Optimality-Theoretic Morphology

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Igra 07: Topics in Morphology

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I. Introduction: Morphology as a Separate Component of Grammar

1. Background

Central assumption:
Inflectional morphology is closely related to syntactic structure, but there are cases where morphology does not share the same vocabulary with syntax (morphomic features, underspecified features), and there are other areas where principles or constraints are relevant for morphology that seem to play no role in syntax. Therefore, the null hypothesis in (1) that morphology = syntax, just applied to smaller linguistic objects, cannot be maintained.

(1) *The morphology = syntax assumption*:
"The alternative [to theories that envisage a separate morphological component] would be to reject the additional non-syntactic assumptions, and push the syntactic program that we have been discussing as far as possible. [...] There are just different morphemes and [...] these somehow interfere with one another when syntactic structure is built, but there is no competition, no ordering of morphemes, no duplication of syntactic features in terminals and vocabulary items, no extra mechanism of vocabulary insertion (as yet unformalized)." (Chris Collins on fb, 2016)

2. Morpho-Syntactic Features between Morphology and Syntax

Morphology:
Inventory of inflection markers (exponents)

Syntax:
Distribution of inflection markers (exponents)

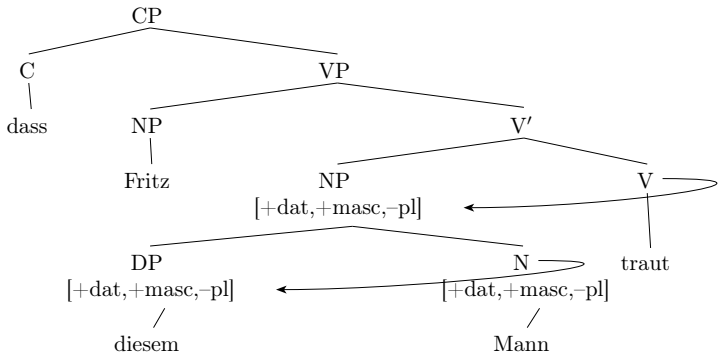
Paradigm 1: Pronominal inflection in German

	[−pl]			[+pl]		
	[+masc]	[+neut]	[+fem]	[+masc]	[+neut]	[+fem]
[+nom]	-er	-es	-e	-e	-e	-e
[+acc]	-en	-es	-e	-e	-e	-e
[+dat]	-em	-em	-er	-en	-en	-en
[+gen]	-es	-es	-er	-er	-er	-er

Syntactic structure

(2) dass Fritz diesem Mann traut
that Fritz$_{nom}$ this man$_{dat}$ trusts

(3)



Observation:
Here it looks as though one could assume that the morpho-syntactic features that are relevant in the morphological component (inventory) and the morpho-syntactic features that are relevant in the syntax (distribution) are identical.

3. Asymmetries

Problem:
There are asymmetries between morphology and syntax with respect to morpho-syntactic features. Two examples:
(i) *Inflection class features* are relevant in morphology, but irrelevant in syntax. These features thus qualify as *morphomic* (Aronoff (1994)).
(ii) *Underspecification* is relevant in morphology, but (typically) not in syntayx.

Paradigm 2: Russian noun inflection, inflection class [1], singular : [+masc]

	I		
	$zavod_m$ ('factory')	$student_m$ ('student')	$žitel_m$ ('inhabitant')
nom/sg	zavod-Ø	student-Ø	žitel'-Ø
akk/sg	zavod-Ø	student-a	žitel-ja
dat/sg	zavod-u	student-u	žitel-ju
gen/sg	zavod-a	student-a	žitel-ja
inst/sg	zavod-om	student-om	žitel-em
prep/sg	zavod-e	student-e	žitel-e

3.1. Necessity of Inflection Classes

Observation (Aronoff (1994), Corbett & Fraser (1993), Fraser & Corbett (1994), Halle (1994)): Independently motivated features (morpho-syntactic features like gender, phonological features like soft or hard stem ending, semantic features like animacy) do not suffice to correctly predict the inflection class for a given stem in all cases. It seems that specific inflection class

Paradigm 3: Russian noun inflection, inflection class [2], singular: [+fem], [+masc]

	II			
	$komnat_f$ ('room')	$učitel'nic_f$ ('teacher')	$nedel'_f$ ('week')	$mužčin_m$ ('man')
nom/sg	komnat-a	učitel'nic-a	nedel-ja	mužčin-a
akk/sg	komnat-u	učitel'nic-u	nedel-ju	mužčin-u
dat/sg	komnat-e	učitel'nic-e	nedel-e	mužčin-e
gen/sg	komnat-y	učitel'nic-y	nedel-i	mužčin-y
inst/sg	komnat-oj(u)	učitel'nic-ej(u)	nedel-ej(u)	mužčin-oj(u)
prep/sg	komnat-e	učitel'nic-e	nedel-e	mužčin-e

