MASC}}$ in Russian (verb: *spa*+*l*+**Ø** '[he] slept'; predicative adjective: *gotov*+**Ø** '[he is] ready'); **-Ø**$_{\mathrm{PRES.IND}}$ in Spanish (verb: *canta*+**Ø**+*mos* '[we] sing' vs. *cantá*+**ba**+*mos* '[we] sang', *canta*+**r**+*emos* '[we] will sing'), **-Ø**$_{\mathrm{SG}}$ in Spanish (noun: *casa*+**Ø** 'house' vs. *casa*+**s** 'houses'), etc., just to name a few. Therefore, if we accept the requirement of synonymous non-zero alternants and refuse to consider all these zeroes, numerous inflectional meanings will turn out to be replacive.

I admit replacive grammemes in special situations (Mel'čuk 1991, 1999 [vol. 4]: 45, 332), but I am not prepared to say that so many grammemes are replacive.

• Second, and more importantly, the radicals **cat-**, **boy-**, **book-**, etc. do not carry the meaning 'singular'! A **mousetrap** is for catching mice, not one mouse; the **toothbrush** is for teeth, not for one tooth; and a **bookbinder** binds books rather than one book. What expresses the meaning 'one [book]' is the complete wordform **book** rather than the (homophonous) radical **book-**, and this wordform does contain an 'unsupported' singular zero suffix.

Therefore, the meaning 'singular' cannot be associated directly with the radical in the case of English nouns (and in all similar cases); 'unsupported' zero signs (=lacking overt alternants) must be admitted. An immediate corollary of this is the existence of zero -emes (sets of signs): morphemes and lexemes that contain only a zero element (morph/lex); for instance, the Spanish nominal morpheme {SINGULAR} is a zero morpheme, while Rus. $Ø^{\text{PEOPLE}}$ and Sp. $Ø^{\text{impers}}$ are zero lexemes.

4. Zero as a last resort

Condition 2 of the ZSI Principle protects us against the proliferation of zeroes in all those cases where the information involved (=the meaning 'X' or the value γ of a syntactic feature) is carried by another sign, which is non-zero. Generally speaking, a zero sign must be exclusive as a possible carrier of the information in question or there is no zero: one should not look for a zero marker where one finds an overt difference, i.e. another linguistic means available to take care of the observed chunk of meaning or a syntactic feature. Let it be emphasized that language has more than segmental signs, e.g., morphs; there are also reduplications, apophonies and conversions, and all these overt operation signs are valued higher than zero signs: they should be preferred over a zero. Let us consider the following simple example.

(4) The German wordform **Mütter** 'mothers' has no plural zero suffix **-$Ø_{\text{PL}}$**, because **Mütter** contains a non-zero signifier to which the meaning 'plural' can be ascribed in a natural and systematic way: this is the Umlaut alternation /u/ ⇒ /ü/, applicable to the corresponding singular wordform **Mutter**. German has many plurals of this type:

Vater ‘father’ ~ *Väter* ‘fathers’
Apfel ‘apple’ ~ *Äpfel* ‘apples’
Faden ‘thread’ ~ *Fäden* ‘threads’
Vogel ‘bird’ ~ *Vögel* ‘birds’
Ofen ‘oven’ ~ *Öfen* ‘ovens’
Bruder ‘brother’ ~ *Brüder* ‘brothers’

All these pairs show an obvious phonemic difference with which the signified ‘plural’ can be naturally associated: the plural formation in (4) must be described by the apophonies $\mathbf{A}_{\mathrm{PL}}^{/a/\Rightarrow/\varepsilon/}$, $\mathbf{A}_{\mathrm{PL}}^{/o/\Rightarrow/ö/}$ and $\mathbf{A}_{\mathrm{PL}}^{/u/\Rightarrow/ü/}$. The signified ‘singular’ is expressed in corresponding nouns by absence of any apophony — in our terms, by the zero apophony $\mathbf{A}_{\mathrm{PL}}^{/\Lambda/\Rightarrow/\Lambda/}$.

5. Zero signs and parasitic formations

Condition 2 helps the linguist to choose between two possible descriptions in the cases where one morphological form is built on another complete form — what are known as ‘parasitic formations’ (Mel’čuk 1991, 1999 [vol. 4]: 46–7); I will illustrate this phenomenon with secondary cases in Daghestanian languages.

(5) Archi (Kibrik 1997: 27–8): the noun GEL ‘mug, tankard’ (the zero suffixes are my addition — IM.)

singular	plural	
Nominative	*gel* +*Ø*+*Ø*	*gel* +*um*+*Ø*
Ergative	*gel* +*Ø*+*li*	*gel* +*um*+*čaj*
Genitive	*gel* +*Ø*+*li*+*n*	*gel* +*um*+*če* +*n*
Dative	*gel* +*Ø*+*li*+*s*	*gel* +*um*+*če* +*s*
Comitative	*gel* +*Ø*+*li*+*ƛu*	*gel* +*um*+*če* +*ƛu*
Comparative	*gel* +*Ø*+*li*+*xur*	*gel* +*um*+*če* +*xur*
. . .	. . .	. . .

Beginning with the genitive, all Archi cases are expressed by suffixes added to the complete form of the ergative, marked by **-li** in the singular and by **-čaj**/**-če** in the plural. This situation can be described in two opposite ways.

- Either we say that the genitive, the dative, etc. are built on the complete form of the ergative; then we have to admit that the suffix of the genitive **-n** is added after the suffix of the ergative **-li**. This is my viewpoint.[2]

- Or we say that all the oblique cases — the genitive, the dative, etc., including the ergative itself! — are formed from the oblique stem of the noun; the suffixes **-li** in the singular and **-čaj/-če** in the plural are then not markers of the ergative, but those of this oblique stem. This is the viewpoint of Kibrik 1992: 81–2 and 1997: 27–8.[3]

If we accept the second viewpoint, we have to admit that the ergative is marked by a zero suffix; such a suffix will be in contrast with all other case suffixes, including of course the zero suffix of the nominative. As a result, the nominative *gel* and the ergative *gelli* will be opposed by two zeroes, while the overt difference **-li** will be treated as non-significative. Such a description seems anti-intuitive to me, and the ZSI Principle does not allow for it. The ergative zero in (5) would violate Condition 2 of this principle: the signified ‘ergative’ can be associated with the suffixes **-li** and **-čaj**, therefore it should; as a result, we have to stick to the first viewpoint. If we accept Condition 2 in the ZSI Principle, we have to agree to a description of secondary cases that admits case formation from a complete case form.[4]

6. Irrelevant overt distinctions accompanying zeroes

Condition 2 contains two important provisos: one which requires that the expression of the information in question be natural and systematic; and another one which requires that a possible candidate for the carrier of this information be absent at ALL levels of representation.

To illustrate the first proviso, let me consider a situation where there exists a physical distinction δ between two wordforms showing a semantic distinction ‘σ’, but where — in spite of this — the researcher has to posit a zero sign which expresses ‘σ’, ignoring δ: it is impossible to associate ‘σ’ with δ in a natural and systematic way.

(6) The paradigm of the Russian noun SESTR(*-á*) ‘sister’ includes the following forms:

	Singular	Plural
Nominative	/s′istrá/	/s′óstri/
Genitive	/s′istrí/	/s′is′t′ór/
Dative	/s′istr′é/	/s′óstram/
. . .	. . .	. . .

Morphologically, these forms each contain two morphs:

- an underlying radical with the signifier /s′os′t′or/. It never appears as such on the surface; in the process of synthesis, it is modified by morphonological rules, which, based on it, construct predictable allomorphs /s′istr/, /s′óstr/, etc.
- the cumulative suffix of number and case: **-á**, **-í**, **-é**, . . ., **-i**, **-Ø**, **-am**, . . .

It is the zero suffix of the genitive plural that is problematic: it has to be postulated in spite of the fact that the forms /s′**istr**+á/ [SG.NOM] and /s′**is′t′ór**/ [PL.GEN] — if we ignore the suffix **-a** — show a phonemic difference: /**st**/ ~ /**s′t′ó**/. This difference, however, is a result of the application of morphonological rules, which are extremely productive in Russian: they apply to thousands of nouns depending on morphological/phonological context, but without any direct link to any grammeme. Thus, the appearance of a fleeting /o/, which we see in /s′is′t′**ó**r/, is not at all related to the expression of the plural or the genitive: this fleeting /o/ appears as well in the nominative singular in masculine nouns (*úg**o**l* 'angle' SG.NOM ~ *ugl+á* 'angle' SG.GEN) or in denominative adjectives (*ok**ó**n+n+yj* 'window' [as in *window pane*] ~ *okn+ó* 'window' SG.NOM). The presence/absence of a fleeting /o/ in Russian nouns depends only on morphonological conditions (an unstressed fleeting /o/ is truncated before a vocalic morph). Moreover, Russian does not use morphological operations at all to express any grammemes; therefore, the statement 'In /s′is′t′ór/, the genitive and the plural are expressed by the operation of substitution /st/ ⇒ /s′t′ó/' is anti-natural and anti-intuitive to the highest degree. Worse, if we try to link the signified 'plural, genitive' to the /st/ ⇒ /s′t′ó/ substitution, we get the following picture: since the string /s′t′ór/ belongs to the signifier of the basic allomorph, we have to say that 'plural, genitive' is expressed by a zero substitution, while the string /st/ marks all the other forms different from the genitive plural! This is clearly unacceptable; all the more so because this description is applicable to just one Russian noun: SESTR(*-á*).

The second proviso, concerning deeper levels of representation, foresees different cases of ellipsis, i.e. situations where the information is carried by a non-zero sign present at a level *n* of representation, but eliminated on the level *n*+1 by special rules (all sorts of deletion, such as that of personal pronouns in PRO-Drop languages, etc.). Thus, the Spanish sentence *Estoy leyendo* '[I] am reading' does not have the zero Subject $*Ø_{1SG}$ 'I': in the syntactic structure, the sentence has the overt Subject YO 'I'; rules of Spanish syntax delete this YO during the transition to the morphological string — after it has specified the agreement of the verb. This proviso requires distinguishing ellipses (=elimination of non-zero signs) from zeroes; cf. the analysis of the Georgian example (8).

7. No non-contrastive zeroes

Condition 3 of the ZSI Principle stipulates that a zero sign contrasts semantically with at least one non-zero sign. Note that this condition does not forbid two zero signs 'contrasting' in the same position, provided this position can also contain a non-zero sign. Thanks to Condition 3, 'useless,' i.e. non-distinctive, zero signs are avoided in two types of situations:

- where the absence of a sign is not significative, because the meaning involved is actually carried by another, non-zero sign;
- where the absence of a sign is significative, but it is a result of a morphological ellipsis — of the deletion of a non-zero sign introduced at a deeper level of representation (see the next section).

A typical example of a presumed non-contrastive zero follows:

(7) The wordform **sheep**, as in *The sheep were grazing* . . ., where it is in the plural, does not include a plural zero suffix ***-Ø**$_{\text{PL}}$, because this ***-Ø**$_{\text{PL}}$ does not contrast with a non-zero suffix: the noun SHEEP is invariable. The radical **sheep** must be characterized in the lexicon as either singular or plural, that is, we deal here with two different signs:

sheep′=⟨'domestic mammal of the genus *Ovis*, SG'; /šīp/; Σ=Noun, radical, . . .⟩

and

sheep″=⟨'domestic mammal of the genus *Ovis*, PL'; /šīp/ ; Σ=Noun, radical, . . .⟩

Other English nouns of the same type (*deer*, *elk*, *grouse*, *trout*, . . .) are described in the same way. (Cf. Janda and Manandise 1984: 232, who emphatically reject a -Ø$_{\text{PL}}$ in the plural form **sheep**.)

8. Zero sign *vs.* morphological ellipsis

In some cases, it is impossible to associate a grammeme that is expressed in a wordform with an overt marker appearing in the same wordform; however, a zero sign cannot be invoked, either, because the morphological position under consideration does not allow a contrast between a zero sign and a non-zero sign — and such zeroes are rejected by the ZSI Principle. A possible solution is *morphological ellipsis* — deletion of a non-zero sign that appears at a deeper level of representation. Let me illustrate this case with a summary description of a fragment of Georgian conjugation.[5] Here are the markers of the Main Verb agreement:

(8) Georgian

	Subject	Direct Object		Subject	Direct Object
Sg 1	**v-**	**m-**	Pl 1	**v- . . . -t**	**gv-**
2		**g-**	2	**-t**	**g- . . . -t**
3	**-s**		3	**-en**	

The distribution of these markers can be illustrated by a (partial) paradigm of the verb XAṪV(-*a*) '[to] draw, paint' in the present indicative active.

	Direct Object (=DirO)					
	Singular			Plural		
Subject	1	2	3	1	2	3
Sg 1	—	**g**+*xaṫav*	**v**+*xaṫav*	—	**g**+*xaṫav*+**t**	**v**+*xaṫav*
2	**m**+*xaṫav*	—	*xaṫav*	**gv**+*xaṫav*	—	*xaṫav*
3	**m**+*xaṫav*+**s**	**g**+*xaṫav*+**s**	*xaṫav*+**s**	**gv**+*xaṫav*+**s**	**g**+*xaṫav*+**t**	*xaṫav*+**s**
Pl 1	—	**g**+*xaṫav*+**t**	**v**+*xaṫav*+**t**	—	**g**+*xaṫav*+**t**	**v**+*xaṫav*+**t**
2	**m**+*xaṫav*+**t**	—	*xaṫav*+**t**	**gv**+*xaṫav*+**t**	—	*xaṫav*+**t**
3	**m**+*xaṫav*+**en**	**g**+*xaṫav*+**en**	*xaṫav*+**en**	**gv**+*xaṫav*+**en**	**g**+*xaṫav*+**en**	*xaṫav*+**en**

Note: blanks show the impossibility of forms with the same person of the Subject and the DirO: *'I – me', *'I – us', *'you$_{SG}$ – you$_{SG}$', . . . For the signifieds of this type, Georgian uses a reflexive construction with the noun TAVI 'head' in the role of reflexive pronoun.

This table shows multiple discrepancies between the grammemes expressed in surface forms and non-zero markers. Thus, in *gxaṫav* 'I draw you$_{SG}$' (the first line of the column 'Singular-2'), the prefix **g-** expresses the second person of the DirO, but we do not find the marker which expresses the singular of this DirO ('you$_{SG}$' rather than 'you$_{PL}$'), nor the marker for the meaning 'I'. Similarly, in *gxaṫaven* 'they draw you$_{PL}$' (the last line of the column 'Plural-2'), the same prefix **g-** expresses the second person of the DirO, while the suffix **-en** shows the third person plural of the Subject; but what expresses the plural of the DirO ('you$_{PL}$', and not 'you$_{SG}$')? This should be the suffix **-t**, but it is not there. This type of question can be asked about most forms in the table. A logically possible answer could be the introduction of zero affixes in all cases where we lack 'material' markers: a zero suffix to mark the singular of the object in *gxaṫav*, another one to mark the plural of the object in *gxaṫaven*, and so forth. However, we have to see whether they will be admissible from the viewpoint of the ZSI Principle. I will begin with the form *gxaṫav* 'I draw you$_{SG}$', which I have already mentioned.

1. 'First person' of the Subject must be expressed by the prefix **v-**, but it is not in the form considered: if a Georgian verbal form contains a non-zero object prefix (in this case, the second person **g-**), no other non-zero prefix can be present in it. Therefore, I cannot postulate here a subject zero prefix $^{*}\text{Ø}_{1p}$-, which would be an allomorph of **-v**: this $^{*}\text{Ø}_{1p}$- cannot contrast with a non-zero prefix, and Condition 3 of the ZSI principle disallows such zeroes.

The correct description is different: the first person of the Subject is expressed by the prefix **v-**, which, closer to the surface, is evicted by the prefix **g-**; this is a typical *morphological ellipsis*:

[**v-** + **g-**] ⇒ **g-**

(I am using square brackets here to indicate an ill-formed surface sequence of linguistic signs.) The initial phonemic cluster *vg-* is possible in Georgian: **v**+*gv*+*i* '[I] sweep', **v**+*gzavn*+*i* '[I] send', **v**+*gleǯ* '[I] tear', etc.; therefore, the substitution **v-** + **g-** ⇒ **g-** cannot be described as phonemic cluster simplification.

2. The form *gxaṫav* 'I draw you$_{SG}$' contrasts with the form *gxaṫav***t** 'I draw you$_{PL}$', where the suffix **-t** expresses the plural of the DirO; this proves the presence, in *gxaṫav*, of a singular DirO zero suffix. I can then write, for 'I draw you$_{SG}$', the following (incomplete) morphic representation:

v + **g** + **xaṫav** + Ø_{SG}-.

3. The form *gxaṫav* contrasts as well with two other forms *gxaṫav***t**:

- *gxaṫav***t**='we draw you$_{SG}$', where **-t** expresses the plural of the Subject;
- *gxaṫav***t**='we draw you$_{PL}$', where **-t** expresses the plural of both the Subject and the DirO.

From this, I can draw two conclusions:

a. The suffix **-t** is an 'unselective' pluralizer: it can pluralize the Subject, or the DirO, or both (and also the IndirO, which I do not consider here); its signified is simply 'plural', without specifying whether it pluralizes the Subject or an Object. By analogy, it can be concluded that in the singular, the zero suffix is equally unselective in the same sense: -Ø_{SG} is for the Subject, the DirO, or both. On the surface, the wordform meaning 'we draw you$_{PL}$' cannot have two plural suffixes **-t**, one for the Subject, and the other for the DirO. Again by analogy, the surface wordform meaning 'I draw you$_{SG}$' cannot have two singular zero suffixes one after another, nor — in the wordform meaning 'I draw you$_{PL}$' — the combination of **-t** with **-Ø$_{SG}$**:

$$[\textbf{-t} + \textbf{-t}] \Rightarrow \textbf{-t}; [\textbf{-Ø}_{SG} + \textbf{-Ø}_{SG}] \Rightarrow \textbf{-Ø}_{SG}; [\textbf{-t} + \textbf{-Ø}_{SG}] \Rightarrow \textbf{-t}; [\textbf{-Ø}_{SG} + \textbf{-t}] \Rightarrow \textbf{-t}$$

Although I have not found the final sequence **-t** + **-t**, the final phonemic cluster of two dentals is possible in Georgian: *v+ḳeṫ+t* 'we lock', *v+žleṫ+t* 'we exterminate'; a sequence of two identical consonants is in principle equally possible. Therefore, I conclude — by analogy with the *__v-__ + __g__-case — that the substitution **-t** + **-t** ⇒ **-t** is not a phonemic cluster simplification.

b. The morphic representation of the form *gxaṫav* 'I draw you$_{SG}$' contains another zero suffix, which marks the singular of the Subject ('I', not *'we'). As a result, the complete morphic representation of this form is as follows:

$$\textbf{v} + \textbf{g} + \textbf{xaṫav} + \textbf{Ø}_{SG} + \textbf{Ø}_{SG}$$

(closer to the surface, one of the zero suffixes is deleted by the corresponding morphological ellipsis rule).

4. The form *gxaṫav* 'I draw you$_{SG}$' is also opposed to the forms *gxaṫav**s*** '**he** draws you$_{SG}$' and *gxaṫav**en*** '**they** draw you$_{SG}$'. But here, the opposition is expressed — at the level of the morphic representation — by the first person subject prefix **v-** (in the morphic representation **v+g+xaṫav-**), which contrasts with the third person singular subject suffix **-s** and with the third person plural subject suffix **-en**. (Closer to the surface, as has been already stated, **v-** is evicted by the prefix **g-**.) So again there is no zero affix — more specifically, no zero prefix *$\textbf{Ø}_{1p}$-; Condition 2 of the ZSI Principle bars the introduction of such a zero.

Now let me turn to the second form mentioned above: *gxaṫaven* 'they draw you$_{PL}$', where the problem arises in connection with the 'absent' pluralizer of the DirO **-t**. The table in (8) shows that this suffix does not combine with any other suffix; but it behaves differently with respect to the subject suffixes of 3sg **-s** and of 3pl **-en**. Namely, **-t** evicts **-s**, but is itself evicted by **-en**:

'he draws you$_{PL}$' ⇔ **g** + **xaṫav** + **s** + **t** ⇔ *gxaṫavt* ⟨*gxaṫavst⟩
'they draw you$_{PL}$' ⇔ **g** + **xaṫav** + **en** + **t** ⇔ *gxaṫav**en*** ⟨*gxaṫavent⟩

To express this fact, I introduce two further morphological ellipsis rules:

$$[\textbf{-s} + \textbf{-t}] \Rightarrow \textbf{-t}; [\textbf{-en} + \textbf{-t}] \Rightarrow \textbf{-en}$$

Again, these are morphological, rather than phonological, rules: the final clusters -**st** and -**nt** are possible in Georgian (*v+sres+t* 'we rub him/them'; *a+lxen+t* 'you$_{PL}$ amuse him', *v+a+rč̇en+t* 'we support him/them').

Finally, I presuppose that the non-zero suffixes -**s** and -**en** always evict adjacent zero suffixes; therefore, we need two more morphological ellipses:

[-**s** + -**Ø**$_{SG}$] ⇒ -**s**; [-**en** + -**Ø**$_{SG}$] ⇒ -**en**

Given the complex combinatorics of Georgian verbal affixes, many verbal forms in the present indicative active manifest multiple ambiguities; for instance:

Verbal form	Signified		Morphic representation
gxaṫavt	'I draw you$_{PL}$'	⇔	**v** + **g** + **xaṫav** + **Ø**$_{SG}$ + **t**
	'we draw you$_{SG}$'	⇔	**v** + **g** + **xaṫav** + **t** + **Ø**$_{SG}$
	'we draw you$_{PL}$'	⇔	**v** + **g** + **xaṫav** + **t** + **t**
	'he draws you$_{PL}$'	⇔	**g** + **xaṫav** + **s** + **t**
gxaṫaven	'they draw you$_{SG}$'	⇔	**g** + **xaṫav** + **en** + **Ø**$_{SG}$
	'they draw you$_{PL}$'	⇔	**g** + **xaṫav** + **en** + **t**

To sum up: If we take into account only the form *gxaṫav* and its oppositions with other forms of the (partial) paradigm of the Georgian verb, just one verbal zero suffix is found in Georgian: an unselective singularizer -**Ø**$_{SG}$. In particular, forms of the type *gxaṫav* 'I draw you$_{SG}$' or *gxaṫavt* 'we draw you$_{SG}$' do not contain the first person subject zero prefix: these forms are obtained as a result of morphological ellipsis — elimination of the 'regular' first person subject prefix **v**-.[6] There is no third person singular subject zero suffix in *gxaṫavt* 'he draws you$_{PL}$', either: this form is also produced by the ellipsis of the subject suffix -**s**. However, the paradigm in (8) shows the presence of another unquestionable zero prefix: the second person subject prefix **Ø**$_{2p}$-, seen in the forms **Ø**+*xaṫav*+**Ø** 'you$_{SG}$ draw him/them' and **Ø**+*xaṫav*+*t* 'you$_{PL}$ draw him/them', as opposed to **v**+*xaṫav*+**Ø** 'I draw him/ them' and **v**+*xaṫav*+*t* 'we draw him/them'.

9. No derivational zero signs

For *grammatical* (=inflectional or derivational) *zero signs*, the ZSI Principle needs an additional condition:

4. Obligatoriness: if a zero sign **X** is grammatical, then the signified 'X' of

X is inflectional, i.e. it is a grammeme or a combination of grammemes.

In other words, 'X' (or each of its components) has to belong to an obligatory morphological category: in the given position, a meaning of this category must be necessarily expressed. 'X' cannot be a derivateme; derivational zeroes should not be allowed to exist. Being non-obligatory, derivatemes are unable to exert enough pressure on the morphological system of the language in order to give rise to zero affixes — because these latter do not enter into paradigmatic oppositions. Consider, for example, the pairs of the following type:

(9) [*to*] *cook* ~ [*a*] *cook*, [*to*] *gossip* ~ [*a*] *gossip* or [*to*] *cheat* ~ [*a*] *cheat.*

In the nouns of these pairs, no agent zero suffix parallel to **-er** should be postulated, because its meaning 'person that X-es' is not inflectional in English. If we admit here an agent zero suffix $^*\text{-Ø}_{\text{AGENT}}$, it would contradict Condition 3 of the ZSI Principle: this presumed zero suffix is not contrastive, since no other derivational suffix appears in this position to mark the underlying radical as 'non-derived.' Such is the case of all derivational affixes: a derivational affix is never obligatory (by definition), and an absence in a non-obligatory position cannot be significative. 'Overt Analogue Criterion' (Sanders 1988: 156) — that is, the existence of a non-zero derivational affix that expresses the same meaning which we are about to ascribe to the presumed zero affix — is not sufficient (and, as we have seen in **3**, not necessary).

The linguistic means used to derive [*a*] *cook*, [*a*] *gossip* and [*a*] *cheat* from [*to*] *cook*, [*to*] *gossip* and [*to*] *cheat* is *conversion*: a regular technique consisting in modification of the syntactics of the initial radical, in this case — the substitution Verb ⇒ Noun (on morphological conversion, see Mel'čuk 1982: 102–4, 1999 [vol. 4]: 309 ff).[7]

The impossibility of derivational zeroes follows from the fact that derivational oppositions are *privative* (Plungjan 1994): a derived unit *X+a* 'X+a' is semantically always more complex than the underlying unit *X* 'X', which does not include any meaning opposed to 'a' (thus, Russian diminutives of the type *šar+ik* '[a] small ball' express the meaning 'small'; but the underlying radicals do not express the meaning 'big' or 'not small'; *šar* can denote a very big and a very small ball — cf. *kroxotnyj šar* '[a] tiny ball'). On the contrary, inflectional oppositions are necessarily *equipollent*: as a rule, one inflectional form *X+b* 'X+b' contrasts with another inflectional form *X+c* 'X+c', so that both forms are of equal semantic complexity.

Acknowledgments

The first version of the chapter was read by D. Beck, L. Iordanskaja, J. Milićević and N. Pertsov; the Georgian data were checked by and discussed with G. Chikoidze and L. Margvelani; the final version underwent the scrutiny of D. Beck and L. Iordanskaja. Thus, the chapter owes a lot to the remarks, proposed corrections and suggestions made by these colleagues and friends. I extend my deepest gratitude to all of them.

Notes

1. This means that “if you **can** do without a zero, you **should** do without a zero” (Plungjan 1984: 149); “*ceteris paribus*, accounts that do without zeroes are always to be preferred over ones that include them” (Janda and Manandise 1984: 231).

2. Note that under the description I propose the signified ‘genitive’ of the suffix **-n** is not replacive. The ergative suffix is selected in Archi (and all similar languages) automatically with any other oblique case suffix and thus does not bring its meaning into the wordform. Cf.: ‘gen’ ⇔ {ERG}, {GEN}; ‘dat’ ⇔ {ERG}, {DAT}; ‘comit(ative)’ ⇔ {ERG}, {COMIT}; . . . The ergative suffix is meaningful only when it expresses the ergative: ‘erg’ ⇔ {ERG}. Its meaning is no more present in the meaning of the wordform *gel+Ø+**li**+n* than the meaning of *bucket* in the meaning of the idiomatic expression [*to*] *kick the **bucket*** ‘[to] die’.

3. I do not consider a description in which the oblique case suffixes are taken to include the ergative marker, that is, where the genitive suffix will be **-lin**, the dative suffix **-lis**, etc. Such a treatment fails to factorize out an element common to more than twenty suffixes. What is more, this element is idiosyncratic and can be irregular; therefore, if we do not isolate it, the complex rules needed to describe it will have to be repeated for all cases.

4. In many Daghestanian languages, the existence of an oblique stem in the declension of the noun cannot be doubted. Thus, in Tsakhur the ergative is expressed by a special suffix added to this oblique stem — just like all other case suffixes are, and the oblique stem cannot be used alone, i.e. without a case suffix, in the text. My above reasoning applies only to such languages as Archi or Lezgian.

5. Georgian verbal morphology has been discussed in a series of recent publications, see, e.g., Anderson (1986: 6–14) (an analysis of the pluralizer **-t**) and (1992: 137–56), Spencer (1991: 219–23), Aronson (1992), and Carmack (1997); these sources provide all further relevant references.

6. A logical analysis of the triple opposition ‘zero ~ ellipsis ~ non-saturation of an obligatory valence slot [in syntax]’ is proposed in Apresjan *et al.* (1978: 304–8). See also Panevová (1998).

7. On the opposition ‘conversion ~ zero-affixation,’ see Lieber (1981: 119 ff.). Lieber’s main argument against derivational zero suffixes in the cases like German *rufen* ‘[to] call’ ~ *der Ruf* ‘[a] call’ (pl. *Rufe*) or *binden* ‘[to] bind’, ‘tie’ ~ *das Band* ‘[a] tie’ (pl. *Bänder*) is that

one zero suffix would not be sufficient, since these derived nouns are of different genders and different declension types. But for the English deverbal adjectives formed from a past participle — of the type *annoyed*, *inhabited*, etc. — Lieber (1981: 144–8) admits a derivational zero suffix, given the absolute uniformity of the derived elements. However, for me, a derivational zero suffix in these forms is inadmissible because it is not contrastive: in the presumed adjective stem *[*annoy+ed*+$Ø_{Adj}$], it would be opposed only to the absence of any derivational suffix in the participle stem [*annoy+ed*], and this is not allowed by the ZSI Principle. The adjective stem $[annoy{+}ed]_{(Adj)}$ is derived from the participle stem $[annoy{+}ed]_{part,\ pass}$ by conversion — in the same way as German *Ruf* from *ruf*(-*en*) etc.

References

Anderson, Stephen. 1986. "Disjunctive Ordering in Inflectional Morphology". *Natural Language and Linguistic Theory*, 4:1.1–32.

——1992. *A-Morphous Morphology*. Cambridge: Cambridge University Press.

Apresjan, Jurij, Leonid Iomdin and Nikolaj Pertsov. 1978. "Ob´´ekty i sredstva modeli poverxnostnogo sintaksisa russkogo jazyka". *International Review of Slavic Linguistics*, 3:3.249–312.

Aronson, Howard. 1992. "On the Marking of O_3 in Georgian". *The Non-Slavic Languages of the USSR*, ed. by H. Aronson, 1–17. Chicago: Chicago Linguistic Society.

Bloch, Bernard. 1947. "English Verb Inflection". *Readings in Linguistics*, ed. by M. Joos, (1958), 243–54. New York, American Council of Learned Societies.

Carmack, Stanford. 1997. "Blocking in Georgian Verb Morphology". *Language* 73:2. 314–38.

Haas, William. 1957. "Zero in Linguistic Description". *Studies in Linguistic Analysis*,ed. by W. Haas (1968), 33–53. Oxford: Basil Blackwell.

Janda, Richard and Esméralda Manandise. 1984. "Zero Really *Is* Nothing: Basque Evidence against 'Ø-Morphemes' (and also against 'Morphologically-Conditioned Phonological Rules')". *Proceedings of the First Eastern States Conference on Linguistics*, 222–37.

Kibrik, Aleksandr. 1997. "Principy organizacii imennoj paradigmy v dagestanskix jazykax (sopostavitel´no-tipologičeskie nabljudenija)". *Očerki po obščim i prikladnym voprosam jazykoznanija*, ed. by Kibrik, A., 80–101. Moskva: MGU.

——1992. "Ierarxii, roli, nuli, markirovannost´ i 'anomal´naja' upakovka grammatičeskoj semantiki". *Voprosy jazykoznanija* 4.27–57.

Lieber, Rochelle. 1981. *On the Organization of the Lexicon*. Bloomington, Ind.: IULC.

Mel'čuk, Igor´. 1974. "O sintaksičeskom nule". *Tipologija passivnyx konstrukcij. Diatezy i zalogi*, ed. by A. A. Xolodovič, 343–61. Leningrad: Nauka.

——1982. *Towards a Language of Linguistics*. München: Fink.

——1988. "Syntactic, or Lexical, Zero". *Dependency Syntax: Theory and Practice*, ed. by I. Mel'čuk, 303–37. Albany, N. Y.: SUNY Press [reprinted in: Mel'čuk, I., *The Russian Language in the Meaning-Text Perspective*, 1995, Moskva — Wien: Škola "Jazyki russkoj kul´tury"/Wiener Slawistischer Almanach, 169–205.]

Mel'čuk, Igor´. 1991. "Subtraction in Natural Language". "*Words are Physicians for an Ailing Mind*" [*Festschrift A. Bogusławski*], ed. by M. Grochowski and D. Weiss, 279–93. München: Sagner.

——1993–2000. *Cours de morphologie générale. Vol. 1–5.* Montréal — Paris: Presses de l'Université de Montréal/CNRS Éditions.

Milićević, Jasmina. 1999. "Pronominal and Verbal Clitics in Serbian: A Morphological Description". *Wiener Slawistischer Almanach* 43.231–56.

Nida, Eugene. 1948. "The Identification of Morphemes". *Language* 24:4.414–41.

Panevová, Jarmila. 1998. "Ellipses and Zero Elements in the Structure of the Sentence". *Tipologija. Grammatika. Semantika* (*k 65-letiju V. S. Xrakovskogo*), ed. by N. Kozinceva and A. Ogloblin, 67–76. Sankt-Peterburg: Nauka.

Plungjan, Vladimir. 1994. "K probleme morfologičeskogo nulja". *Znak*, ed. by V. Belikov, E. Muravenko and N. Pertsov, 148–55. Moskva: Russkij učebnyj centr.

Sanders, Gerald. 1988. "Zero Derivation and the Overt Analogue Criterion". *Theoretical Morphology. Approaches in Modern Linguistics*, ed. by M. Hammonds and M. Noonan, 155–75. San Diego *etc.*: Academic Press.

Spencer, Andrew. 1991. *Morphological Theory. An Introduction to Word Structure in Generative Grammar*. London: Basil Blackwell.

Chapter 20

"Constructional" and "structural" iconicity of noun vs. adjective/pronoun markers in the Slavic nominal inflection

Thomas Menzel
Oldenburg

1. Preliminaries: Constructional iconicity and its restrictions

Constructional iconicity (devoted to Peirce's diagrammaticity) is one of the most important "preference laws" introduced by Natural Morphology to describe the diachronic development of inflectional systems. As a semiotically based relation, it works on universal grounds, a matter which has been shown especially by Mayerthaler (1981). Universally, inflectional systems tend to establish relations between the level of content and of expression (between signata and signantia) of the kind that the more complex the encoded grammatical features are by content, the more complex their formal expressions will be. Since the complexity of inflectionally encoded features is indicated independently from morphology — for example, by psycholinguistic evidence of different types, such as child language, L2-acquisition, aphasia etc. — it can be used to evaluate concrete representations of marker oppositions in the sense of markedness relations.[1] According to Wurzel (1984), the classification of iconic relations between markers has to consider the following three types of formal patterns:

A. Most unmarked inflectional patterns follow "maximal" iconicity, which is based on segmental quantity. It occurs in two different manners. The first — a less complex grammatical feature does not have any marker at all (i.e., it shows zero-encoding), a more complex feature takes an added marker, consisting of at least one phonological segment (cf. Russian in 1). The second — a less complex grammatical feature is encoded by an added marker, and the more complex feature by a longer one (cf. 2). This kind of iconic relation occurs in most cases together with qualitative alterations (cf. 3).

(1) *stol*-$\varnothing_{\text{NOM.SG}}$–*stol*-*y*$_{\text{NOM.PL}}$ 'table'

(2) *dobr-yj*$_{\text{NOM.SG.MASC}}$ 'good': *dobr-ym*$_{\text{INSTR.SG.MASC}}$–*dobr-ymi*$_{\text{INSTR.PL.MASC}}$

(3) *stol*-$\varnothing_{\text{NOM.SG}}$ 'table': *stol-om*$_{\text{INSTR.SG}}$–*stol-ami*$_{\text{INSTR.PL}}$

B. "Minimal" iconic relations are contrasts of inflectional markers, which are restricted to mere qualitative oppositions; cf. Russian in (4):

(4) *knig-a*$_{\text{NOM.SG}}$–*knig-i*$_{\text{NOM.PL}}$ 'book'

As Andersen (1980) has pointed out, such relations often show a kind of iconicity on the phonological level: in our example a low vowel with high sonority expresses the less complex grammatical feature, while a high front vowel expresses the more complex feature. The complexity of content coincides with phonological markedness in the sense that the less complex grammatical category is encoded by the phonologically less featured vowel. In Slavic, most of the qualitative (minimal iconic) singular–plural marker oppositions follow this condition.

C. Apart from these kinds of iconic relations there also exist non-iconic ones (cf. Russian in (5)) and counter-iconic ones (cf. (6)). They are considered instances of imminent linguistic change or relics of the past. The existence and diachronic stability of these forms has to be regarded in terms of marked inflectional patterns.

(5) *soldat*-$\varnothing_{\text{NOM.SG.} = \text{GEN.PL}}$ 'soldier'

(6) *knig-a*$_{\text{NOM.SG}}$–*knig*-$\varnothing_{\text{GEN.PL}}$ 'book'

Markedness in the inflectional system occurs mainly as semiotic markedness with respect to the principle of constructional iconicity. According to a universal preference law of language change, marked structures turn to unmarked structures in diachrony (Bailey 1973: 37) — if they change at all and if the change does not come from outside the system. Constructional iconicity thus indicates both possible changes in inflectional systems and the direction of change.

However, in the concept of language-specific Natural Morphology by Wurzel (1984, 1998), there are certain instances of "system-congruency" capable of overruling even universal semiotic naturalness. Incidentally, they function as parameters of markedness themselves. Structural patterns can be qualified as more or less dominant on a language-specific base. When different strategies of encoding occur together in the same domain of inflectional structures, the more frequent ones (according to Wurzel 1984: 86 in terms of type-frequency) are dominant and unmarked. Language-specific dominant patterns are regarded as expanding diachronically at the expense of less dominant patterns. This prevents typological splits, which would make the mental processing of inflectional morphology more difficult.

The functional part of iconic relations cannot be discussed in detail here. The formal contrasts between inflectional markers have to be compared with oppositions of content, concerning number, case, and gender. Of course, we cannot simply compare the complexity in content of, for example, ACC.DUAL and INSTR.SG. Instead, we have to compare features of number with features of number and features of case with features of case — as far as our theory of the given grammatical category allows us to do so. But, as we will see, there are possibilities for comparing combined case-number-markers. At least a morphologically well-established formal opposition between the direct cases NOM and ACC and the other cases can be taken into account as the base for distinguishing two categories of cases in singular and plural, respectively (cf. Greenberg 1966: 38).

Our objective will primarily be to examine the iconic relations between Slavic noun and adjective/pronoun markers. This is a domain where iconicity has never been studied in detail up to now. We cannot merely see the relevance of the given preference model here, but also its language-specific restrictions. Furthermore, when examining the language-specific restrictions on constructional iconicity, it becomes clear that these are not random, but show a high degree of relatedness to the categorical structure of the inflectional system. It can be claimed that the iconic relations between nouns and their congruent adjectives or pronouns are sensitive to the grammatical categories encoded by the given forms. Moreover, this claim is valid for structural relations inside parts of speech as well. According to the complexity of the encoded grammatical categories, the number of alternative markers in a given paradigmatic position is either equivalent or even greater in nouns than in adjectives. For example, Polish masculine and neuter nouns take different endings in the DAT.SG, but the adjective/pronoun marker is identical for all masculines and neuters. Cf. (7a) (MASC) and (7b) (NTR):

(7) a. *t-emu dobr-emu lekarz-owi* 'to this good doctor'
  b. *t-emu duż-emu drzew-u* 'to this big tree'

As will be shown in the following, the distribution of identity or greater diversification of noun and adjective/pronoun marker oppositions is organized in certain levels of iconic structuring. These relations will be labeled "structural iconicity".

For technical reasons we will limit ourselves to a survey of one West Slavic (Polish) and one East Slavic language (Russian). Only productive inflectional classes will be considered. As Dressler (1998: 114–15) points out, unproductive or archaic structures are insignificant for the cognitively-based conditions of inflectional systems. In our case, this restriction is additionally motivated due to the fact that the productive inflectional (macro-)classes of the nouns (C-masculines, *a*-declension and *o*/*e*-declension[2]) show direct formal parallels in the adjective inflection (cf. 12a–c).

2. The diachrony of constructional iconicity in adjectival/pronominal inflection

We must admit that it is difficult to explain iconic relations even within the inflectional system of the nouns. So what chance do we have to establish them between different parts of speech? We do not intend to resolve this task for random parts of speech, but only for the nominal ones (in the sense of classical grammar). Nouns, adjectives and pronouns are closely related by similar sets of inflectionally encoded categories. But in their syntactic behaviour adjectives and congruent pronouns are to be regarded as the more restricted categories in relation to nouns. The former normally do not occur in independent use while the latter do.[3] It can be argued that with regard to the categorical contents, the former are more complex than the latter. This relation will be traced here on the level of expression.

In most of the Slavic languages, adjectives and pronouns have adjusted their sets of markers. In Common Slavic there was a "simple" and a "compound" inflection of adjectives, that are said to differ in use according to the feature of definiteness. The simple adjective inflection was identical with the noun inflection, so it will not be our concern in the following. The compound adjective inflection consisted of a combination of noun markers and the corresponding forms of an anaphoric pronoun **jь*:

(8) 'good'	MASC	NTR	FEM
NOM.SG	**dobr-ъ-jь*	**dobr-o-je*	**dobr-a-ja*
GEN.SG	**dobr-a-jego*	**dobr-a-jego*	**dobr-y-ję*
DAT.SG	**dobr-u-jemu*	**dobr-u-jemu*	**dobr-ě-ji*

In this way all compound forms of adjectives contrasted in an iconic manner with the noun inflection. Later on the compound forms of adjectives fused in language-specific ways. For example, in East Slavic the pronoun markers (of the non-palatal type) replaced the compound adjective markers. In Polish there was contraction in most cases (cf. Stieber 1971: 79 ff). Adjective markers adjusted to the markers of the regularly inflected pronouns; as a result, the non-substantive declensions developed a unified pattern. Furthermore, "simple" adjectives commonly got lost in North Slavic in attributive positions. The fact that the long adjective markers got preserved and not the short economical ones, has to be explained by the preference for establishing iconic marker oppositions within the attributive NP: adjectives and pronouns tend to take longer markers than nouns (cf. Jakobson 1962/1971: 169).

Above all, what has been lost in the diachronic development of the Slavic adjective inflection, is the iconic relation between SG and PL markers. In fact, no maximal iconic relation has ever existed in this inflectional subsystem. Old Church Slavonic anaphoric pronouns took as many segments in PL markers as in SG markers; cf. (9):

(9) NOM.MASC **jь*$_{\text{SG}}$: *ji*$_{\text{PL}}$, GEN.MASC *jego*$_{\text{SG}}$: *jixъ*$_{\text{PL}}$, DAT.MASC *jemu*$_{\text{SG}}$: *jimъ*$_{\text{PL}}$ 'this'

In the plural paradigm, compound adjective markers were constructed as true compounds in the NOM and ACC only, with the other plural cases consisting of the anaphoric pronoun added to a connecting vowel *-y-*. The reason is obvious: otherwise extraordinarily long markers would result, which comprise four syllables; cf. (10):

(10) INSTR.PL.FEM **dobr-ami-jimi* > *dobr-y-jimi* > *dobr-ymi* 'good'

Thus, iconic relations were established only within the single number paradigms, mainly between the nominative and the other case forms.

In the functionally more complex category of adjectives/pronouns, iconic relations are significantly more restricted, compared with the functionally less complex category of nouns. In the latter, maximally iconic relations can occur both between nominatives and other cases and between singular and plural cases. In the former, most of the singular–plural oppositions show minimally iconic encoding (for instance, Russian NOM.SG.FEM *dobr-aja* vs. NOM.PL *dobr-ye*), and there are some subtractive (and hence anti-iconic) relations, too (cf. Russian GEN.SG.MASC/NTR *dobr-ogo* vs. GEN.PL *dobr-yx*). In diachrony, the number of maximally iconic number oppositions clearly increased in the noun subsystem, but it increased only insignificantly in the adjective subsystem. Adjectives already take long markers in the singular paradigms, so an iconic encoding of the number opposition would have resulted in plural markers consisting of several syllables. This pattern of "overmarking" is prevented by the preference for inflectional economy.

Whereas constructional iconicity in nouns serves as a device for relating number and case hierarchies, in adjectives this functional feature is weakened. However a very obvious formal characteristic of adjective inflections is to be seen in the assignment of iconic relations towards the corresponding noun inflections. In those Slavic languages that preserve case inflection, no noun inflection is longer than the congruent adjective inflection (cf. the quite long marker of the Polish DAT.SG -*owi*$_{\text{SUBST}}$, which contrasts with the similar long marker -*emu*$_{\text{ADJ./PRON}}$ in (7a)). We cannot go into the details of the explanation of single markers. But the overall tendency is clear. It shows a relatively constant preservation of maximal iconic encoding between adjectives and nouns.

3. Iconic distribution of structural patterns in the nominal inflection

Up to now, when discussing iconic patterns, we have been concentrating on formal devices only. Constructional iconicity in this sense is understood as iconicity in constructing complementary word forms. It is based on segmental devices of an exclusively phonological character (Wurzel 1984: 67). But, as has been suggested above, there can be other types of iconic relations. We have to search for them in the structural devices of the inflectional system which comprise not only the phonological expression, but also the distribution of markers in a given paradigmatic position. As we have seen, the contrast of noun and adjective inflections is a dominant iconic structure in the Slavic inflectional systems. So we should take this contrast as a starting point for further investigations. In some paradigmatic positions, there are marker oppositions among the nouns, that do not have parallels among the adjectives/pronouns. In other paradigmatic positions instead, inflectional classes of nouns and adjectives/pronouns show parallel structures. These contrasting patterns do not apply accidentally. They can be motivated by iconic relations: complex case–gender features imply complex inflectional structures, that is, divergence between inflectional structures of nouns and adjectives/pronouns. Simple case–gender features imply parallelism in the inflectional system of these parts of speech. This content-structure relation will be termed "structural iconicity".

Let us see what structural iconicity in the Slavic languages looks like. The best examples can be found in Polish. In this language, there are few identical (non-iconic) markers of congruent attributes in relation to the nouns they modify; cf. (11):

(11) *dobr-a książk-a*$_{\text{NOM.SG}}$, *dobr-ą książk-ą*$_{\text{INSTR.SG}}$ 'good book'

These markers are violations of the overall iconic tendency to encode adjectives/pronouns with longer markers than those of the nouns. But this structural pattern has been permissible in Polish only in the NOM, ACC, INSTR.SG, NOM and ACC.PL (and in these cases only in certain paradigms). In all other cases, identical markers of the adjectives and nouns have been lost (cf. Menzel 2000: 237 ff). The identity of markers is the highest degree of structural equivalence. It applies only to the least-featured cases (NOM and ACC of both numbers) and to the INSTR.SG. In the following this will be interpreted as the basis of structural iconic relations.

In modern Slavic languages, syntactic gender distinctions and morphological inflectional class distinctions refer generally to the same formal or semantic criteria. So it is plausible that formal oppositions in adjective gender encodings should converge with formal oppositions of noun inflectional classes — and that formal homonymies in adjective gender encoding should converge with formal homonymies of noun inflectional classes. The tripartite gender opposition of the Russian adjectives *bol'š -oj*$_{\text{MASC}}$, *bol'š -aja*$_{\text{FEM}}$, *bol'š -oe*$_{\text{NTR}}$ 'big' has a parallel in the noun inflectional classes, cf. NOM.SG in (12):

(12) a. *bol'š-oj stol-∅* 'big table'
b. *bol'š-aja ženščin-a* 'big woman'
c. *bol'š-oe pol-e* 'big field'

On the other hand, also the homonymies of adjective MASC and NTR gender markers have a parallel in Russian nouns: cf. (13):

(13) a. GEN.SG *bol'š-ogo stol-a*$_{\text{MASC}}$/*polj-a*$_{\text{NTR}}$ 'big table/field'
b. DAT.SG *bol'š-omu stol-u*$_{\text{MASC}}$/*polj-u*$_{\text{NTR}}$ 'big table/field'

Turning back to Polish, non-iconic relations of the type *dobr-a książk-a* 'good book' are only tolerated in positions with strict parallels of noun and adjective inflectional structures. In Russian, where no contraction of adjective markers on identical vowels took place, the same paradigmatic positions optionally show "reduplicative" markers (cf. Voeykova 1997: 144). Paradigmatic positions with parallelism between adjective gender oppositions and noun inflectional class oppositions constitute the first level of structural iconicity. Level I applies in Russian for all singular cases (except INSTR.SG). In Polish it applies only for NOM, ACC, and — possibly — INSTR.SG.

Identical structures of genders and inflectional classes are not at all common in Polish. Structural parallelism of adjective and noun inflection is evident, nevertheless there are some important divergences which may not be neglected. In the West Slavic and Ukrainian noun inflections, gender/animacy oppositions occur which have no correspondences in adjective/pronoun inflection (Kucała 1978: 181). Consider the following marker oppositions in Polish:

(14)	C-MASC.ANIM	C-MASC.INANIM	*o/e*-NTR
NOM.SG	*dobr-y lekarz-Ø*	*duż-y dom-Ø*	*duż-e drzew-o*
GEN.SG	*dobr-ego lekarz-a*	*duż-ego dom-u*	*duż-ego drzew-a*
DAT.SG	*dobr-emu lekarz-owi*	*duż-emu dom-owi*	*duż-emu drzew-u*
NOM.PL	*dobrz-y lekarz-e*	*duż-e dom-y*	*duż-e drzew-a*
GEN.PL	*dobr-ych lekarz-y*	*duż-ych dom-ów*	*duż-ych drzew-Ø*
	'good doctor'	'big house'	'big tree'

In the non-feminine GEN.SG and DAT.SG there are no marker oppositions in the adjectives/pronouns, opposed to a binary marker opposition in the nouns. In the NOM.PL there is a binary opposition in the adjectives/pronouns opposed to a tertiary one in the nouns. In the GEN.PL three noun markers contrast with a uniform adjective marker. (Note that the ACC.PL is identical with either NOM or GEN.PL.) The system of noun inflectional classes in all these positions is formally more elaborated than that of attributive gender oppositions. This is the second level of structural iconicity. In Russian, it applies only to the NOM, GEN (and ACC) PL; cf. (15):

(15)	C-MASC	*a*-FEM	*o/e*-NTR
NOM.SG	*bol'š-oj stol-Ø*	*bol'š-aja ženščin-a*	*bol'š-oe pol-e*
NOM.PL	*bol'š-ie stol-y*	*bol'š-ie ženščin-y*	*bol'š-ie polj-a*
GEN.PL	*bol'š-ich stol-ov*	*bol'š-ich ženščin-Ø*	*bol'š-ich pol-ej*
	'big table'	'big woman'	'big field'

In Polish, the picture is more diversified. In this language, there are further formal features which fit into the pattern, too. Some relatively elaborate inflectional structures of Polish nouns are related to the fact that marker distributions in several cases depend on the phonological shape of the stem-final consonants. This applies only to nouns, never to adjectives. Consider the following overview from contemporary Polish:

<table>
<tr><td>(16)</td><td>Nouns</td><td>Non-palatal subclass</td><td>Palatal subclass</td></tr>
<tr><td></td><td>DAT.SG *a*-decl.</td><td>-′e</td><td>-i (-y)</td></tr>
<tr><td></td><td>LOC.SG *a*-decl.</td><td>-′e</td><td>-i (-y)</td></tr>
<tr><td></td><td>LOC.SG C-MASC, *o*/*e*-NTR[4]</td><td>-′e/-u</td><td>-u</td></tr>
<tr><td></td><td>NOM.PL</td><td>-′i (-y)</td><td>-e</td></tr>
<tr><td></td><td></td><td colspan="2">-ov′e, -y (-i), -a</td></tr>
</table>

The distribution of distinct noun markers according to palatal/non-palatal stem-final consonants is a structural pattern which developed in Late Common Slavic. It has been lost in most contemporary Slavic languages. But, as we see, it works in Polish, and it works exactly in such positions of the singular paradigms where the distributional pattern of gender/animacy oppositions does not apply. With the exception of a single instance (the GEN.SG of the *a*-declension) all productive noun inflectional classes show more elaborate structures than their adjective/pronoun equivalents in GEN, DAT, LOC.SG, NOM.PL and ACC.PL. These are the paradigmatic positions where the second level of structural iconicity applies in Polish.

The iconic foundation of this unusual structural classification seems to be clear. Level I structural iconicity is valid in Polish only for NOM and ACC.SG, i.e., for the least complex case features in the least complex number. INSTR.SG fits here too, a fact which we will have to interpret later on. Level II is obviously valid for more complex case features in the least complex number SG — and also for the least complex cases NOM and ACC in the more complex number PL. On the basis of a combined scale of content complexity for the categories number and case, structural iconicity exactly reflects the hierarchy of items on this scale. Minimal complex case-number-items are structurally less complex, combinations of a more complex and a less complex item show significantly more complex structural patterns. What about combinations of a complex number and a complex case?

These positions can be taken as instances of the third level of structural iconic encoding. The most complex inflectional contents show a tendency to avoid “overmarking” of iconic relations. In most East and West Slavic languages oppositions of noun inflectional classes have been lost in the DAT.PL, INSTR.PL and LOC.PL. Instead, these languages show strict formal parallelism and phonological similarity of adjective and noun markers. For example, in Russian, the consonantal phonemes of these markers are identical, differences consist only in a minimal iconic vowel opposition. The more complex phonological feature of high vowels concerns the adjectives and the less complex phonological feature of low vowels concerns the nouns:

(17) *bol'š-im stol-am*$_{\text{DAT.PL}}$, *bol'š-imi stol-ami*$_{\text{INSTR.PL}}$, (*o*) *bol'š-ix stol-ax*$_{\text{PREP.PL}}$
'big table'

Similarity, but not formal identity of noun and adjective markers is characteristic of the third level of structural iconicity.

We can even argue, that the INSTR.SG also represents level III structural iconicity in Polish and Russian: for in this position, too, similar markers exist, differentiated only by vowel oppositions — however, only in non-feminine genders (cf. Russian *pod bol'š-im stol-om* 'under the big table'). The instrumental case is one of the most complex in the Slavic case system (cf. Hentschel 1999: 259). So it is no surprise that its markers are treated in the same way as non-nominative/non-accusative plural markers. Further evidence for this suggestion comes from the Common Slavic formation of compound adjective word forms. As mentioned above, the economical way of constructing these forms is not by double inflection (of a noun marker and an anaphoric pronoun) but by a connecting vowel *-y-* and an anaphoric pronoun. This applies for all plural cases except NOM and ACC — and also for the INSTR.SG (cf. *sъ dobr-y-imъ člověk-omъ* 'with the good man'). So the shortened pattern of compound adjectives covers all positions of level III structural iconicity — and the INSTR.SG as well.

4. Conclusion: iconic patterns and their restrictions in Slavic inflectional morphology

The proposed tendency to establish "phonologically similar" markers in the most complex categorical contents (as level III structural iconicity) causes considerable restrictions on constructional iconicity. Since markers of nouns and adjectives tend to take identical consonantal structures and differ only by the implemented vowel, there is no possibility of establishing maximal iconic relations between them within the NP. The extent of iconic relations in inflectional morphology is limited by arbitrary (symbolic) encoding. But the border between iconic and symbolic patterns is not as impassable as one might suppose. Where no constructional iconicity applies, symbolic encodings can be matched by iconic patterns of inflectional structures. Even restrictions on constructional iconicity can be explained as indicators of another semiotic strategy of encoding morphological oppositions, which has been presented here in the terms of "structural iconicity".The formal features of structural iconicity may vary among the languages, as well as the functional extensions of each level. Cf. (18):

(18)		Level I	Level II	Level III
	Russian	all SG cases	NOM.GEN.ACC.PL	DAT.INSTR.PREP.PL
	Polish	NOM.ACC.SG	GEN.DAT.LOC/VOC.SG, NOM.GEN.ACC.PL	DAT.INSTR.LOC.PL; INSTR.SG?

The distribution of the different levels of constructional iconicity in the paradigms presented above is by no means random. It reflects the levels of complexity of combined case-number contents.

Notes

1. Note that we recognize as a "marked" structure not the complexity of a feature "plural" in relation to a feature "singular" or of a marker containing two phonological segments in relation to another one containing only one segment. This is an instance of (semantic or phonological) "featuredness", which Prague linguists described not by the German term "markiert" but by "merkmalhaft".

2. The terminology of the Slavic inflectional classes in general corresponds to the solution found in well known studies such as Corbett (1991). A detailed explanation can be found in Menzel (2000).

3. Pronouns nevertheless are not involved in the current discussion on the basis of their syntactic functions, but on the basis of inflectional regularity. Our examples do not cover the highly idiosyncratic forms of first and second persons personal pronouns.

4. The VOC.SG of masculine nouns in Polish fits the pattern by acquiring the same markers {-'e} and {-u} as the LOC.SG, with only slight differences in their distribution. Neuter nouns, instead, do not distinguish between NOM/ACC.SG and VOC.SG at all. Note that in Russian, the "prepositional case" corresponds to the "locative" in other Slavic languages.

References

Andersen, Henning 1980. "Morphological change: towards a typology". *Historical Morphology* ed. by Jacek Fisiak, 1–50. The Hague etc.: Mouton

Bailey, Charles James N. 1973. *Variation and linguistic theory*. Arlington: Center for Applied Linguistics

Corbett, Greville C. 1991. *Gender*. Cambridge: University press

Dressler, Wolfgang U. 1998. "Produktivität als Zentralbegriff der grammatischen (bes. flexionsmorphologischen) Systemadäquatheit". *Zbornik referatov II. mednarodnega simpozija o teoriji naravnosti 23. do 25. maj 1996* ed. by Karmen Teržan-Kopecky, 113–24. Maribor: Pedagoška fakulteta

Greenberg, Joseph H. 1966. *Language universals. With special reference to feature hierarchies.* The Hague/Paris: Mouton

Hentschel, Gerd 1999. "Die grammatischen Kategorien des Substantivs unter funktionalem Aspekt". *Handbuch der sprachwissenschaftlichen Russistik und ihrer Grenzdisziplinen* ed. by Helmut Jachnow, 243–72. Wiesbaden: Harassowitz

Jakobson, Roman 1962/1971. "Morfologičeskie nabljudenija nad slavjanskim skloneniem". In: *Selected Writings* II, 154–83. The Hague/Paris: Mouton

Kucała, Marian 1978. *Rodzaj gramatyczny w historii polszczyzny*. Wrocław etc.: Ossolineum

Mayerthaler, Willi 1981. *Morphologische Natürlichkeit.* Wiesbaden: Athenaion

Menzel, Thomas, 2000. *Flexionsmorphologischer Wandel im Polnischen. Eine natürlichkeitstheoretische Untersuchung auf allgemeinslavischem Hintergrund.* (= *Studia Slavica Oldenburgensia*, 5.) Oldenburg: BIS-Verlag

Stieber, Zdzisław 1971. *Zarys gramatyki porównawczej języków słowiańskich. Część II, 1: Fleksja imienna.* Warszawa: PWN

Voeykova, Maria D. 1997. "Acquisition of adjective inflections (secondary paradigms in Child Russian)". *Papers and Studies in Contrastive Linguistics* 33: 141–51. Poznań: School of English UAM

Wurzel, Wolfgang Ullrich 1984. *Flexionsmorphologie und Natürlichkeit. Ein Beitrag zur morphologischen Theoriebildung.* Berlin: Akademie

——1998. "On markedness". *Theoretical Linguistics* 24: 53–71

Chapter 21

Morphological splits — Iconicity and Optimality

Tore Nesset and Hans-Olav Enger
University of Tromsø and University of Oslo

1. Introduction

In this chapter we explore the following question: What are the principles that govern the distribution of markers in morphological splits? By "morphological splits", we understand diachronic changes where a category that has been marked by one marker only, is divided in two, in that a new marker emerges and occupies part of the domain. Our main proposals can be summarized as follows:

- Morphological splits are of two types; in addition to so-called "doughnut" categories, which have received some attention previously, we identify a type of "inverse doughnuts".
- A unified explanation for the distribution of markers in both types is possible in terms of iconicity.
- Morphological splits can be modelled as constraint reranking in the sense of Optimality Theory (OT, Prince and Smolensky 1993).
- OT allows us to formalize insights from Natural Morphology (NM, Dressler *et al.* 1987), and thus provides a valuable tool in the study of historical morphology.

Given the space limitations on contributions to this volume, our article is by necessity summary and programmatic. However, after presenting the two types of split (Sections 2–3) and our proposal for a unified explanation (Section 4), we explore a number of examples from Germanic and Slavonic in Section 5. In Section 6, we discuss the delimitation of the scope of the hypothesis. A formalization within OT is provided in Section 7, before we conclude the chapter in Section 8.

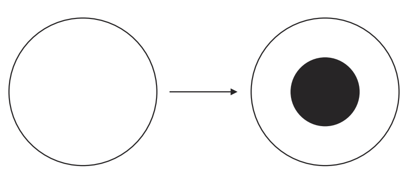
2. "Doughnut" categories

For one type of morphological splits, the metaphor "doughnut" category has been suggested (Croft *et al.* 1987). In splits of this kind, the new marker appears in the central domain of the category, thus eating a hole in its middle, as it were. The core is renewed, the periphery maintains the old marker as illustrated in Figure 1.

At this point, a note on the term "category" may be in order. As noted by Matthews (1972: 161–2), this term is used in many ways in morphology. For our purposes, we may define it as a coherent semantic field that — prior to the morphological split — is expressed by one morphological marker.

Using the metaphor "doughnut" for a category, Croft *et al.* (1987) assume, much in the spirit of Lakoff (1987), that linguistic categories tend to have a periphery and a core. The core (or prototype) is usually understood as a central subcategory that shows the highest degree of representativity of the category as a whole. More elaborate definitions may be found in the literature (e.g. Langacker 1987: 371). However, while we share the belief that at least many linguistic categories may be structured in this way, the analysis we propose does not hinge on categories having internal structure. The reason is that our analysis is couched in terms of iconicity and informativeness, as will become clear below.

Examples of doughnuts in the literature include the reflexive-middle-passive domain in Scandinavian and Slavonic languages. For instance, when the old middle marker *-s* in Scandinavian is replaced by the more recent *seg*, this development begins with the "prototypical reflexive", which is commonly understood as the core of the category (Croft *et al.* 1987; Kemmer 1993). Essentially the same happens when the territory of Russian *-sja* is invaded by *sebja*. Doughnuts have been discussed by other scholars, for instance Haspelmath (to appear) and Dahl (2000), who say they are quite



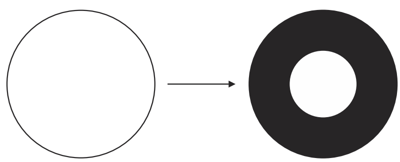
○ Old marker ● New marker

Figure 1.

frequent and arise naturally in grammaticalization processes. In fact, Pederson (1991: 348) has pointed to a parallel in "Kuryłowicz' fourth law", a well-established observation in diachrony. For example, when the domain of the old English plural form *brethren* is invaded by the new form *brothers*, the new form occupies the centre of the category; the old form is relegated to the periphery.

3. "Inverse doughnuts"

Whereas doughnut categories are well attested and have been discussed in the literature, we suggest that not all morphological splits are of this kind. In many cases, the new marker occupies the peripheral, not the central, domain of the category. For such cases, we coin the term "*inverse doughnuts*". Morphological splits of this kind are illustrated in Figure 2.



○ Old marker ● New marker

Figure 2.

An example of an inverse doughnut is this: in the Nynorsk variety of Norwegian, the possessive clitic *-s* is by and large restricted to words for human beings.[1] Elsewhere, possession can be expressed by means of a preposition. Compare *Jons hund* 'John's dog' vs. *halsbåndet til hunden* 'the collar of the dog'.[2] Diachronically, the clitic *-s* is the older expression. Furthermore, the conceptual core of the category of possession is presumably cases of humans owning something. (A dog does not "own" its collar in the same way as a man owns his dog.) So the newer marker is used in the more peripheral parts of the category. In Section 5, we shall see that inverse doughnuts are in fact amply attested. At this stage, we merely note that they have not been given as much attention as the ordinary doughnuts; the name "inverse doughnut" is our invention.

4. The Iconicity Hypothesis

What decides whether a change results in a doughnut or an inverse doughnut? We suggest that iconicity plays an important part for the distribution of the new and the old marker. We shall call this hypothesis the Iconicity Hypothesis.

Iconicity Hypothesis
When there are two different, but comparable grammatical markers of different length, the longer marker is given to the most informative meaning.[3]

This hypothesis predicts iconic marking in the sense of Dressler *et al.* (1987), in that what is more in form is predicted to be more in meaning. This hypothesis yields predictions for a wide range of phenomena, notably both kinds of doughnuts. We first turn to the ordinary doughnuts, exemplified by the reflexives (Section 2). Given that the new markers are longer than the old ones (Russian *sebja* is longer than *-sja* and Norwegian *seg* longer than *-s*), the Iconicity Hypothesis predicts that the prototypical reflexive carries more content. This is indeed the case: prototypical reflexives denote actions that are directed towards other entities, so they represent the unexpected case. Therefore, they are more informative than middle situations, which involve actions normally directed towards the self (cf. Kemmer 1993).

Also the example of inverse doughnuts in Section 3 complies with the Iconicity Hypothesis. In the examples *Jons hund* versus *halsbåndet til hunden*, the free form *til* is longer than the clitic *-s*, so the hypothesis predicts that *til* is more informative.[4] This prediction is borne out, insofar as *til* is used for the "unexpected" case of possession — dogs do not own things in the same way as humans do.

In our view, the most attractive aspect of the Iconicity Hypothesis is that it applies to morphological splits of both the doughnut and the inverse doughnut type, as this section has shown. Earlier proposals in terms of prototypes (Croft *et al.* 1987; Kemmer 1993) might provide an account of doughnut splits, but do not carry over to inverse doughnuts.

5. Testing the hypothesis

Section 4 has shown how the Iconicity Hypothesis handles one example of each type of doughnut. The purpose of this section is to test the hypothesis against a number of further examples. They include a disproportionate number of inverse doughnuts, since this phenomenon has been given so little attention previously.

We first consider one ordinary doughnut; the example is taken from Haspelmath (to appear). In German, the present tense is multifunctional; it can express all the three functions habitual, progressive, and future. German *ich spiele* can mean 'I play/I'm playing/I'll play'. Haspelmath takes the progressive to be central among these three, and observes that if a language with this multifunctionality pattern

> develops a new progressive form which ousts the old form in its progressive function, the old form may end up with just the two functions "habitual" and "future". [. . .] This appears to have happened in Turkish, where the old present tense (e.g. *okut-ur* 'teaches/will teach') is now restricted to habitual and future, whereas the progressive is obligatorily expressed by the new progressive form (*okut-uyo-r* 'is teaching'). As a result, the Turkish old present tense no longer expresses a coherent area on the semantic map, but rather a region in the form of a doughnut, with a hole in the middle [. . .]. (Haspelmath to appear)

We would add that the new progressive in Turkish is longer than the old present tense. The Iconicity Hypothesis would accordingly predict that the progressive is more informative than the present tense. This prediction is indeed correct; the progressive is more specific than the present tense.

We now turn to the inverse doughnuts. Consider first pluralization of neuter nouns in some varieties of Norwegian. Two suffixes, Ø (zero) and *-er*, compete in the indefinite plural of these nouns. The criteria for choosing between Ø and *-er* include the following (cf. Faarlund *et al.* 1997: 167–72):

1. The number of syllables of the noun in the indefinite singular. Monosyllables are more likely to take Ø, polysyllables are more likely to take *-er*. Compare e.g. *barn–barn* 'child–children' versus *universitet–universiteter* 'university–universities'.
2. Whether the word has an unstressed *-e* in the indefinite singular. If it has, it is more likely to take *-er*; if it has not, it is more likely to take Ø. Compare *eple–epler* 'apple–apples' versus *besøk–besøk* 'visit-visits'.
3. Whether the meaning of the noun is abstract or concrete. This can be illustrated by the two different plurals of the neuter *poeng* 'point'. Compare *Talen inneholdt mange gode poenger* (*poeng* is also acceptable, but less usual) 'the speech contained many good points' versus *Hvor mange poeng* (**poenger*) *fikk du på prøven?* 'how many points did you get at the test?' We suggest that the meaning of *poeng* is more abstract in the first example. In this sentence the focus is on quality rather than quantity, since it is

> only here that a point can be good. One does not normally quantify the exact number of points in a speech. The second sentence, by contrast, foregrounds quantification in the sense that it is about exact calculations of points. Only in this sentence is it possible to speak of half a point. The fact that the second sentence involves a more clear-cut example of quantification shows that the use of *poeng* here is more concrete.

Since the distribution of Ø vs. -*er* is not clear-cut, but rather depends on the tendencies outlined above, it is not immediately obvious whether the category in question should be classified as either a doughnut or an inverse doughnut. However, whereas -*er* is attested in all genders, Ø is practically unique to neuters. It is thus associated with prototypical neuters in a way that -*er* is not. In fact, -*er* is rather associated with feminines. For neuters, -*er* is by and large restricted to nouns ending in -*e* in the indefinite singular. This -*e* is in practice often indicative of feminines, as shown by evidence from language change (Beito 1954) and child language (Fretheim 1985). These observations suggest that Ø map onto the centre of the category, while -*er* is relegated to the periphery. Since Ø is the older marker (-*er* was not found in Old Norse), the pluralized neuters seem to constitute an inverse doughnut where the newer marker occupies the periphery of the category.

We submit that the pluralization of Norwegian neuters complies with the Iconicity Hypothesis, which implies that the longer allomorph, i.e. -*er*, is the more informative. As pointed out in (3) above, abstract nouns favour -*er*. Furthermore, according to (1), -*er* is also preferred in polysyllabic nouns, which are often abstract. Many abstracts are non-countable, and they are generally less prone to pluralization. In this way, pluralization with -*er* represents the unexpected case and can be considered more informative. In other words, what is more in form, is also more in meaning.

Another test case for the Iconicity Hypothesis involves the use of definiteness in varieties of Norwegian (and some other varieties of Scandinavian). The normal translation of English *my boss* would be *sjefen min* 'boss-DEF my', where definiteness is marked by the suffix -*en*. By contrast, the normal translation of English *my father* in these varieties is *far min* 'father my', without any definiteness suffix. We shall say that *far min* exhibits "non-overt definiteness", as there are many arguments for saying that this phrase is definite, syntactically and semantically. Conversely, we shall say that *sjefen min* exhibits "overt definiteness" because of the morphological marking. The difference between *sjefen* min and *far min* is an interesting "alienability split"

(Dahl and Tamm 1998; Dahl to appear), and can be described as follows. *Far min* is a case of inalienable possession, and non-overt definiteness is preferred. This is not surprising; there are many languages in which definite articles do not occur when a possessive expression is present (cf. Haspelmath 1999). *Sjefen min*, on the other hand, is an example of alienable possession, and the definite article does occur, despite the presence of a possessive expression. Diachronically, the construction with possessor and non-overt definiteness is older than the construction with possessor and overt definiteness. In other words, the older construction is used for inalienable possession. Inalienable possession might be described as the core of the category, as kinship terms denote more fundamental relations than e.g. that between a boss and his subordinates.

The pattern *far min/sjefen min* fits in with a cross-linguistic regularity observed by Haspelmath (1999): the tendency to omit the definite article in possessed NPs is greater when the possessed noun is a kinship term. This is because the (inalienable) possessive relation is inherent in kinship nouns. Given that possessed NPs are more likely than other NPs to be definite (syntactically and pragmatically), Haspelmath argues that definiteness marking is more redundant in combination with possessed kinship terms. While Haspelmath's account is based on the notion of avoiding redundancy, that is, economic motivation, our analysis relies on iconicity. However, these two ideas are broadly compatible. We would argue that the definiteness suffix -*en* is richer in semantic content in combination with other nouns than with kinship terms.

Thus, the longer expression (with overt definiteness) is used for the more informative meaning. In this way, the case of non-overt versus overt definiteness in (in)alienable possession provides additional evidence for the Iconicity Hypothesis.

6. The lexicon as the limit of the Iconicity Hypothesis

The examples of doughnut and inverse doughnut categories surveyed so far are morphological (for example, the pluralization of Norwegian neuters) and syntactic (double vs. single determination in possessive phrases). However, there are also lexical examples. In English, there are a number of loan-words from French for food made of the animal. The animal itself is referred to by its Anglo-Saxon name. Thus, the meat from the ox is referred to as *beef*; the meat of the swine is called *pork*. Similar splits are attested for Russian, which has received numerous abstract or religious loan-words from Church Slavonic. In a number of cases, the original Russian form is retained for a rather concrete meaning, while the Church Slavonic cognate is allotted to a more abstract meaning. For example, originally Russian *golova* is used for the concrete meaning of 'head', the Church Slavonic *glava* for the less concrete 'head/boss'. We would analyse both these cases as inverse doughnuts, in which the newer words are used for a peripheral meaning.

How do these examples relate to the Iconicity Hypothesis? We suggest that they do not relate at all. In the case of lexical items like *ox–beef* or *golova–glava*, there are no grammatical markers at stake which may be shorter or longer, more or less informative. Thus, examples of this kind are simply beyond the scope of the Iconicity Hypothesis. Importantly, this does not mean that they are at variance with the hypothesis. As formulated in Section 4 above, the Iconicity Hypothesis applies to cases where grammatical markers of different length compete. As the lexical examples surveyed here do not meet this condition, they cannot be explained by the hypothesis, but they do not contradict it, either.

We suggest, then, that the Iconicity Hypothesis is not applicable to lexical examples. In Peircean terms, the Iconicity Hypothesis deals with diagrammatic iconicity; insofar as a formal relationship between long and short markers corresponds to a relationship between more and less informative meaning, we are dealing with combinations of signs. Given that the lexicon mainly contains single signs, one would not expect diagrammatic iconicity in the lexicon. It follows that lexical examples are inapplicable to the Iconicity Hypothesis.

We now turn to an intriguing example of an inverse doughnut, the gender system of most varieties of Danish and Swedish. We shall use standard Swedish as an example. There has been a change from a gender system in which there are two pronouns that can refer to non-neuter nouns — *han*, *hon* (roughly 'he, she') — to one in which there are three pronouns that can refer to non-neuter nouns — *han*, *hon*, *den* (roughly 'he, she, it'). In the more recent system, the choice between *han*, *hon* on the one hand and *den* on the other is primarily decided by whether the referent of the noun phrase is human or not:

(1) a. *Pojken är sjuk — han är sjuk* 'the boy is ill — he is ill'
    b. *Flickan är sjuk — hon är sjuk* 'the girl is ill — she is ill'
    c. *Hunden är sjuk — den är sjuk* 'the dog is ill — it is ill'

The semantic core of gender systems is constituted by words for human beings (cf. Corbett 1991). It follows that *den*, the new form in this subsystem, is applied for words that constitute the periphery of the category, so we are dealing with an inverse doughnut. This case is parallel to the *ox–beef* and *golova–glava* examples; and there is no sense in which *den* is longer than *han*. So while the gender example is not in conflict with the Iconicity Hypothesis, it cannot be explained in terms of the hypothesis, either. The inapplicability of the hypothesis may be due to the fact that we are dealing with competition between lexical items. This supports our tentative suggestion that the lexicon is outside the scope of the Iconicity Hypothesis.

7. An OT account

In this section we will propose a formal account of morphological splits in terms of OT (Prince and Smolensky 1993). In order to represent the insights of the analysis formulated above, we need two constraints:

*Allo(morphy): Allomorphy is prohibited.
Iconicity: More content corresponds to more form.

The evaluation refers to pairs of markers as in the case of the Norwegian reflexive-middle-passive domain:

(2) a. *s* (mid/pas)– *s* (refl) (uniform marking)
    b. *s* (mid/pas) – *seg* (refl) (iconic marking)
    c. *seg* (mid/pas) – *s* (refl) (countericonic marking).

The constraints may be ranked in two different orders. When *Allo(morphy) is topranked, candidate (a) is optimal. When Iconicity is topranked, on the other hand, candidate (b) is optimal. Thus, morphological splits can be modelled as the reranking of *Allo(morphy) >> Iconicity to Iconicity >> *Allo(morphy). This is illustrated by the tableaux in Table 1.

Table 1.

	*Allo	Icon
☞ a. s - s		*
b. s - seg	*!	
c. seg - s	*!	*

⇒

	Icon	*Allo
a. s - s	*!	
☞ b. s - seg		*
c. seg - s	*!	*

Notice that these constraints are based on insights from NM (Dressler *et al.*

1987), in that they reward “natural” allomorphy patterns. As can be seen from Table 1, the countericonic marking pattern of candidate (c) does not emerge as optimal under any ranking, since this candidate violates both constraints. Therefore the analysis predicts that uniform or iconic marking are possible, whereas countericonicity is not expected.

8. Conclusions

In this chapter, we have examined two different sorts of morphological splits, doughnuts and inverse doughnuts. Whereas doughnut categories have been discussed in the literature, the category type for which we have coined the term “inverse doughnut” has not been studied equally well. We have argued that both splits can be given a unified explanation by means of one hypothesis, the Iconicity Hypothesis. This hypothesis draws on insights from NM. Whereas former explanations may account for doughnuts, they do not account for inverse doughnuts. By contrast, the iconicity hypothesis accounts for both kinds of splits, drawing on the concept of informativeness rather than the distinction between core and periphery of linguistic categories.

We have shown that morphological splits can be modelled as constraint reranking in the sense of OT. Our analysis illustrates the value of the OT formalism in accounting for competition between different naturalness factors described in NM. One may perhaps say that OT makes explicit what is implicit in NM. Conversely, our analysis suggests that the NM insights on naturalness constitute an important contribution to an OT account of morphology (see also Elgersma and Houseman 1999). This point is theoretically important, for the role of OT in morphology has recently been questioned by Spencer (1998), who argues that some morphotactics simply is a matter of language-specific stipulation, rather than (re)ranking of universal constraints as predicted by OT. While accepting this point, we suggest that for the study of morphological change, OT still provides useful tools when the constraints are based on NM principles and insights. In this respect, morphology may be parallel to syntax: while some syntax probably has to be a matter of language-specific stipulation, OT may still (as observed by Vincent 1999: 1143–5) be valuable in an account of syntactic change.

Notes

1. According to Faarlund *et al.* (1997: 259), *-s* is used with proper names and words for human beings. This would seem to imply that proper names that do not denote humans combine with *-s*. However, according to our native speaker intuition, non-human proper names, e.g. place-names, are less felicitous with *-s* in Nynorsk: Thus, ?*Tynsets ordførar* 'the mayor of T. (place-name)' is much more peripheral than *Jons hund* 'John's dog'.

2. There is a third construction where possession is expressed by means of the reflexive possessive pronoun *sin*, as in *Jon sin hund* 'John's dog'. This complicates the picture somewhat, but we shall not treat this construction here, as it is a later innovation.

3. As observed by an anonymous referee, this hypothesis bears affinities to insights presented by Zipf (1935/1968). However, a detailed comparison between our approach and Zipf's is beyond the scope of the present chapter.

4. There is an additional reason for saying that *til* should be more informative, namely that free forms will be more salient than bound forms.

References

Beito, Olav T. 1954. *Genusskifte i nynorsk*. Oslo: Jacob Dybwad.

Corbett, Greville G. 1991. *Gender*. Cambridge: Cambridge University Press.

Croft, William, Hava Bat-Zeev Shyldkrot and Suzanne Kemmer. 1987. "Diachronic semantic processes in the middle voice." *Papers from the 7th International Conference on Historical Linguistics* ed. by Anna Giacalone Ramat *et al.*, 179–92. Amsterdam and Philadelphia: John Benjamins.

Dahl, Östen. 2000. "The tense-aspect systems of European languages in a typological perspective." *Tense and Aspect in the Languages of Europe* ed. by Östen Dahl. (*Empirical Approaches to Language Typology 20: 6*). Berlin: Mouton de Gruyter.

——To appear. "Grammaticalization and the life-cycle of constructions." To be published in a volume in the series RASK Supplement Volumes edited by Carl-Erik Lindberg, title not yet announced.

——and Maria Koptjevskaja-Tamm. 1998. "Alienability splits and the grammaticalization of possessive constructions." *Papers from the 16th Scandinavian Conference of Linguistics* ed. by T. Haukioja, 38–49. Åbo: Publications of the Department of Finnish and General Linguistics of the University of Turku.

Dressler, Wolfgang U., Willi Mayerthaler, Oswald Panagl and Wolfgang U. Wurzel. 1987. *Leitmotifs in Natural Morphology* (*SLCS 10*). Amsterdam and Philadelphia: John Benjamins.

Elgersma, Diana and Paul Houseman. 1999. "Optimality Theory and Natural Morphology: An Analysis of German Plural Formation". *Folia Linguistica* XXXIII. 333–53.

Faarlund, Jan Terje, Svein Lie and Kjell Ivar Vannebo. 1997. *Norsk Referansegrammatikk*. Oslo: Universitetsforlaget.

Fretheim, Thorstein. 1985. “Er bokmålet tvekjønnet eller trekjønnet?” *Morfologi/Morphology* ed. by Ernst Håkon Jahr and Ove Lorentz, 99–102. Oslo: Novus.

Haspelmath, Martin. 1999. “Explaining article-possessor complementarity: Economic motivation in noun phrase syntax”. *Language* 75. 227–43.

——To appear. “The geometry of grammatical meaning: Semantic maps and cross-linguistic comparison.” In: Tomasello, Michael (ed.), The new psychology of language, vol. 2. Mahwah, NJ: Lawrence Erlbaum.

Kemmer, Suzanne. 1993. *The Middle Voice*. Amsterdam and Philadelphia: John Benjamins.

Lakoff, George. 1987. *Women, Fire and Dangerous Things*. Chicago: University of Chicago Press.

Langacker, Ronald W. 1987. *Foundations of Cognitive Grammar, volume I: Theoretical Prerequisites*. Stanford: Stanford University Press.

Matthews, P. H. 1972. *Inflectional morphology: A theoretical study based on aspects of Latin verb conjugation*. (*Cambridge Studies in Linguistics 6*.) Cambridge: Cambridge University Press.

Pederson, Eric. 1991. *Subtle semantics: universals in the polysemy of reflexive and causative constructions*. Unpublished Ph.D. dissertation, University of California at Berkeley.

Prince, Alan and Paul Smolensky. 1993. *Optimality Theory*. Unpublished manuscript.

Spencer, Andrew. 1998. “Bulgarian clitics — the limits of Optimality.” *Essex research reports in linguistics. 20: July 1998*, 18–43. University of Essex.

Vincent, Nigel. 1999. “The evolution of c-structure: prepositions and PPs from Indo-European to Romance.” *Linguistics* 37. 1111–53.

Zipf, George K. 1935/1968. *The psycho-biology of language*. Cambridge, Mass.: MIT Press.

CHAPTER 22

Gender inversion in Romance derivatives with -*arius*

Michel Roché
Université de Toulouse-Le Mirail

The research I present here deals with both gender assignment and the lexical structure of derivatives constructed with Romance suffixes descended from Latin -*arius*, -*aria*, -*arium*. My purpose is to connect these two approaches and cast new light on a question — gender assignment to suffixal derivatives — which seems not to have really been tackled yet either by general studies on gender (see, for example, Corbett 1991) or by lexical morphology (see Scalise 1983 for instance).

On the one hand, I have shown in a previous study of gender assignment in French (Roché 1991) that an inversion of gender — from base to derivative — can be observed in several derivational processes, in proportions which exceed largely what could be expected by chance in a language with only two genders. In the suffixation with -*on*, for instance, all the derivatives are masculine and most of them have a feminine base : *glace* FEM 'ice' → *glaçon* MASC 'ice cube', *échelle* FEM 'ladder' → *échelon* MASC 'rung', etc. Among non-animated nouns, the bases are feminine in a proportion of 92 per cent. One constraint selects feminine bases, since -*on*, when used as a nominal suffix, has no feminine counterpart. In evaluative derivation in general, gender inversion is linked with the lexicalization of the derivative and reinforces the differentiation between the base and the derivative : *une boulette* can be any small *boule* 'ball', while masculine *un boulet* is used for special kinds of balls, which are not necessarily small (coal nut, cannonball, etc.). In some formations, a gender switch is a derivative process in itself: *Guillotin* → *guillotine*, *pèlerin* 'pilgrim' → *pèlerine* 'cape', etc. The most noticeable instance, however, is the derivation with -*ier*/-*ière*, as will be seen below.

Similar observations could be made for other Romance languages, but they have generally been limited to cases of mere gender switch, as in the case of the well-known ‘fruit’/‘tree’ opposition in Italian and Spanish: It. *mela* ‘apple’/*melo* ‘apple tree’, Sp. *manzana* ‘apple’/*manzano* ‘apple tree’, etc. On suffixal derivation, a paper mainly devoted to Spanish -*ero*, -*era* (García 1970), in spite of an enthusiastic postscript by Yakov Malkiel, seems not to have attracted much attention nor been exploited subsequently.

On the other hand, the descriptions of the suffixes It. -*aio*/-*aia* and -*iere*/-*iera*, Fr. -*ier*/-*ière*, Oc. -*ièr*/-*ièra*, Ca. -*er*/-*era*, Sp. -*ero*/-*era*, Po. -*eiro*/-*eira* have stumbled on the difficulty in accounting for the wide range of derivatives, in the categorial, semantic and referential fields. They have generally been regarded as fundamentally adjectival, in traditional historical studies (see, for example, Rohlfs 1969 on Italian) as well as in recent synchronic ones (Corbin 1991 on French, for instance). Therefore, the distribution of nominal derivatives between masculine and feminine is explicitly (Rohlfs) or implicitly (Corbin) supposed to follow the rules of gender assignement applied to nominalized adjectives. This analysis raises no problem for personal names: any of the /+hu/ derivatives can potentially be used with both genders, according to the sex of the referent. But things are different with inanimate derivatives.

Generally speaking, two main processes are at work, in French, for nominalized adjectives. In the first, gender is due to an implicit determinatum, whether through ellipsis or not. *Du blanc* ‘white wine’, *du rouge* ‘red wine’, are masculine because *vin* is masculine, whereas the names of musical notes — *une blanche*, *une noire* — are feminine because French *note* is feminine. When there is no implicit determinatum, masculine is used as default gender : *le blanc* is for the colour itself, in a generic use, an equivalent of a Latin or German neuter ; *du blanc*, to name a cosmetic, is for ‘something white’ ; etc. This is the reason why masculine is more frequent than feminine among nominalized adjectives. The proportions are 70 to 30 per cent in a sample of 324 items from *Le Petit Robert* (1988 : 1–426, cf. Roché 1991 : 301–10).

In the other Romance languages, things are roughly similar, with a lesser importance of unmarked masculines. But among Romance inanimate derivatives with -*arius*, the situation is clearly different: (1) for most of them, it is impossible to find an implicit determinatum which could account for the gender; (2) the feminine derivatives, in most languages, are more numerous than the masculine ones.

Consequently, these derivatives cannot be all deadjectival. A number of them, at least, are directly nominal and receive their gender by other means. This distinction has been made by Rainer (1993 : 477, 488) for Spanish: only a few derivatives are considered as the result of an ellipsis, apart from the other *Bildungstypen*. But for these types — the majority of the derivatives — there is no explanation for the distribution between masculine *-ero* and feminine *-era*. In Diekman's article on French *-ier* (1979), there is no explanation either, even though some of the *semantische Nische* are associated with one or other gender.

It is necessary, then, to observe more closely how gender is assigned to these derivatives. My study has been based on samples containing 962 inanimate derivatives for French (from *Le Grand Robert de la langue française*); 977 for Occitan (from Alibert's *Dictionnaire occitan-français*); 456 for Italian, 730 for Catalan, 750 for Spanish, 961 for Portuguese (from reverse dictionaries). This makes it possible to assert that gender assignment to the derivatives of this family may follow three processes: (1) the deadjectival one; (2) gender inversion; (3) attraction to a homogeneous lexical paradigm. The distribution of the derivatives into these three categories is connected with the semantic and referential aspects of the derivation, but there is no clear-cut coincidence between the two approaches. Gender assignment, indeed, is a result of a conflict between competing processes, and the observation of large-scale series of derivatives is essential to establish which one prevails in a particular class.

Deadjectival gender assignment can be witnessed, for instance, in the comparison of Fr. *baleinier* 'whaling ship', (*cargo*) *bananier* 'banana-boat', *pétrolier* 'tanker', etc., with It. *baleniera*, (*nave*) *bananiera*, *petroliera*, etc. Even though the ellipsis is not testified in all cases, the masculine words *navire*, *bateau*, *cargo* in French, the feminine *nave* in Italian, act implicitly as generic terms. The same logic opposes Fr. *baleinier*/*baleinière*, the feminine being due to the generic *chaloupe*, or Ca. *torpediner*/*torpedinera*, for which masculine *vaixell* is opposed to feminine *llanxa*. These derivatives belong to many referential classes, and the semantic relations between base and derivative are very diverse. However, as a whole, they constitute a minority of the /−an/ nouns constructed with these suffixes. As regards the gender of the base, no constraint can be observed: masculine derivatives are as likely to have a feminine base as a masculine one, and so are feminine derivatives.

Gender inversion, in contrast, is generally associated with a particular relation between the derivative and its base. Principally : container to thing contained, and collective/element (or mass noun/element). These two sorts of relations are close to one another : broadly speaking, the derivative designates something that contains what is designated by the base. Fr. *bûcher*, for example, may be used for a 'woodshed', lit. a shed designed to contain *bûches* ('logs'), or for a 'heap of logs' — a collective. In Italian, *un moscaio* may be a 'place infested by flies' or a 'cloud of flies'.

The first significant class is that of derivatives which designate an artefact designed to contain (or hold) what is designated by the base : containers, properly speaking, boxes, cases, bags, holders, pieces of furniture, rooms, etc. For instance : Sp. *ceniza* FEM → *cenicero* MASC 'ashtray'/Sp. *jabón* MASC → *jabonera* FEM 'soapdish'; Oc. *carn* FEM → *carnier* MASC 'gamebag'/Fr. *gibier* MASC → *gibecière* FEM 'idem'; Ca. *coixí* MASC → *coixinera* FEM 'cushion case'/Ca. *agulla* FEM → *aguller* MASC 'needle case'; Po. *lápis* MASC → *lapiseira* FEM 'pencil holder'/Po. *candeia* FEM → *candeeiro* MASC 'candlestick'; It. *piatto* MASC → *piattaia* FEM 'dresser'/Oc. *escudela* FEM → *escudelièr* MASC 'idem'; Ca. *cotxe* MASC → *cotxera* FEM 'carriage shed'/Ca. *llenya* FEM → *llenyer* MASC 'woodshed'; Sp. *llave* FEM → *llavero* MASC 'key ring'; Oc. *timon* MASC → *timonièra* FEM 'opening for the rudder (in a boat's hull)'; etc. The notion of « container » is not used for a referential class, but to characterize a derivational operation, the semantic shift operated by the derivation. It may be extended to a ring, a mere surface, or even a hole, 'to pass through' being a mode of 'to be in'. As can be seen in Table 1, the vast majority of masculine derivatives have a feminine base, and vice-versa. The proportions of gender inversion exceed two thirds in most languages.

The other significant class, from a semantic point of view, is that of collectives. The derivative designates an amount of what is designated by the base, be it countable — It. *bottone* MASC → *bottoniera* FEM 'button row', Sp. *cabello* MASC → *cabellera* FEM 'hair', Ca. *os* MASC → *ossera* FEM 'skeleton', etc. — or non countable — Fr. *glace* FEM → *glacier* MASC 'glacier', Oc. *fum* MASC → *fumatièra* FEM 'mass of smoke'. As a variant, the derivative may designate a complex artefact in which the referent of the base Noun is repeated several

Table 1. Containers

Base Derivative	Total	m ↓ m	**f ↓ m**	/ ↓ m	Total m		f ↓ f	**m ↓ f**	/ ↓ f	Total f		**Gender inversion**
Italian	119	11	**23**	1	35	29%	30	**52**	2	84	71%	**65%**
French	168	24	**60**	1	85	51%	21	**56**	6	83	49%	**72%**
Occitan	122	13	**44**	2	59	48%	24	**35**	4	63	52%	**68%**
Catalan	158	10	**41**	2	53	34%	40	**63**	2	105	66%	**68%**
Spanish	216	20	**66**	1	87	40%	40	**88**	1	129	60%	**72%**
Portuguese	153	20	**34**	1	55	36%	38	**60**	0	98	64%	**62%**

Table 2. Collectives in general

Base Derivative	Total	m↓m	f↓**m**	/↓m	Total m		f↓f	**m**↓**f**	/↓f	Total f		**Gender inversion**
Italian	34	1	**7**	0	8	24%	6	**20**	0	26	76%	**79%**
French	55	6	**42**	0	48	87%	4	**3**	0	7	13%	**82%**
Occitan	67	8	**39**	4	51	76%	5	**10**	1	16	24%	**78%**
Catalan	42	4	**14**	0	18	43%	6	**17**	1	24	57%	**76%**
Spanish	38	6	**14**	0	20	53%	5	**13**	0	18	47%	**71%**
Portuguese	42	10	**9**	0	19	45%	6	**17**	0	23	55%	**62%**

times, as in Sp. *pluma* FEM → *plumero* MASC 'feather duster' ; Fr. *clef* FEM → *clavier* MASC 'keyboard', *boule* FEM → *boulier* MASC 'abacus', *pédale* FEM → *pédalier* MASC 'pedal mechanism', 'pedal-board' (compare to It. *pedale* MASC → *pedaliera* FEM). The rate of gender inversion is high (cf. Table 2), with the exception of Portuguese. In French, nearly all the derivatives are masculine, from which it may be inferred that the derivation, through gender inversion, operates a selection among the possible bases.

The derivations grouped in Table 3 combine the relations expressed in the two preceding classes, 'container' and 'collective'. The base designates an animal, a vegetable or a mineral, and the derivative an animal dwelling, an orchard, a quarry. . ., that is to say: the place where the animal lives, where the mineral can be found, etc. — a sort of container — , or a gathering of animals, a grove, a natural site — a collective. Ex.: It. *vespa* FEM → *vespaio* MASC 'wasp nest'; Oc. *lop* MASC → *lobièra* FEM 'wolf's den'; Fr. *termite* MASC → *termitière* FEM 'termitary' (compare to Sp. *termite* FEM → *termitero* m.); It. *cipolla* FEM → *cipollaio* MASC 'onion field'; Fr. *riz* MASC → *rizière* FEM 'ricefield'; Po. *areia* FEM → *areeiro* MASC 'sand quarry'; Oc. *ferre* MASC → *ferriera* FEM 'iron mine'; It. *scoglio* MASC → *scogliera* FEM 'rocky coast strip'; etc. The same patterns are at work in the three series — animal, vegetable and mineral — , in spite of slight differences. There is a striking parallel, in Occitan, for example, in the names of places characterized by the great number of such-and-such elements, be it animals, plants or stones : *grapaud* MASC → *grapaudièra* FEM 'place with many toads', *genibre* MASC → *genibrièra* FEM 'place with many junipers', *calhau* MASC → *calhaudièra* FEM 'place with many pebbles'. Concerning gender, the noticeable fact, in this class, is the predominance of feminines, mainly in French, Occitan and Spanish. When it becomes hegemonic, if no other suffix can be used for the same purpose, the number of exceptions increases, as in French for names of mines and quarries. In Spanish, where a

Table 3. Animal/vegetable/mineral collectives/places

Base → Derivative:	Total	m→m	f→**m**	/→m	Total m		f→f	**m**→**f**	/→f	Total f		**Gender inversion**
Italian	145	21	**36**	5	62	43%	18	**63**	2	83	57%	**72%**
French	156	10	**13**	1	24	15%	40	**87**	5	132	85%	**67%**
Occitan	230	13	**25**	3	41	18%	62	**124**	3	189	82%	**67%**
Catalan	94	6	**20**	1	27	29%	21	**46**	0	67	71%	**71%**
Spanish	117	8	**12**	3	23	20%	20	**72**	2	94	80%	**75%**
Portuguese	92	7	**9**	2	18	20%	30	**43**	1	74	80%	**58%**

choice is possible, a selection of the bases can be made and the number of exceptions is less sizeable.

If these three classes are put together — Table 4 is the sum of Tables 1, 2 and 3 — the differences between most languages are blurred. The influence of the gender of the base is, remarkably, the same — with the exception of Portuguese — in spite of the differences in the proportions of masculine and feminine among the derivatives. Actually, the three classes could be conflated into a single one.

The situation is quite different with the names of trees (and some other plants) constructed from the name of the fruit (or other production). The notions of "container", or "collective", are no longer relevant (one could say that the apples are *in* the apple tree, but the idea of production is predominant : the apple tree makes apples as the cow makes milk). And the morphological systems are not the same in the six languages. In French, suffixation is the only device, -*ier* is the only suffix, and masculine the only gender : *pomme* FEM → *pommier* MASC 'apple tree', *abricot* MASC → *abricotier* MASC 'apricot tree'. In Portuguese, suffixation is also predominant, but the

Table 4. Tables 1 + 2 + 3

Base → Derivative	Total	m→m	f→**m**	/→m	Total m		f→f	**m**→**f**	/→f	Total f		**Gender inversion**
Italian	298	33	**66**	6	105	35%	54	**135**	4	193	65%	**70%**
French	379	40	**115**	2	157	42%	65	**146**	11	222	58%	**71%**
Occitan	419	34	**108**	9	151	36%	91	**169**	8	268	64%	**69%**
Catalan	294	20	**75**	3	98	33%	67	**126**	3	196	67%	**70%**
Spanish	371	34	**92**	4	130	35%	65	**173**	3	241	65%	**73%**
Portuguese	287	37	**52**	3	92	32%	74	**120**	1	195	68%	**61%**

Table 5. Trees (and other plants)

Base Derivative	Total	m ↓ m	**f** ↓ **m**	/ ↓ m	Total m		f ↓ f	**m** ↓ **f**	/ ↓ f	Total f		**Gender inversion**
Italian	/	/	/	/	/		/	/	/	/		
French	165	58	**105**	2	165	100%	0	**0**	0	0	0%	**64%**
Occitan	128	27	**87**	4	118	92%	4	**6**	0	10	8%	**75%**
Catalan	119	30	**41**	0	71	60%	30	**18**	0	48	40%	**50%**
Spanish	58	15	**17**	2	34	59%	11	**11**	2	24	41%	**52%**
Portuguese	181	59	**19**	0	78	46%	84	**16**	3	103	54%	**20%**

derivatives may also be feminine : *cereja* FEM → *cerejeira* FEM 'cherry tree', *marmelo* MASC → *marmeleiro* MASC 'quince tree'. In Italian, suffixation is present in dialects, but very rare in the national idiom, where it is replaced by the other pattern, gender switch : *mela* FEM 'apple'/*melo* MASC 'apple tree'. In Catalan and Spanish, both systems coexist, in different proportions. In Occitan the situation is roughly the same as in French.

As regards gender (cf. Table 5), the fact that, in French, names of trees are all masculine seems to be related to the gender of the generic term *arbre*. But a historical flashback is necessary. All the most ancient names of fruits, inherited from Latin, are feminine: *pomme*, *poire*, *prune*, *noix*, *châtaigne*. . ., and there is no evidence that the gender shift of Latin *arbor*, formerly feminine, had been completed when the first derivatives appeared, in Late Latin. The origin of the masculine paradigm of French names of trees is, very likely, gender inversion. It is a variant of the Italian and Spanish pattern of gender switch, combined in French with suffixation. Later, this series being quite homogeneous, the names of trees continued to be masculine even when the first masculine names of fruits appeared. In Portuguese, the presence of feminine names of trees, or other plants, could be due to the fact that the noun for 'tree', *árvore*, remained feminine. But Table 5 shows that most of these feminine names of trees have a feminine base, while masculine names have a masculine base, in 80 per cent of the cases : *laranja* FEM → *laranjeira* FEM 'orange tree'/*limão* MASC → *limoeiro* MASC 'lemon tree'; *fava* FEM → *faveira* FEM 'broad bean plant'/*feijão* MASC → *feijoeiro* MASC 'bean plant'. The gender of the derivative is governed by the gender of the base, not by that of a generic. In other words, gender assignment does not follow a de-adjectival process but a de-nominal one, as in the former classes. In Spanish and Catalan, the situation is too intricate to be sketched in a few words.

The space allocated to this chapter does not allow me to mention other lexical series (but none has the same importance as the former ones), nor to even sketch a historical survey of the question. The most important stages would be: (1) the institution of gender inversion, in Late Latin or Proto-Romance, as a break with the system of gender assignment of Classical Latin (and in parallel with the widening of the functions of the suffix, due to an increasing confusion between *-ariu/-aria* and *-are* (Arias Abellán 1992)); (2) the development of lexical series, wholly masculine or feminine, whose attraction gradually supplanted gender inversion in many cases.

The existence of these lexical series is the main explanation for the exceptions — those thirty per cent, more or less, which do not follow gender inversion, in the classes where it works for a majority of derivatives. In French, for instance, the names of groves and plantations are mostly feminine, according to gender inversion, since the names of trees and other plants are most often masculine : *sapin* MASC → *sapinière* FEM 'fir plantation', *houblon* MASC → *houblonnière* FEM 'hopfield', *riz* MASC → *rizière* FEM 'ricefield', etc. The influence of the majority leads to the feminine gender of several derivatives, the base of which is a feminine name of plant, such as *lavande* FEM → *lavandière* FEM 'lavender field' or *luzerne* FEM → *luzernière* FEM 'lucerne field'. This is the reason why the rate of exceptions tends to increase. In some series — French names of trees, for instance — the hegemony of a homogeneous paradigm has completely supplanted gender inversion. The second cause for exceptions is the interference with deadjectival gender assignment. On masculine Fr. *beurre* 'butter', for instance, the most common derivative has long been feminine *beurrière*, which was regular but has been restricted to technical uses ; the masculine *beurrier*, which is now used in everyday French for a butter dish, is an ellipsis of the attested phrase *pot beurrier*. The name of a vase designed to contain *bouquets* ought to be feminine, but *bouquetier* is masculine as an ellipsis of *vase bouquetier*. Other exceptions are due to particular connotations of gender, for instance the 'small'/'big' opposition in Occitan, the feminine being used for the bigger item: *garba* FEM → *garbièr* MASC 'stack of sheaves'/*garbièra* FEM 'bigger stack of sheaves'; *fen* MASC → *fenièr* MASC 'haycock', 'hayloft'/*fenièra* FEM 'haystack', 'hayloft'. In some cases, the exceptions are to be related to a gender variation of the base. Such words as French *sable* 'sand' or *légume* 'vegetable', nowadays masculine, have long been used with both genders; *fourmi* 'ant', which is now feminine, was formerly masculine. The derivatives — *sablier* MASC 'sand box', 'sandglass'; *légumier* MASC 'vegetable dish'; *fourmilière* FEM 'ant-hill', 'ants' nest' — may have been constructed in relation with the obsolete gender.

Further research will be necessary to make precise several points, but gender inversion itself is well established as a process of gender assignment to these derivatives. Which implies that the derivation with the descendants of -*arius* has become fundamentally nominal, as well as adjectival, and that there are not two distinct suffixes in each language (-*aio* and -*aia*, -*ero* and -*era*, -*ier* and -*ière* . . .), as considered in the tradition of Romance studies, but only one.

References

Arias Abellán, C. 1992. "Convergencias y mecanismos de selección sufijales (a propósito de -*alis* (-*aris*)/-*arius*)". *Habis* 23. 321–38.

Corbett, Greville. 1991. *Gender*. Cambridge: Cambridge University Press.

Corbin, Danielle and Pierre Corbin. 1991. "Un traitement unifié du suffixe -*ier*(*e*)". *Lexique* 10. 61–145.

Diekmann, Erwin. 1979. "Zu frz. -*ier*". In *Festschrift Kurt Baldinger zum 60. Geburtstag*, ed. by M. Höfler, H. Vernay and L. Wolf, 375–91. Tübingen: Niemeyer.

García, Erica C. 1970. "Gender Switch in Spanish Derivation (with Special Reference to -*a* → -*ero*, -*o* → -*era*, -*a* → -*ín*, -*ón*)". *Romance Philology* 24:1. 39–54.

Rainer, Franz. 1993. *Spanische Wortbildungslehre*. Tübingen: Niemeyer.

Roché, Michel. 1991. *De l'attribution du genre aux mots nouveaux dans la langue française*, thèse, Toulouse.

Rohlfs, Gerhard. 1969. *Grammatica storica della lingua italiana e dei suoi dialetti*, *III*, transl. by T. Franceschi and M. Caciagli Fancelli. Turin: Einaudi.

Scalise, Giorgio. 1983. *Morfologia lessicale*. Padova: CLESP.

Chapter 23

Polysynthetic word formation

Wichita contributions to the morphology/syntax debate

David S. Rood
University of Colorado

1. The question to investigate

Bresnan and Mchombo (1995) explores the issues of word formation in Bantu from the perspective of the *lexical integrity principle*, which holds that "words are built out of different structural elements and by different principles of composition than syntactic phrases." Mithun (1984, 1986) and Sasse (1999) contend that polysynthetic verbs with incorporated nouns are formed in the lexicon in Mohawk and Cayuga, while Sadock (1986) argues for their formation by syntactic rules in Greenlandic. Using a different research paradigm, psycholinguistic investigation of speakers of English, Italian, Hebrew, Japanese and Serbo-Croatian (Feldman 1995; Hagiwara *et al.* 1999; Laudanna *et al.* 1992; Marslen-Wilson *et al.* 1994 and many others) has demonstrated two kinds of access to or processing of morphology: recall of memorized forms, and separate processing of stems and affixes. Can these approaches be combined to provide insights into the way speakers of polysynthetic languages formulate utterances? If pronominal arguments or verbs with incorporated nouns are part of memorized and recalled strings, then polysynthetic words are likely to be analogous to words in other kinds of languages. But if these combinations are processed on-line, we will still need further kinds of investigative tools to sort out the lexical vs. syntactic question.

Unfortunately, at this time, experimental psycholinguistics is unlikely to be useful in the investigation of Wichita, since there are only about ten living speakers, and not all of them are completely fluent. In this chapter, then, I would like to explore the internal linguistic arguments for and against syntactic word formation in Wichita, and add a bit of anecdotal psycholinguistic observation that seems to support the conclusion that even if the assembly of these words is syntactic, the final product is an entry in the lexicon.

First, however, the difference between syntax and morphology needs to be clarified. In this chapter I conceive "syntactic formation" to be the assembly of units which identify the arguments of a predicate and express their relationships. Bresnan and Mchombo (1995: 190–2) uses theory-internal argumentation to allow affixal pronouns to have syntactic function even though the final construction is a word, and restricts syntax to phrasal constructions with some kind of gap. While I would contend that syntax is syntax, whether or not it is word-internal, I think I can also demonstrate that in Wichita "pieces" of words can be antecedents of subsequent constructions. I will conclude, then, that Wichita words can be constructed by syntactic principles, and can also function as if they were phrases rather than words.

The rest of this chapter is organized as follows. Section 2 is a survey of the relevant properties of Wichita; Section 3 proves that the constructions I am calling words really are words; Section 4 adduces arguments demonstrating that some of these words are syntactic constructions, primarily because they include either pronominal or nominal arguments of the predicate, and responds to some possible counterarguments to this position. Section 5 adds the anecdotal psycholinguistic evidence alluded to above and expresses my conclusions.

2. An introduction to Wichita

Wichita is spoken in Oklahoma, in the southern plains of the United States. There are only about 10 living speakers, all of them older than 70. I began studying it in 1964, when there were many more speakers, and have data which today's speakers cannot reproduce; all of the data I use for my conclusions are from spontaneously produced continuous texts, generally narratives or monologues of other sorts.

Wichita is typologically polysynthetic: most of the "work" of the grammar, the association of arguments and adjuncts with predicates and the association of one predicate with another, is accomplished by bound verbal morphology, rather than by word order, case marking, or other overt indications of constituency or phrase structure. Verbs must have at least four morphemes, and quite normally have as many as 10 or 12. Arguments are frequently incorporated into the middle of verbs, with bound verbal affixes on either side of noun roots. In this kind of language, the number of 'words' is unbounded in the same way that the number of predicate-plus-argument sequences is unbounded in more isolating languages, though obviously there is a limit to the length of any word (unlike the theoretically unlimited length of sentences). Speakers are just as creative about word formation in Wichita as they are about sentence formation in English, actively coining new constructions to fulfill the needs of the current discourse. Wichita utterances normally consist of more than one word, but sentence boundaries are often difficult to find and word order seems to have little to do with anything except pragmatics. Let me illustrate with the first few lines of a traditional story; (1a–d) may each be a separate sentence, though the various criteria for finding sentence boundaries (intonation, particles, word classes, semantic coherence) lead to conflicting results:

(1) a. Ka:háskiyakíre:réʔeriwa:ha.
Ka: -hasʔ- kiy- -a -aki -i -re:
new.topic-narr -quot.-3.subj-past-LINK-NEW INFO
-reʔer -i(wa:)ha
-village.LOC -be.a.place.(distrib)
'Once upon a time they say there was a big village.'

b. Nareʔeriwa:hah wérah hinnih kiya:sʔa:ká:kʔicaki;
Na -reʔer -i(wa:)ha -h wérah
ppl.3.subj-village.LOC-be.a.place.(distrib)-subord DUB
hinnih kiya -hasʔ-a -aki -i
and human.subject -narr-3.subj.-past -LINK
-ʔak -ʔicaki
-plural.patient-sit;dwell
'There being (such) a village, they lived there;'

c. ka:hi:rá:i:cʔa hasʔa:ki:ʔi hinnih ni:haskwá:riks.
ka:hi: -rá:i:c-ʔa hasʔ-a -aki -i -ʔi hinnih
woman-old -NOUN narr-3.subj-past-LINK-be and
ni:has-kwá:riks
uncle-(unique to this compound)
'There was an old woman, and an old man.'

d. Chiʔass wérah i:kaʔa: kiʔí:wa:waʔasʔi hásʔikaʔakihiʔnneʔecakih.
Chiʔass wérah yi -kaʔa -a: -aki
one DUB dual-quot-3.subject.POSSESSOR-past
-ʔi: wa:waʔa-s -ʔi hasʔ-yi -kaʔa -ki -i
-grandchild-INC-be narr-dual-quot-past.ppl-LINK
-hiʔr -ra -ʔicaki -h
-anim.patient-TRANS-sit; dwell-subord
'They had one grandson whom they took care of.'

The focus of this discussion is on the nature of the long words built around verb roots. Are these lexical items, lexical creations, or syntactic constructions? How much of these forms is stored as a unit and how much is assembled or parsed on the spot?

3. Linguistic evidence for word status

The classical definition of a "word" is that of a "minimal free form", that is, a construction which cannot be divided such that its parts are also independent words. By that definition, all the polysynthetic verbs in our sample are unambiguously words. The morphemes for 'village' and 'grandchild' might seem to be counterexamples to this claim, but they are not. The morpheme translated 'village' is one of a class of about 20 locatives; they function like English locative prepositions, having meanings like 'on', 'under', and 'in', but also 'in fire', 'in water', and, here, 'village'. The morpheme translated 'grandchild' is indeed a noun, and could be extracted, but the remainder is then not a grammatical construction — the *-s* which follows *ʔí:wa:waʔa* in the original form only occurs with incorporated nouns, and must be absent from both the noun and the verb if the noun is not incorporated.

4. Evidence for and against the syntactic composition of polysynthetic words

I hope I have just demonstrated that these long forms are words, and as such that they could be just like the words in better studied languages: memorized as wholes, or memorized as stems and affixes. We might even hypothesize that they are memorized as stems and complexes of affixes which are pre-assembled, the way that portemantaux in inflectional languages are pre-assembled. Against such a proposal, it seems to me, is that the function of some of the component morphemes is syntactic: they provide information about the relationship between the arguments and the predicate, identify the arguments, and some of them can be referred to independently of the rest of the word.

4.1 Arguments and predicates

There are of course many languages which indicate the person and number of subjects and objects by bound verbal morphology, and Wichita is just like them up to a point. There are separate morphemes for subject and object for first, second, and inclusive person; third person is marked by default, i.e. if a transitive verb is marked as taking a first person object, the subject will be understood to be third person, whereas use of the first person subject morpheme implies a third person object; see (2):

(2) *ta-ki-hirʔí:ras* (-*ki*- 'me') 'he/she found me'
ta-c-hirʔí:ras (-*c*- 'I') 'I found him/her'

In the presence of an overt noun, that noun is interpreted as the relevant third person argument. Sentences with two nouns and no other context are ambiguous (recall that word order is not syntactically relevant); see (3):

(3) wi:c ka:hi:kʔa ti -hirʔí:ras
man woman indic.3.subj.3.obj.-find.anim.object
'a woman found a man; a man found a woman'

If there is a beneficiary or other indirect object in the construction, that fact is registered in the verb, and the roles of the argument markers shift. Cf. (4):

(4) ta -ki -:c -hirʔí:ras
indic-me-dative-find.anim.object
'he/she found him/her for me'

Third person arguments are now potentially even more ambiguous; compare (5) with (3):

(5) wi:c ka:hi:kʔa ti -:c -hirʔí:ras
man woman indic.3.subj.3.obj.-dative-find.anim.obj.
'A woman found it for a man; a man found it for a woman; a man found a woman for him/her; a woman found a man for him/her; she/he found a man for a woman; she/he found a woman for a man.'

The dative morphology can also mean that the pronominal object possesses the direct object, so (4) could mean 'he found mine' and (5) could translate the 'for' phrases as possessives instead ('she found his', etc.). Different morphology can indicate that the subject of the verb is possessed:

(6) *tatí:hirʔí:ras* 'Mine found him'
ta:kihirʔí:ras 'His found me'

And these functions can be combined; (7) indexes four distinct arguments, namely subject, non-subject possessor, recipient, and direct object:

(7) isí:riʔasta:hannaʔa
i -s -í:ri -ʔak -ta:ha -rV -ra
imper-2.subj-dative.and.possessive-dative.pl-knife -pl.obj.-TRANS
-ʔa
come
'bring them$_i$ their$_j$ knives'

So most of the information about the relationship of various arguments to the predicate is expressed in the verbal word. It is not hard to see that the number of such words for the language as a whole would be very large, but it is still possible to list the prefix combinations and claim that they can be added to verb stems productively, just as inflections in languages like Turkish can be added by a fluent speaker to any verb, even if a particular combination has never actually been heard by that speaker. Thus, despite the fact that syntactic information is included in these words, one could still argue that they are lexical formations, not sentences.

That argument becomes less convincing when we compare the way in which familiar languages use inflection with the characteristics of polysynthetic languages. These are not like the so-called "pro-drop" languages (Spanish, for example), in which inflectional marking for person repeats information that is at least potentially available elsewhere in the sentence. The personal affixes in polysynthetic verbs are pronominal, not agreement morphemes. This is easy to demonstrate for Wichita, because there is nothing in the language with which these morphemes can "agree" — that is, there are no other pronouns. If I want to answer a question like "Who is there?" with something like "me", I must use a fully inflected verb, marked for first person subject. Moreover, there is no verb without an indication of the person and number of its arguments — there are no non-finite forms.

The picture is thus: (a) the language has no pronouns that are not verbal affixes, and the arguments of every verb are indexed on that verb; (b) the grammar of the language must therefore deal with person inflection the same way that other grammars deal with sentences with pronouns; (c) to the extent that sentences with pronominal arguments are syntactic constructions, polysynthetic verbs are syntactic constructions.

The fact that the bound morphemes and morpheme combinations are limited in number and listable then becomes parallel to the fact that the pronouns in other languages are chosen from a small list as well. The psycholinguistic processing issue then seems to me to become different from that of processing of morphology; questions of how syntactic constructions are formed must also enter the picture.

There is another, more dramatic way in which polysynthetic words display characteristics of sentences in other languages, and I want to turn now to a discussion of noun incorporation.

4.2 Noun Incorporation

What makes word formation in Wichita dramatically different from that of most other languages is the phenomenon of noun incorporation. Now we leave the realm of listable forms, and enter unboundedly productive territory; now we are at the point where speakers must be able to create and hearers understand new words with the same fluency that speakers of English deal with new sentences.

The most common kind of noun incorporation is that illustrated in examples (1d) or (7), where a noun stem (often slightly modified) is inserted into the verbal word. Usually it is the syntactic direct object of the verb which is treated this way, but Wichita also often incorporates the single arguments of intransitive verbs, as in (8):

(8) kiya:kiriwa:cé:rhirʔasʔirhawi
kiy -a -aki -riwa:c-re:rhirʔa-s -ʔirhawi
quot-3.subj-past-big -buffalo -INCORP-lie
'There was a big buffalo lying there.'

And there is one bizarre example, (9), in which the addressee of an imperative is incorporated:

(9) isa:ciye:scakhachinnʔistir
i -s -a:c -niye:s-cakhac-hinnʔistiri
imper-2.subj-preverb[1]-child -grey -run fast
'Grey Child, run fast!'

Are the words which result from this process still part of a speaker's lexicon? Marianne Mithun (1984, 1986) has argued, "yes."

The phenomenon of noun incorporation (NI) received considerable attention in the linguistic literature in the mid 1980s, starting with Mithun (1984) on the typology and evolution of the phenomenon, and continuing with Sadock's (1986) objections and Mithun's response. Baker's more recent books (1988, 1996) are an elegant explication of how government and binding theory can deal with incorporation, rather than a cross-linguistic discussion of the phenomena. Mithun claimed that noun incorporation is invariably a morphological device; the results are always words, never sentences. I think, however, that for Wichita one can make a case for incorporation as a syntactic, rather than a morphological, device, even though the results are still words.

Mithun considers and rejects three possible arguments that would indicate that NI is a syntactic process: noun phrase composition, anaphora, and referentiality of the incorporated noun.

Example (1d) is much like her Mohawk example; in Wichita, an incorporated noun is modified by a quantifier ('one') and a relative clause ('whom they cared for'). Any analysis of the English translation of that sentence would posit a noun phrase with 'grandchild' as its head and the relative clause as a modifying embedded sentence in the phrase; a parallel analysis of Wichita would then have to propose some kind of rule extracting the head from the NP and inserting it into the verb, and since this would have to be later than the phrase formation rules, it would clearly have to be a syntactic process. Note, too, in the light of Bresnan and Mchombo (1995), that the antecedent of the relative clause is embedded in the preceding word. This is therefore a clear example (there are many others in my data) of a "gapping" construction where the gap is filled by part of a preceding word. By Bresnan and Mchombo's definitions, too, then, verbs with incorporated nouns must be syntactic constructions.

Mithun seems to claim, however, (and I agree) that in fact there is no noun phrase in these constructions in Mohawk or, by extension, in Wichita. She argues, first, that the modifiers can occur equally easily when there is no incorporated noun or other overtly marked linguistic element to serve as the head. If the pragmatic context is clear, one could say, e.g. (10):

(10) *chíʔass i:kaʔa:kiʔi* 'they had one'.

While this does not prove that the modifier and the noun do not form a phrase when both are overtly present, combined with the physical separation of the parts, it is suggestive of a very loose bond, or none at all. The potential "phrase" does not necessarily move or delete as a unit. In a parallel fashion, the word translated as a relative clause could be used in numerous other contexts to mean any of the glosses in (11):

(11) 'one whom they took care of'
'the couple who took care of him'
'their caring for him'
'when/before/after/while they were taking care of him'

Thus the nominalization construction can focus on any part of the nominalized word, be it the subject, the object, the event, or the time of action, but in every case the identity of the object argument is clear from its introduction in the preceding word. That object is "gapped" in the second word. Mithun, apparently assuming that the incorporated noun cannot be a syntactic antecedent, asserts that these facts show that polysynthetic sentences consist of strings of words in which each individual word is self-contained, and reference from one word to the next is purely pragmatic and not syntactic. Although Mithun says that this shows that polysynthetic verbs are not syntactic constructions, in fact it only shows that they are words; it says nothing about how they are assembled.

Mithun's second argument (1984: 871) is that incorporated nouns are not the antecedents of anaphoric pronouns, because Mohawk pronouns refer to pragmatic, not syntactic, antecedents. The logic goes something like this: A pronoun can have a pragmatically determined antecedent. Therefore apparent antecedents, whether or not they are incorporated, are not grammatical antecedents. Such reasoning seems to me to amount to claiming an absence of grammatical anaphor all together in these languages, and I cannot think of an argument that would refute such a claim, since the presence of an antecedent would not be accepted as counterevidence. The question of whether or not there can be anaphoric reference to incorporated nouns seems therefore to be unanswerable. Note, however, that an incorporated noun is at least pragmatically accessible independently of the verb in which it occurs, in contrast with the non-final elements of compounds in English (*The fire$_i$men raced to the burning building but found it$_i$ already out) or meaning components (*John is an orphan and he misses them (=his parents)).

In discussing the third test for syntactic properties of incorporated nouns, namely referentiality and the possibility that an incorporated noun can be the first mention of something which will continue to be important in the discourse, she writes:

> Although the identity of the referents of IN's . . . is often deducible from context, the IN's themselves are not, strictly speaking, referential . . . They usually background N's that have either already been introduced (old information), or N's reflecting incidental entities that will play no further role in the discourse . . .
>
> In those relatively rare cases where entities first appear in discourse as IN's, any subsequent mention of them regularly includes a restatement of the N, either incorporated or independent. (Mithun 1984: 866)

This is clearly untrue for (1d), where the introduction of the grandchild (who is the hero and main character of the story) is in incorporated position, and where the pronoun in the next word unambiguously refers to him. He continues to be the subject of the next several sentences, in which it is explained that he regularly wet the bed, and his bedclothes had to be hung outside to dry. Then the topic changes, and we learn that someone else was gathering a war party. That person describes his mission as "we are going to go over there," and the narrator then explains further: "They were looking for something going on, and for some different people, too." The morpheme for 'something going on' is necessarily part of a verb, but 'people' is a noun, and is introduced incorporated in the verb 'be' as its subject. These 'people' continue to be participants in the discourse, so we have another example of the introduction of participants in the story in incorporated position. The texts contain other examples.

These examples seem to me to be clear instances of first mentions of incorporated referential nouns which are topical in the subsequent discourse.

5. Other kinds of evidence

So where are we? The goal has been to examine evidence for syntactic processes in word formation in Wichita, to help decide whether words in a polysynthetic language, like those of other languages, consist of roots and derivational and/or inflectional affixes, or whether these words also contain material that must be inserted during the creative process of formulating utterances for the discourse. We have found that there are word characteristics, such as bound morphology, borderline characteristics such as a complex inflectional apparatus which includes argument marking (pronouns and case markers), and syntax-like phenomena such as noun incorporation, where the incorporated noun can be referential, the first mention of a discourse topic, the antecedent of a gap in a subsequent word, and perhaps the antecedent of anaphoric reference.

From the linguist's perspective, then, the formations we have been discussing seem to be words, but words whose internal structure is partially syntax like and transparent enough so that parts of the words can be accessed independently for purposes of discourse continuity. Theoretically, then, I would claim that polysynthetic words are formed using syntactic as well as morphological processing.

The next logical question is to be posed to speakers: is a word like *i:kaʔa: kiʔí:wa:waʔasʔi* really just one word, or is it a sentence?

At this point, I have one kind of answer to the question, and I would like to continue my investigations by finding experimental evidence. The nature of the extant evidence is a lot like that which Mithun uses to support her contention that Mohawk constructions with incorporated nouns are lexicalized, i.e. part of a look-up list. She says:

> Speakers are keenly aware of the lexical status of all such combinations. They know not only which constructions are possible, but also which of these actually exist — i.e. which are lexicalized. They immediately recognize those that are not. Speakers remember who uses a word not used by others, even when it is a perfectly transparent combination of two highly productive stems. A Mohawk speaker's lexicon can be enormous, because of the high productivity of word formation processes like NI; but it is well-defined. (Mithun 1984: 972)

Sasse (1999: 323) makes a similar observation about another Iroquoian language, Cayuga. My observation of Wichita speakers' behavior toward these words is that they do indeed see them as unanalyzable units. For example, during field work I often ask, "How does that end?", but no one I have worked with will answer such a question directly: they always say the whole word again; they do not start in the middle or at the end to reproduce the form.

Another revealing observation was made during a workshop to prepare teaching materials. I pointed out the very simple paradigmatic regularity between first and second person forms, namely, that the difference between a verb with 'you' as subject and one with 'I' as subject is simply a change between /s/ and /c/ (see (12)). One speaker's response was, "I never did notice that".

(12) *tasʔicaki* ‘you are sitting’
tacʔicaki ‘I am sitting’

I suggest that this implies that these forms are psychologically unanalyzed units in the speakers’ minds, but it is precisely this kind of data which should be the subject of psycholinguistic experiments. Are these words produced from memory of the whole, or from the assembly of stems and affixes?

Notes

1. Preverbs are required pieces of verb stems.

References

Baker, Mark C. 1988. *Incorporation: A Theory of Grammatical Function Changing*. Chicago: University of Chicago Press.
——1996. *The Polysynthesis Parameter*. Oxford: Oxford University Press.
Bresnan, Joan and Sam. A. Mchombo. 1995. “The Lexical Integrity Principle: Evidence from Bantu”. *Natural Language and Linguistic Theory* 13.181–254.
Feldman, Laurie Beth, ed. 1995. *Morphological Aspects of Language Processing*. Hillsdale, N. J.: Lawrence Erlbaum Associates, Inc.
Hagiwara, Hiroko, Yoko Sugioka, Takane Ito, Mitsuru K. Lawamura, and Junichi Shiota 1999. “Neurolinguistic Evidence for Rule-Based Nominal Suffixation”. *Language* 75. 739–63.
Laudanna, Alessandro, William Badecker and Alfonso Caramazza 1992. “Processing Inflectional and Derivational Morphology”. *Journal of Memory and Language* 31.333–48.
Marslen-Wilson, William, Lorraine Komisarjevsky Tyler, Rachelle Waksler and Lianne Older 1994. “Morphology and Meaning in the English Mental Lexicon”. *Psychological Review* 101.3–33.
Mithun, Marianne 1984. “The Evolution of Noun Incorporation”. *Language* 60.847–94.
——1986. “On the Nature of Noun Incorporation”. *Language* 62.32–7.
Sadock, Jerrold M. 1986. “Some Notes on Noun Incorporation”. *Language* 62.19–31.
Sasse, Hans Jürgen. 1999. “Lexicological and lexicographic problems of word families in Cayuga”. *Sprachtypologie und Universalienforschung* 52.320–34.

CHAPTER 24

On the mental representation of Russian aspect relations

Marina Roussakova, Serguei Sai, Svetlana Bogomolova,
Dmitrij Guerassimov, Tatiana Tangisheva, Natalia Zaika
St. Petersburg State University

1. Introduction

The Russian aspect is one of the most widely debated Russian grammatical categories. A number of well-known classic works are devoted to this issue (Bondarko 1996; Comrie 1976; Dahl 1985; Maslov 1984), and there are many new investigations on various facets of the problem of aspect (Bybee et al. 1994; Chertkova 1996; Paducheva 1996; Galaktionova 1997; Zaliznjak and Shmelev 2000). However, a limited amount of experimental research on the Russian aspect is carried out.

2. Aim and background

This paper presents experimental evidence to a question that has occupied minds of students of the Russian aspect for some time, namely: whether aspect should be treated as a classifying or as an inflectional category (Glovinskaja 1986; Maslov 1984; Chertkova 1997). Many researchers treat aspect as a classifying category (Paducheva 1996; Lehmann 1998); others believe that it holds an intermediate position between the two types of grammatical categories (Lomov 1977; Yaszay 1997). Aspect is relatively seldom characterised as a purely inflectional category.

The majority of Russian verbs are members of the so-called aspectual pairs; that is, for approximately 65 per cent of Russian verbs another verb can be found very close in its lexical meaning but differing in its aspect (Pertsov

1998; cf. also Yaszay 1997 proposing that a notion of an aspectual pair has a continuous character). Usually one of the members of an aspectual pair is derived from the other by way of more or less regular suffixation or prefixation; distinction between prefixation and suffixation is crucial for many aspectologists who consider the process of imperfectivisation as an inflectional process, while perfectivisation by the means of prefixation is viewed as derivation (Bondarko 1996; Maslov 1984).

At any rate it is evident that the Russian aspect has some features of a classifying as well as an inflectional category. These structural features are reviewed by N. Pertsov (Pertsov 1998). Structural ambiguity leads to the problem of mental representation and processing of aspectual forms. Thus the basic question of the present research may be put as follows: *Are members of aspectual pairs stored and processed as separate lexemes or are they rather the forms of one lexeme?*

3. Experiment

To answer the question we conducted an experiment during which subjects were provoked to produce various verb forms based on the other forms of the same verb. For instance, the present tense form of a verb was presented and subjects were to provide the past tense form of the same verb.

stimulus		expected reaction
reshaet	→	*reshal*
'(he, she, it) decides'		'(he) decided'

Adult informants were mostly presented with a short series of sample stimuli together with their expected response (for instance, 'I will say *skazhet* and you should say *skazal*, I will say *vidit* and you will answer *videl*', and so on; both perfective and imperfective stimuli were presented). Then several stimuli were presented to check whether a subject had understood the task. Only after this introduction were real test words presented.

Only few adult subjects failed to understand the task in this form; however, the task turned out to be difficult enough for the children, especially for the younger ones. Thus, the experimenters were forced to simplify the task, by providing children with the verbs in a context, for instance, 'tomorrow Vanja will solve (*reshit*) a/the problem; yesterday he . . . as well' (both the imperfective *reshal* and perfective *reshil* are possible in this context).

Both imperfective and perfective stimuli in the experiment were forms of verbs which are members of aspectual pairs; moreover, if a certain verb was a stimulus for a certain group of subjects, then its aspectual counterpart was used as a stimulus in the other group of subjects. Though we had a very limited series of stimuli, we tried to represent different types of structural and semantic correspondences between members of aspectual pairs. For instance, for the pair of verbs *sreZAT'* 'to cut off' (henceforth translations are extremely rough) and *SREzat'* 'to have cut off' semantic difference seems to be almost purely aspectual; structurally infinitives of these verbs are only distinguished by the position of stress. On the other hand, the verbs *kidat'* 'to throw several times' and *kinut'* 'to throw something just once' are also treated as the members of an aspectual pair, though they have much structural difference and their semantic interrelationship does not look like purely aspectual.

Various groups of subjects were examined — 20 three-year-old children, 25 four-year-old children, 21 five-year-old children, 28 six-year-old children, 75 adult Standard Russian speakers, and 38 speakers of the dialect of the Belozersk district in the Vologda region (these were not included when the results were statistically analysed); besides, approximately 150 subjects were presented the task in the written form; these are also not included in the statistical analysis.

4. Results

4.1 The average probability of mistakes

Many subjects answered with the form of a verb opposite in aspect to the stimulus form and to the expected answer. Such answers must be treated as erroneous according to the traditional viewpoint and are therefore conventionally referred to as 'mistakes' in this text. Other types of erroneous answers were extremely rare.

The percentage of mistakes is very high; it ranged from 4 to 36 per cent for imperfective stimuli and from 40 to 77 per cent for perfective stimuli (see Table 1).[1] For example, 96 per cent of those subjects presented with a verb form *kidaet* '(he, she, it) throws' correctly provided by the past tense form of this verb *kidal* '(he) threw'. At the same time only 23 per cent of subjects gave a correct response to the perfective form *pomozhet* '(he, she, it) will help', while 77 per cent responded with the past tense form of the imperfective verb with the same meaning *pomogal* '(he) was helping' instead of giving the correct answer *pomog* '(he) has helped'. These percentages indicate that subjects do not perceive any difference in lexical meaning between members of some aspectual pairs. This implies that members of at least some aspectual pairs are stored as one lexeme.

4.2 Differences in probability of mistakes for different aspectual pairs

The probability of mistakes differs from one aspectual pair to another (the difference for some of them is statistically significant), which means that the degree of intimacy in the mental representations of the members of aspectual pairs differs considerably from one aspectual pair to another. It is difficult to reveal the factors underlying this distinction on the basis of our small sample of eleven aspectual pairs. The percentage of mistakes probably partly depended on the inflectional characteristics of the verbs; namely, it is higher for the stimuli belonging to the archaic or rare inflectional types, since subjects preferred to answer with the verbs of -*aj*/-*a* type, which is most likely the default type in Russian.

4.3 The problem of the base form

If the forms opposed in aspect are sometimes stored as the forms of one lexeme, we face an important question: Which form functions as the base form?

Table 1.

Imperfective stimuli	Imperfective answers	Perfective stimuli	Perfective answers
kidaet	0.96	*kinet*	0.43
vydumyvaet	0.83	*vydumaet*	0.54
dajot	0.64	*dast*	0.5
brosaet	0.85	*brosit*	0.41
pomogaet	0.92	*pomozhet*	0.23
puskaet	0.86	*pustit*	0.43
oskorbljaet	0.83	*oskorbit*	0.5
reshaet	0.85	*reshit*	0.54
obmanyvaet	0.76	*obmanet*	0.50
srezaet	0.83	*srezhet*	0.60
bezhit	0.84	*probezhit*	0.36

Experimental results may shed some light on this question. The number of imperfective answers is greater than the number of perfective answers for both perfective and imperfective stimuli (see Table 1; the difference is statistically significant, $p < .01$).[2] Thus we can conclude that imperfective forms may represent both imperfective and perfective forms in one's mental lexicon while the opposite is less probable.

If aspect forms are stored as one lexeme, *then the base form would be rather imperfective than perfective*. It is important to mention that despite the latter hypothesis the solution of the problem of the base form must not be uniform for all the aspectual pairs. The hypothesis proposed, however, is supported by the fact that both type and token frequency of imperfective verbs is much higher than that of perfective verbs.

4.4 The probability of mistakes for subjects of different ages

The most surprising result was that 3-year-old children showed the highest probability of correct answers in comparison with other groups of subjects, while adults showed the lowest (see Table 2; the difference between 3-year-old children and adults is statistically significant, $p < .01$).

Table 2.

Age (years)	3	4	5	6	7–12	Adults
Correct answers	73%	67%	61%	67,5%	62%	61%

This experimental result agrees well with two well-known facts: (1) Russian children (even those making first steps in acquisition of the Russian grammatical system) almost always use aspect forms appropriately (Ceytlin 2000: 89, 148–52), which may seem curious if one takes into consideration the fact that improper use of the Russian aspect forms often gives away non-native Russian-speakers even long after other components of grammar seem to be perfectly acquired, (2) at a certain age Russian children quite frequently make a peculiar type of mistake in verb forms that indicates an intensive process on their part to construct forms of both perfective and imperfective verbs based on each other.

All these observations imply that members of aspectual pairs are acquired separately and that their mental representations are combined during the course of the development of language competence.

5. General conclusions

The problem of the nature of the Russian aspect remains unsolved. At any rate the members of the so-called aspectual pairs are far from functioning in the mental lexicon separately; they are evidently bound with each other by intimate interdependence.

This fact implies a more general conclusion. The distinction between word-formation and inflection caused numerous debates among linguists. However, the example of the category of the Russian aspect shows that this distinction provided by the structural linguistics does not necessarily correspond to psycholinguistic reality; most probably there is no strict boundary between word formation and inflection. This view supports approaches in which it is postulated that there are no separate grammatical and lexical modules in language competence.

Usually the acquisition of a new grammatical category develops through the establishment of new grammatical oppositions in the frames of the same grammatical space (Slobin 1973). This process is thought to be accompanied by the simultaneous establishment of the correspondences between newly acquired grammatical categories and their markers. However, our experiment on the Russian aspect indicates another possible method of acquisition of a grammatical category: a new aspectual 'hyperparadigm' is established through the merger of already formed independent paradigms in the language competence of a child. One may suppose that similar reshaping could be observed in the process of acquisition of other grammatical categories.

Notes

1. This result agrees well with the data obtained through pedagogic practice: It has been shown that while studying the Russian verb grammar in the frames of a theoretical course of Russian, schoolchildren make numerous mistakes when they are asked to produce the infinitive form of a verb based on a finite form of the same verb or vice versa (Gogun 1999).

2. The percentage of imperfective answers to perfective stimuli may be simply counted by subtracting the percentage of perfective answers from 100%, for instance, 100−43 = 57% of subjects gave the erroneous imperfective answers *kidal* to the perfective stimulus *kinet*.

References

Bondarko, Alexander V. 1996. *Problemy grammaticheskoj semantiki i russkoj aspektologii.* [*Problems of Grammatical Semantics and the Russian Aspectology*]. Saint-Petersburg: Saint-Petersburg University.

Bybee, Joan L., Revere Perkins and William Pagliuca. 1994. *The Evolution of Grammar: Tense, Aspect, and Modality in the Languages of the World.* Chicago: University of Chicago Press.

Ceytlin, Stella N. 2000. *Jazyk i rebjonok: lingvistika detskoj rechi* [*Language and Child: Child Language Linguistics*]. Moscow: Vlados.

Chertkova, Marina Yu. 1996. *Grammaticheskaja kategorija vida v sovremennom russkom jazyke* [*The Grammatical Category of Aspect in Contemporary Russian*]. Moscow: Moscow State University Press.

——ed. 1997. *Trudy aspektologicheskogo seminara filologicheskogo fakul'teta MGU im. M. V. Lomonosova* [*The Proceedings of the Aspectological Seminar at the Philological Faculty of MGU*]. Vol. 1–2. Moscow: Moscow University Press.

——ed. 1998. *Tipologija vida: Problemy, poiski, reshenija* [*The Typology of Aspect: Problems, Research, Solutions*]. Moscow: Shkola 'Jazyki russkoj kul'tury'.

Comrie, Bernard. 1976. *Aspect: An Introduction to the Study of Verbal Aspect and Related Problems.* Cambridge: Cambridge University Press.

Dahl, Östen. 1985. *Tense and Aspect Systems.* Oxford: Blackwell.

Galaktionova, I. V., ed. 1997. *Sintaksis: izuchenie i prepodavanie.* [*Syntax: Research and Pedagogical Problems*]. Moscow: Dialog-MGU.

Glovinskaja, Marina Ya. 1986. *Teoreticheskie problemy vidovremennoj semantiki russkogo glagola* [*Theoretical Problems of and Aspect Semantics of the Russian Verb*]. Unpublished doctoral dissertation, Moscow.

Gogun, Elena A. 1999. *Graficheskaja nagljadnost' kak sredstvo formirovanija u mladshix shkol'nikov grammaticheskix znanij* [*Graphical Image as a Means to Develop Grammar Awareness in Younger Schoolchildren*]. Ph.D. dissertation, SPbGPU, Saint-Petersburg.

Karoljak, Stanislav, ed. 1995. *Semantika i struktura slavjanskogo vida* [*Semantics and Structure of the Slavic Aspect*], *Vol. 1–2.* Kraków.

Lehmann, V. 1988. 'Der russische Aspekt und die lexikalische Bedeutung des Verbs [*The Russian Aspect and the Lexical Meaning of Verb*]'. *ZSlPh*, 48:1.

Lomov, Anatolij M. 1977. *Ocherki po russkoj aspektologii* [*Essays in the Russian Aspectology*]. Voronezh: Voronezh University Press.

Maslov, Yurij S. 1984. *Ocherki po aspektologii* [*Essays in Aspectology*]. Leningrad: Leningrad University Press.

Paducheva, Elena V. 1996. *Semanticheskie issledovanija: Semantika vremeni i vida v russkom jazyke. Semantika narrativa* [*Semantic Studies: Tense and Aspect Semantics in the Russian Language. The Semantics of Narrative*]. Moscow: Shkola 'Jazyki russkoj kul'tury'.

Pertsov, N. V. 1998. 'Russkij vid: slovoizmenenie ili slovoobrazovanie [The Russian Aspect: Inflection vs. Derivation]'. Chertkova 1998. 343–56.

Slobin, Dan I. 1973. 'Cognitive Prerequisites for the Development of Grammar'. *Studies of Child Language Development*, ed. by C. A.Ferguson and Dan I. Slobin, 175–208. New York: Holt, Rinehart and Winston.

Yaszay, L. 1997. 'O principax vydelenija vidovoj pary v russkom jazyke [Determining Russian Aspectual Pairs]'. *Voprosy jazykoznanija* 4.70–84.

Zaliznjak, Anna A. and Aleksej D. Shmelev. 2000. *Vvedenie v russkuju aspektologiju.* [*Introduction to the Russian Aspectology*]. Moscow: Shkola 'Jazyki russkoj kul′tury'.

Language index

Subject index

CURRENT ISSUES IN LINGUISTIC THEORY

E. F. K. Koerner, Editor
Department of Linguistics, University of Ottawa
OTTAWA, Canada K1N 6N5
koerner@uottawa.ca

The *Current Issues in Linguistic Theory* (CILT) series is a theory-oriented series which welcomes contributions from scholars who have significant proposals to make towards the advancement of our understanding of language, its structure, functioning and development. CILT has been established in order to provide a forum for the presentation and discussion of linguistic opinions of scholars who do not necessarily accept the prevailing mode of thought in linguistic science. It offers an alternative outlet for meaningful contributions to the current linguistic debate, and furnishes the diversity of opinion which a healthy discipline must have. In this series the following volumes have been published thus far or are scheduled for publication:

1. KOERNER, Konrad (ed.): *The Transformational-Generative Paradigm and Modern Linguistic Theory*. 1975.
2. WEIDERT, Alfons: *Componential Analysis of Lushai Phonology.* 1975.
3. MAHER, J. Peter: *Papers on Language Theory and History I: Creation and Tradition in Language. Foreword by Raimo Anttila.* 1979.
4. HOPPER, Paul J. (ed.): *Studies in Descriptive and Historical Linguistics. Festschrift for Winfred P. Lehmann.* 1977.
5. ITKONEN, Esa: *Grammatical Theory and Metascience: A critical investigation into the methodological and philosophical foundations of 'autonomous' linguistics.* 1978.
6. ANTTILA, Raimo: *Historical and Comparative Linguistics.* 1989.
7. MEISEL, Jürgen M. & Martin D. PAM (eds): *Linear Order and Generative Theory.* 1979.
8. WILBUR, Terence H.: *Prolegomena to a Grammar of Basque.* 1979.
9. HOLLIEN, Harry & Patricia (eds): *Current Issues in the Phonetic Sciences. Proceedings of the IPS-77 Congress, Miami Beach, Florida, 17-19 December 1977.* 1979.
10. PRIDEAUX, Gary D. (ed.): *Perspectives in Experimental Linguistics. Papers from the University of Alberta Conference on Experimental Linguistics, Edmonton, 13-14 Oct. 1978.* 1979.
11. BROGYANYI, Bela (ed.): *Studies in Diachronic, Synchronic, and Typological Linguistics: Festschrift for Oswald Szemérenyi on the Occasion of his 65th Birthday.* 1979.
12. FISIAK, Jacek (ed.): *Theoretical Issues in Contrastive Linguistics.* 1981. Out of print
13. MAHER, J. Peter, Allan R. BOMHARD & Konrad KOERNER (eds): *Papers from the Third International Conference on Historical Linguistics, Hamburg, August 22-26 1977.* 1982.
14. TRAUGOTT, Elizabeth C., Rebecca LaBRUM & Susan SHEPHERD (eds): *Papers from the Fourth International Conference on Historical Linguistics, Stanford, March 26-30 1979.* 1980.
15. ANDERSON, John (ed.): *Language Form and Linguistic Variation. Papers dedicated to Angus McIntosh.* 1982.
16. ARBEITMAN, Yoël L. & Allan R. BOMHARD (eds): *Bono Homini Donum: Essays in Historical Linguistics, in Memory of J.Alexander Kerns.* 1981.
17. LIEB, Hans-Heinrich: *Integrational Linguistics. 6 volumes. Vol. II-VI n.y.p.* 1984/93.
18. IZZO, Herbert J. (ed.): *Italic and Romance. Linguistic Studies in Honor of Ernst Pulgram.* 1980.
19. RAMAT, Paolo et al. (eds): *Linguistic Reconstruction and Indo-European Syntax. Proceedings of the Colloquium of the 'Indogermanischhe Gesellschaft'. University of Pavia, 6-7 September 1979.* 1980.
20. NORRICK, Neal R.: *Semiotic Principles in Semantic Theory.* 1981.
21. AHLQVIST, Anders (ed.): *Papers from the Fifth International Conference on Historical Linguistics, Galway, April 6-10 1981.* 1982.

22. UNTERMANN, Jürgen & Bela BROGYANYI (eds): *Das Germanische und die Rekonstruktion der Indogermanischen Grundsprache. Akten des Freiburger Kolloquiums der Indogermanischen Gesellschaft, Freiburg, 26-27 Februar 1981*. 1984.
23. DANIELSEN, Niels: *Papers in Theoretical Linguistics. Edited by Per Baerentzen*. 1992.
24. LEHMANN, Winfred P. & Yakov MALKIEL (eds): *Perspectives on Historical Linguistics. Papers from a conference held at the meeting of the Language Theory Division, Modern Language Assn., San Francisco, 27-30 December 1979*. 1982.
25. ANDERSEN, Paul Kent: *Word Order Typology and Comparative Constructions*. 1983.
26. BALDI, Philip (ed.): *Papers from the XIIth Linguistic Symposium on Romance Languages, Univ. Park, April 1-3, 1982*. 1984.
27. BOMHARD, Alan R.: *Toward Proto-Nostratic. A New Approach to the Comparison of Proto-Indo-European and Proto-Afroasiatic. Foreword by Paul J. Hopper*. 1984.
28. BYNON, James (ed.): *Current Progress in Afro-Asiatic Linguistics: Papers of the Third International Hamito-Semitic Congress, London, 1978*. 1984.
29. PAPROTTÉ, Wolf & René DIRVEN (eds): *The Ubiquity of Metaphor: Metaphor in language and thought*. 1985 (publ. 1986).
30. HALL, Robert A. Jr.: *Proto-Romance Morphology. = Comparative Romance Grammar, vol. III*. 1984.
31. GUILLAUME, Gustave: *Foundations for a Science of Language.*
32. COPELAND, James E. (ed.): *New Directions in Linguistics and Semiotics*. Co-edition with Rice University Press who hold exclusive rights for US and Canada. 1984.
33. VERSTEEGH, Kees: *Pidginization and Creolization. The Case of Arabic*. 1984.
34. FISIAK, Jacek (ed.): *Papers from the VIth International Conference on Historical Linguistics, Poznan, 22-26 August. 1983*. 1985.
35. COLLINGE, N.E.: *The Laws of Indo-European*. 1985.
36. KING, Larry D. & Catherine A. MALEY (eds): *Selected papers from the XIIIth Linguistic Symposium on Romance Languages, Chapel Hill, N.C., 24-26 March 1983*. 1985.
37. GRIFFEN, T.D.: *Aspects of Dynamic Phonology*. 1985.
38. BROGYANYI, Bela & Thomas KRÖMMELBEIN (eds): *Germanic Dialects:Linguistic and Philological Investigations*. 1986.
39. BENSON, James D., Michael J. CUMMINGS, & William S. GREAVES (eds): *Linguistics in a Systemic Perspective*. 1988.
40. FRIES, Peter Howard (ed.) in collaboration with Nancy M. Fries: *Toward an Understanding of Language: Charles C. Fries in Perspective*. 1985.
41. EATON, Roger, et al. (eds): *Papers from the 4th International Conference on English Historical Linguistics, April 10-13, 1985*. 1985.
42. MAKKAI, Adam & Alan K. MELBY (eds): *Linguistics and Philosophy. Festschrift for Rulon S. Wells*. 1985 (publ. 1986).
43. AKAMATSU, Tsutomu: *The Theory of Neutralization and the Archiphoneme in Functional Phonology*. 1988.
44. JUNGRAITHMAYR, Herrmann & Walter W. MUELLER (eds): *Proceedings of the Fourth International Hamito-Semitic Congress*. 1987.
45. KOOPMAN, W.F., F.C. Van der LEEK , O. FISCHER & R. EATON (eds): *Explanation and Linguistic Change*. 1986
46. PRIDEAUX, Gary D. & William J. BAKER: *Strategies and Structures: The processing of relative clauses*. 1987.
47. LEHMANN, Winfred P. (ed.): *Language Typology 1985. Papers from the Linguistic Typology Symposium, Moscow, 9-13 Dec. 1985*. 1986.
48. RAMAT, Anna G., Onofrio CARRUBA and Giuliano BERNINI (eds): *Papers from the 7th International Conference on Historical Linguistics*. 1987.
49. WAUGH, Linda R. and Stephen RUDY (eds): *New Vistas in Grammar: Invariance and*

Variation. Proceedings of the Second International Roman Jakobson Conference, New York University, Nov.5-8, 1985. 1991.

50. RUDZKA-OSTYN, Brygida (ed.): *Topics in Cognitive Linguistics.* 1988.
51. CHATTERJEE, Ranjit: *Aspect and Meaning in Slavic and Indic. With a foreword by Paul Friedrich.* 1989.
52. FASOLD, Ralph W. & Deborah SCHIFFRIN (eds): *Language Change and Variation.* 1989.
53. SANKOFF, David: *Diversity and Diachrony.* 1986.
54. WEIDERT, Alfons: *Tibeto-Burman Tonology. A comparative analysis.* 1987
55. HALL, Robert A. Jr.: *Linguistics and Pseudo-Linguistics.* 1987.
56. HOCKETT, Charles F.: *Refurbishing our Foundations. Elementary linguistics from an advanced point of view.* 1987.
57. BUBENIK, Vít: *Hellenistic and Roman Greece as a Sociolinguistic Area.* 1989.
58. ARBEITMAN, Yoël. L. (ed.): *Fucus: A Semitic/Afrasian Gathering in Remembrance of Albert Ehrman.* 1988.
59. VAN VOORST, Jan: *Event Structure.* 1988.
60. KIRSCHNER, Carl & Janet DECESARIS (eds): *Studies in Romance Linguistics. Selected Proceedings from the XVII Linguistic Symposium on Romance Languages.* 1989.
61. CORRIGAN, Roberta L., Fred ECKMAN & Michael NOONAN (eds): *Linguistic Categorization. Proceedings of an International Symposium in Milwaukee, Wisconsin, April 10-11, 1987.* 1989.
62. FRAJZYNGIER, Zygmunt (ed.): *Current Progress in Chadic Linguistics. Proceedings of the International Symposium on Chadic Linguistics, Boulder, Colorado, 1-2 May 1987.* 1989.
63. EID, Mushira (ed.): *Perspectives on Arabic Linguistics I. Papers from the First Annual Symposium on Arabic Linguistics.* 1990.
64. BROGYANYI, Bela (ed.): *Prehistory, History and Historiography of Language, Speech, and Linguistic Theory. Papers in honor of Oswald Szemérenyi I.* 1992.
65. ADAMSON, Sylvia, Vivien A. LAW, Nigel VINCENT and Susan WRIGHT (eds): *Papers from the 5th International Conference on English Historical Linguistics.* 1990.
66. ANDERSEN, Henning and Konrad KOERNER (eds): *Historical Linguistics 1987.Papers from the 8th International Conference on Historical Linguistics,Lille, August 30-Sept., 1987.* 1990.
67. LEHMANN, Winfred P. (ed.): *Language Typology 1987. Systematic Balance in Language. Papers from the Linguistic Typology Symposium, Berkeley, 1-3 Dec 1987.* 1990.
68. BALL, Martin, James FIFE, Erich POPPE &Jenny ROWLAND (eds): *Celtic Linguistics/ Ieithyddiaeth Geltaidd. Readings in the Brythonic Languages. Festschrift for T. Arwyn Watkins.* 1990.
69. WANNER, Dieter and Douglas A. KIBBEE (eds): *New Analyses in Romance Linguistics. Selected papers from the Linguistic Symposium on Romance Languages XVIIII, Urbana-Champaign, April 7-9, 1988.* 1991.
70. JENSEN, John T.: *Morphology. Word structure in generative grammar.* 1990.
71. O'GRADY, William: *Categories and Case. The sentence structure of Korean.* 1991.
72. EID, Mushira and John MCCARTHY (eds): *Perspectives on Arabic Linguistics II. Papers from the Second Annual Symposium on Arabic Linguistics.* 1990.
73. STAMENOV, Maxim (ed.): *Current Advances in Semantic Theory.* 1991.
74. LAEUFER, Christiane and Terrell A. MORGAN (eds): *Theoretical Analyses in Romance Linguistics.* 1991.
75. DROSTE, Flip G. and John E. JOSEPH (eds): *Linguistic Theory and Grammatical Description. Nine Current Approaches.* 1991.
76. WICKENS, Mark A.: *Grammatical Number in English Nouns. An empirical and theoretical account.* 1992.
77. BOLTZ, William G. and Michael C. SHAPIRO (eds): *Studies in the Historical Phonology of Asian Languages.* 1991.

78. KAC, Michael: *Grammars and Grammaticality.* 1992.
79. ANTONSEN, Elmer H. and Hans Henrich HOCK (eds): *STAEF-CRAEFT: Studies in Germanic Linguistics. Select papers from the First and Second Symposium on Germanic Linguistics, University of Chicago, 24 April 1985, and Univ. of Illinois at Urbana-Champaign, 3-4 Oct. 1986.* 1991.
80. COMRIE, Bernard and Mushira EID (eds): *Perspectives on Arabic Linguistics III. Papers from the Third Annual Symposium on Arabic Linguistics.* 1991.
81. LEHMANN, Winfred P. and H.J. HEWITT (eds): *Language Typology 1988. Typological Models in the Service of Reconstruction.* 1991.
82. VAN VALIN, Robert D. (ed.): *Advances in Role and Reference Grammar.* 1992.
83. FIFE, James and Erich POPPE (eds): *Studies in Brythonic Word Order.* 1991.
84. DAVIS, Garry W. and Gregory K. IVERSON (eds): *Explanation in Historical Linguistics.* 1992.
85. BROSELOW, Ellen, Mushira EID and John McCARTHY (eds): *Perspectives on Arabic Linguistics IV. Papers from the Annual Symposium on Arabic Linguistics.* 1992.
86. KESS, Joseph F.: *Psycholinguistics. Psychology, linguistics, and the study of natural language.* 1992.
87. BROGYANYI, Bela and Reiner LIPP (eds): *Historical Philology: Greek, Latin, and Romance. Papers in honor of Oswald Szemerényi II.* 1992.
88. SHIELDS, Kenneth: *A History of Indo-European Verb Morphology.* 1992.
89. BURRIDGE, Kate: *Syntactic Change in Germanic. A study of some aspects of language change in Germanic with particular reference to Middle Dutch.* 1992.
90. KING, Larry D.: *The Semantic Structure of Spanish. Meaning and grammatical form.* 1992.
91. HIRSCHBÜHLER, Paul and Konrad KOERNER (eds): *Romance Languages and Modern Linguistic Theory. Selected papers from the XX Linguistic Symposium on Romance Languages,University of Ottawa, April 10-14, 1990.* 1992.
92. POYATOS, Fernando: *Paralanguage: A linguistic and interdisciplinary approach to interactive speech and sounds.* 1992.
93. LIPPI-GREEN, Rosina (ed.): *Recent Developments in Germanic Linguistics.* 1992.
94. HAGÈGE, Claude: *The Language Builder. An essay on the human signature in linguistic morphogenesis.* 1992.
95. MILLER, D. Gary: *Complex Verb Formation.* 1992.
96. LIEB, Hans-Heinrich (ed.): *Prospects for a New Structuralism.* 1992.
97. BROGYANYI, Bela & Reiner LIPP (eds): *Comparative-Historical Linguistics: Indo-European and Finno-Ugric. Papers in honor of Oswald Szemerényi III.* 1992.
98. EID, Mushira & Gregory K. IVERSON: *Principles and Prediction: The analysis of natural language.* 1993.
99. JENSEN, John T.: *English Phonology.* 1993.
100. MUFWENE, Salikoko S. and Lioba MOSHI (eds): *Topics in African Linguistics. Papers from the XXI Annual Conference on African Linguistics, University of Georgia, April 1990.* 1993.
101. EID, Mushira & Clive HOLES (eds): *Perspectives on Arabic Linguistics V. Papers from the Fifth Annual Symposium on Arabic Linguistics.* 1993.
102. DAVIS, Philip W. (ed.): *Alternative Linguistics. Descriptive and theoretical Modes.* 1995.
103. ASHBY, William J., Marianne MITHUN, Giorgio PERISSINOTTO and Eduardo RAPOSO: *Linguistic Perspectives on Romance Languages. Selected papers from the XXI Linguistic Symposium on Romance Languages, Santa Barbara, February 21-24, 1991.* 1993.
104. KURZOVÁ, Helena: *From Indo-European to Latin. The evolution of a morphosyntactic type.* 1993.
105. HUALDE, José Ignacio and Jon ORTIZ DE URBANA (eds): *Generative Studies in Basque Linguistics.* 1993.
106. AERTSEN, Henk and Robert J. JEFFERS (eds): *Historical Linguistics 1989. Papers from the 9th International Conference on Historical Linguistics, New Brunswick, 14-18 August 1989.* 1993.

107. MARLE, Jaap van (ed.): *Historical Linguistics 1991. Papers from the 10th International Conference on Historical Linguistics, Amsterdam, August 12-16, 1991.* 1993.
108. LIEB, Hans-Heinrich: *Linguistic Variables. Towards a unified theory of linguistic variation.* 1993.
109. PAGLIUCA, William (ed.): *Perspectives on Grammaticalization.* 1994.
110. SIMONE, Raffaele (ed.): *Iconicity in Language.* 1995.
111. TOBIN, Yishai: *Invariance, Markedness and Distinctive Feature Analysis. A contrastive study of sign systems in English and Hebrew.* 1994.
112. CULIOLI, Antoine: *Cognition and Representation in Linguistic Theory. Translated, edited and introduced by Michel Liddle.* 1995.
113. FERNÁNDEZ, Francisco, Miguel FUSTER and Juan Jose CALVO (eds): *English Historical Linguistics 1992. Papers from the 7th International Conference on English Historical Linguistics, Valencia, 22-26 September 1992.*1994.
114. EGLI, U., P. PAUSE, Chr. SCHWARZE, A. von STECHOW, G. WIENOLD (eds): *Lexical Knowledge in the Organisation of Language.* 1995.
115. EID, Mushira, Vincente CANTARINO and Keith WALTERS (eds): *Perspectives on Arabic Linguistics. Vol. VI. Papers from the Sixth Annual Symposium on Arabic Linguistics.* 1994.
116. MILLER, D. Gary: *Ancient Scripts and Phonological Knowledge.* 1994.
117. PHILIPPAKI-WARBURTON, I., K. NICOLAIDIS and M. SIFIANOU (eds): *Themes in Greek Linguistics. Papers from the first International Conference on Greek Linguistics, Reading, September 1993.* 1994.
118. HASAN, Ruqaiya and Peter H. FRIES (eds): *On Subject and Theme. A discourse functional perspective.* 1995.
119. LIPPI-GREEN, Rosina: *Language Ideology and Language Change in Early Modern German. A sociolinguistic study of the consonantal system of Nuremberg.* 1994.
120. STONHAM, John T. : *Combinatorial Morphology.* 1994.
121. HASAN, Ruqaiya, Carmel CLORAN and David BUTT (eds): *Functional Descriptions. Theorie in practice.* 1996.
122. SMITH, John Charles and Martin MAIDEN (eds): *Linguistic Theory and the Romance Languages.* 1995.
123. AMASTAE, Jon, Grant GOODALL, Mario MONTALBETTI and Marianne PHINNEY: *Contemporary Research in Romance Linguistics. Papers from the XXII Linguistic Symposium on Romance Languages, El Paso//Juárez, February 22-24, 1994.* 1995.
124. ANDERSEN, Henning: *Historical Linguistics 1993. Selected papers from the 11th International Conference on Historical Linguistics, Los Angeles, 16-20 August 1993.* 1995.
125. SINGH, Rajendra (ed.): *Towards a Critical Sociolinguistics.* 1996.
126. MATRAS, Yaron (ed.): *Romani in Contact. The history, structure and sociology of a language.* 1995.
127. GUY, Gregory R., Crawford FEAGIN, Deborah SCHIFFRIN and John BAUGH (eds): *Towards a Social Science of Language. Papers in honor of William Labov. Volume 1: Variation and change in language and society.* 1996.
128. GUY, Gregory R., Crawford FEAGIN, Deborah SCHIFFRIN and John BAUGH (eds): *Towards a Social Science of Language. Papers in honor of William Labov. Volume 2: Social interaction and discourse structures.* 1997.
129. LEVIN, Saul: *Semitic and Indo-European: The Principal Etymologies. With observations on Afro-Asiatic.* 1995.
130. EID, Mushira (ed.) *Perspectives on Arabic Linguistics. Vol. VII. Papers from the Seventh Annual Symposium on Arabic Linguistics.* 1995.
131. HUALDE, Jose Ignacio, Joseba A. LAKARRA and R.L. Trask (eds): *Towards a History of the Basque Language.* 1995.

132. HERSCHENSOHN, Julia: *Case Suspension and Binary Complement Structure in French.* 1996.
133. ZAGONA, Karen (ed.): *Grammatical Theory and Romance Languages. Selected papers from the 25th Linguistic Symposium on Romance Languages (LSRL XXV) Seattle, 2-4 March 1995.* 1996.
134. EID, Mushira (ed.): *Perspectives on Arabic Linguistics Vol. VIII. Papers from the Eighth Annual Symposium on Arabic Linguistics.* 1996.
135. BRITTON Derek (ed.): *Papers from the 8th International Conference on English Historical Linguistics.* 1996.
136. MITKOV, Ruslan and Nicolas NICOLOV (eds): *Recent Advances in Natural Language Processing.* 1997.
137. LIPPI-GREEN, Rosina and Joseph C. SALMONS (eds): *Germanic Linguistics. Syntactic and diachronic.* 1996.
138. SACKMANN, Robin (ed.): *Theoretical Linguistics and Grammatical Description.* 1996.
139. BLACK, James R. and Virginia MOTAPANYANE (eds): *Microparametric Syntax and Dialect Variation.* 1996.
140. BLACK, James R. and Virginia MOTAPANYANE (eds): *Clitics, Pronouns and Movement.* 1997.
141. EID, Mushira and Dilworth PARKINSON (eds): *Perspectives on Arabic Linguistics Vol. IX. Papers from the Ninth Annual Symposium on Arabic Linguistics, Georgetown University, Washington D.C., 1995.* 1996.
142. JOSEPH, Brian D. and Joseph C. SALMONS (eds): *Nostratic. Sifting the evidence.* 1998.
143. ATHANASIADOU, Angeliki and René DIRVEN (eds): *On Conditionals Again.* 1997.
144. SINGH, Rajendra (ed): *Trubetzkoy's Orphan. Proceedings of the Montréal Roundtable "Morphophonology: contemporary responses (Montréal, October 1994).* 1996.
145. HEWSON, John and Vit BUBENIK: *Tense and Aspect in Indo-European Languages. Theory, typology, diachrony.* 1997.
146. HINSKENS, Frans, Roeland VAN HOUT and W. Leo WETZELS (eds): *Variation, Change, and Phonological Theory.* 1997.
147. HEWSON, John: *The Cognitive System of the French Verb.* 1997.
148. WOLF, George and Nigel LOVE (eds): *Linguistics Inside Out. Roy Harris and his critics.* 1997.
149. HALL, T. Alan: *The Phonology of Coronals.* 1997.
150. VERSPOOR, Marjolijn, Kee Dong LEE and Eve SWEETSER (eds): *Lexical and Syntactical Constructions and the Construction of Meaning. Proceedings of the Bi-annual ICLA meeting in Albuquerque, July 1995.* 1997.
151. LIEBERT, Wolf-Andreas, Gisela REDEKER and Linda WAUGH (eds): *Discourse and Perspectives in Cognitive Linguistics.* 1997.
152. HIRAGA, Masako, Chris SINHA and Sherman WILCOX (eds): *Cultural, Psychological and Typological Issues in Cognitive Linguistics.* 1999.
153. EID, Mushira and Robert R. RATCLIFFE (eds): *Perspectives on Arabic Linguistics Vol. X. Papers from the Tenth Annual Symposium on Arabic Linguistics, Salt Lake City, 1996.* 1997.
154. SIMON-VANDENBERGEN, Anne-Marie, Kristin DAVIDSE and Dirk NOËL (eds): *Reconnecting Language. Morphology and Syntax in Functional Perspectives.* 1997.
155. FORGET, Danielle, Paul HIRSCHBÜHLER, France MARTINEAU and María-Luisa RIVERO (eds): *Negation and Polarity. Syntax and semantics. Selected papers from the Colloquium Negation: Syntax and Semantics. Ottawa, 11-13 May 1995.* 1997.
156. MATRAS, Yaron, Peter BAKKER and Hristo KYUCHUKOV (eds): *The Typology and Dialectology of Romani.* 1997.
157. LEMA, José and Esthela TREVIÑO (eds): *Theoretical Analyses on Romance Languages. Selected papers from the 26th Linguistic Symposium on Romance Languages (LSRL XXVI), Mexico City, 28-30 March, 1996.* 1998.
158. SÁNCHEZ MACARRO, Antonia and Ronald CARTER (eds): *Linguistic Choice across Genres. Variation in spoken and written English.* 1998.

159. JOSEPH, Brian D., Geoffrey C. HORROCKS and Irene PHILIPPAKI-WARBURTON (eds): *Themes in Greek Linguistics II.* 1998.
160. SCHWEGLER, Armin, Bernard TRANEL and Myriam URIBE-ETXEBARRIA (eds): *Romance Linguistics: Theoretical Perspectives. Selected papers from the 27th Linguistic Symposium on Romance Languages (LSRL XXVII), Irvine, 20-22 February, 1997.* 1998.
161. SMITH, John Charles and Delia BENTLEY (eds): *Historical Linguistics 1995. Volume 1: Romance and general linguistics.* 2000.
162. HOGG, Richard M. and Linda van BERGEN (eds): *Historical Linguistics 1995. Volume 2: Germanic linguistics.Selected papers from the 12th International Conference on Historical Linguistics, Manchester, August 1995.* 1998.
163. LOCKWOOD, David G., Peter H. FRIES and James E. COPELAND (eds): *Functional Approaches to Language, Culture and Cognition.* 2000.
164. SCHMID, Monika, Jennifer R. AUSTIN and Dieter STEIN (eds): *Historical Linguistics 1997. Selected papers from the 13th International Conference on Historical Linguistics, Düsseldorf, 10-17 August 1997.* 1998.
165. BUBENÍK, Vit: *A Historical Syntax of Late Middle Indo-Aryan (Apabhraṁśa).* 1998.
166. LEMMENS, Maarten: *Lexical Perspectives on Transitivity and Ergativity. Causative constructions in English.* 1998.
167. BENMAMOUN, Elabbas, Mushira EID and Niloofar HAERI (eds): *Perspectives on Arabic Linguistics Vol. XI. Papers from the Eleventh Annual Symposium on Arabic Linguistics, Atlanta, 1997.* 1998.
168. RATCLIFFE, Robert R.: *The "Broken" Plural Problem in Arabic and Comparative Semitic. Allomorphy and analogy in non-concatenative morphology.* 1998.
169. GHADESSY, Mohsen (ed.): *Text and Context in Functional Linguistics.* 1999.
170. LAMB, Sydney M.: *Pathways of the Brain. The neurocognitive basis of language.* 1999.
171. WEIGAND, Edda (ed.): *Contrastive Lexical Semantics.* 1998.
172. DIMITROVA-VULCHANOVA, Mila and Lars HELLAN (eds): *Topics in South Slavic Syntax and Semantics.* 1999.
173. TREVIÑO, Esthela and José LEMA (eds): Semantic Issues in Romance Syntax. 1999.
174. HALL, T. Alan and Ursula KLEINHENZ (eds): *Studies on the Phonological Word.* 1999.
175. GIBBS, Ray W. and Gerard J. STEEN (eds): *Metaphor in Cognitive Linguistics. Selected papers from the 5th International Cognitive Linguistics Conference, Amsterdam, 1997.* 2001.
176. VAN HOEK, Karen, Andrej KIBRIK and Leo NOORDMAN (eds): *Discourse in Cognitive Linguistics. Selected papers from the International Cognitive Linguistics Conference, Amsterdam, July 1997.* 1999.
177. CUYCKENS, Hubert and Britta ZAWADA (eds): *Polysemy in Cognitive Linguistics. Selected papers from the International Cognitive Linguistics Conference, Amsterdam, 1997.* 2001.
178. FOOLEN, Ad and Frederike van der LEEK (eds): *Constructions in Cognitive Linguistics. Selected papers from the Fifth International Cognitive Linguistic Conference, Amsterdam, 1997.* 2000.
179. RINI, Joel: *Exploring the Role of Morphology in the Evolution of Spanish.* 1999.
180. MEREU, Lunella (ed.): *Boundaries of Morphology and Syntax.* 1999.
181. MOHAMMAD, Mohammad A.: *Word Order, Agreement and Pronominalization in Standard and Palestinian Arabic.* 2000.
182. KENESEI, István (ed.): *Theoretical Issues in Eastern European Languages. Selected papers from the Conference on Linguistic Theory in Eastern European Languages (CLITE), Szeged, April 1998.* 1999.
183. CONTINI-MORAVA, Ellen and Yishai TOBIN (eds): *Between Grammar and Lexicon.* 2000.
184. SAGART, Laurent: *The Roots of Old Chinese.* 1999.
185. AUTHIER, J.-Marc, Barbara E. BULLOCK, Lisa A. REED (eds): *Formal Perspectives on Romance Linguistics. Selected papers from the 28th Linguistic Symposium on Romance Languages (LSRL XXVIII), University Park, 16-19 April 1998.* 1999.

186. MIŠESKA TOMIĆ, Olga and Milorad RADOVANOVIĆ (eds): *History and Perspectives of Language Study.* 2000.
187. FRANCO, Jon, Alazne LANDA and Juan MARTÍN (eds): *Grammatical Analyses in Basque and Romance Linguistics.* 1999.
188. VanNESS SIMMONS, Richard: *Chinese Dialect Classification. A comparative approach to Harngjou, Old Jintarn, and Common Northern Wu.* 1999.
189. NICHOLOV, Nicolas and Ruslan MITKOV (eds): *Recent Advances in Natural Language Processing II. Selected papers from RANLP '97.* 2000.
190. BENMAMOUN, Elabbas (ed.): *Perspectives on Arabic Linguistics Vol. XII. Papers from the Twelfth Annual Symposium on Arabic Linguistics.* 1999.
191. SIHLER, Andrew L.: *Language Change. An introduction.* 2000.
192. ALEXANDROVA, Galina M. and Olga ARNAUDOVA (eds.): *The Minimalist Parameter. Selected papers from the Open Linguistics Forum, Ottawa, 21-23 March 1997.* 2001.
193. KLAUSENBURGER, Jurgen: *Grammaticalization. Studies in Latin and Romance morphosyntax.* 2000.
194. COLEMAN, Julie and Christian J. KAY (eds): *Lexicology, Semantics and Lexicography. Selected papers from the Fourth G. L. Brook Symposium, Manchester, August 1998.* 2000.
195. HERRING, Susan C., Pieter van REENEN and Lene SCHØSLER (eds): *Textual Parameters in Older Languages.* 2000.
196. HANNAHS, S. J. and Mike DAVENPORT (eds): *Issues in Phonological Structure. Papers from an International Workshop.* 1999.
197. COOPMANS, Peter, Martin EVERAERT and Jane GRIMSHAW (eds): *Lexical Specification and Insertion.* 2000.
198. NIEMEIER, Susanne and René DIRVEN (eds): *Evidence for Linguistic Relativity.* 2000.
199. PÜTZ, Martin and Marjolijn H. VERSPOOR (eds): *Explorations in Linguistic Relativity.* 2000.
200. ANTTILA, Raimo: *Greek and Indo-European Etymology in Action. Proto-Indo-European *aǵ-* .2000.
201. DRESSLER, Wolfgang U., Oskar E. PFEIFFER, Markus PÖCHTRAGER and John R. RENNISON (eds.): *Morphological Analysis in Comparison.* 2000.
202. LECARME, Jacqueline, Jean LOWENSTAMM and Ur SHLONSKY (eds.): *Research in Afroasiatic Grammar. Papers from the Third conference on Afroasiatic Languages, Sophia Antipolis, 1996.* 2000.
203. NORRICK, Neal R.: *Conversational Narrative. Storytelling in everyday talk.* 2000.
204. DIRVEN, René, Bruce HAWKINS and Esra SANDIKCIOGLU (eds.): *Language and Ideology. Volume 1: cognitive theoretical approaches.* 2001.
205. DIRVEN, René, Roslyn FRANK and Cornelia ILIE (eds.): *Language and Ideology. Volume 2: cognitive descriptive approaches.* 2001.
206. FAWCETT, Robin: *A Theory of Syntax for Systemic-Functional Linguistics.* 2000.
207. SANZ, Montserrat: *Events and Predication. A new approach to syntactic processing in English and Spanish.* 2000.
208. ROBINSON, Orrin W.: *Whose German? The ach/ich alternation and related phenomena in 'standard' and 'colloquial'.* 2001.
209. KING, Ruth: *The Lexical Basis of Grammatical Borrowing. A Prince Edward Island French case study.* 2000.
210. DWORKIN, Steven N. and Dieter WANNER (eds.): *New Approaches to Old Problems. Issues in Romance historical linguistics.* 2000.
211. ELŠÍK, Viktor and Yaron MATRAS (eds.): *Grammatical Relations in Romani. The Noun Phrase.* 2000.
212. REPETTI, Lori (ed.): *Phonological Theory and the Dialects of Italy.* 2000.
213. SORNICOLA, Rosanna, Erich POPPE and Ariel SHISHA-HALEVY (eds.): *Stability, Variation and Change of Word-Order Patterns over Time.* 2000.
214. WEIGAND, Edda and Marcelo DASCAL (eds.): *Negotiation and Power in Dialogic Interaction.* 2001.