Paradigm 4: Russian noun inflection, inflection class [3], singular: [+fem]

	III		
	tetrad'$_f$ ('notebook')	*myš'*$_f$ ('mouse')	*doč'*$_f$ ('daughter')
nom/sg	tetrad'-Ø	myš'-Ø	doč'-Ø
akk/sg	tetrad'-Ø	myš'-Ø	doč'-Ø
dat/sg	tetrad-i	myš-i	doč-er-i
gen/sg	tetrad-i	myš-i	doč-er-i
inst/sg	tetrad'-ju	myš'-ju	doč-er'-ju
prep/sg	tetrad-i	myš-i	doč-er-i

features on stems are unavoidable.

Observation:
Most of the variation concerns the choice of the plural marker. However, in the singular, too, inflection class features must be postulated in order to capture the assignment of stems to inflection classes: strong vs. weak masculine nouns. Again, independently motivated features of stems do not suffice here. (Cf., e.g., [±animate] – see *Dirigent* 'conductor' vs. *Planet* 'planet').

3.2. Syncretism and Underspecification

Observation:
There are many homonymies of inflection markers: *syncretism*. (There is a narrow notion of syncretism: one marker for more than one case. There is also a more general interpretation: formal identity of different cells in any given paradigm. I adopt the latter notion.) It is not a priori clear to what extent syncretism can be viewed as systematic, and to what extent it might be accidental. However, it is uncontroversial that at least some instances of syncretism are not accidental. Consequently, the question arises of how to account for the phenomenon.

Example:
There are 24 different paradigm cells in paradigm 1, but there are only 5 distinct markers: *-e*, *-er*, *-en*, *-es*, *-em*. Thus, there is only one marker for the morpho-syntactic feature specifications [+dat,+masc,–pl] and [+dat,+neut,–pl]: *-em*; and this marker is different from all the other markers in paradigm 1.

Paradigm 5: noun inflection in Russian (simplified)

	[–pl]			[+pl]		
	[1]	[2]	[3]	[1]	[2]	[3]
[+nom]	-Ø	-a	-Ø	-i	-i	-i
[+acc]	-Ø/-a	-u	-Ø	-i/-ov(-ej)	-i/-Ø	-i/-ej
[+dat]	-u	-e	-i	-am	-am	-am
[+gen]	-a	-i	-i	-ov(-ej)	-Ø	-ej
[+inst]	-om	-oj	-ju	-ami	-ami	-ami
[+prep]	-e	-e	-i	-ax	-ax	-ax

Paradigm 6: German noun inflection, inflection classes [1]-[4]

	[1]		[2]	[3]		[4]	
	Hund$_m$ 'dog'	*Schaf*$_n$ 'sheep'	*Baum*$_m$ 'tree'	*Buch*$_n$ 'book'	*Mann*$_m$ 'man'	*Strahl*$_m$ 'ray'	*Auge*$_n$ 'eye'
nom/sg	Hund-Ø	Schaf-Ø	Baum-Ø	Buch-Ø	Mann-Ø	Strahl-Ø	Auge-Ø
acc/sg	Hund-Ø	Schaf-Ø	Baum-Ø	Buch-Ø	Mann-Ø	Strahl-Ø	Auge-Ø
dat/sg	Hund-Ø	Schaf-Ø	Baum-Ø	Buch-Ø	Mann-Ø	Strahl-Ø	Auge-Ø
gen/sg	Hund-es	Schaf-es	Baum-es	Buch-es	Mann-es	Strahl-s	Auge-s
nom/pl	Hund-e	Schaf-e	Bäum-e	Büch-er	Männ-er	Strahl-en	Auge-n
acc/pl	Hund-e	Schaf-e	Bäum-e	Büch-er	Männ-er	Strahl-en	Auge-n
dat/pl	Hund-en	Schaf-en	Bäum-en	Büch-ern	Männ-ern	Strahl-en	Auge-n
gen/pl	Hund-e	Schaf-e	Bäum-e	Büch-er	Männ-er	Strahl-en	Auge-n

Analysis: natural classes and underspecification:
A common basis of the instances of a given syncretism is sought – a property that the different contexts exhibiting an identical marker have in common. This property characterizes a *natural class* of morpho-syntactic specifications. In the case at hand, [+dat,+masc,–pl]- and [+dat,+neut,–pl] contexts differ only with respect to gender information. Assumption: [+masc] and [+neut] form a natural class. Natural classes can be derived from a *decomposition* of the standard morpho-syntactic features into combinations of more abstract primitive features.

(4) *Decomposition of gender features in German*:
- a. masculine = [+masc,–fem]
- b. feminine = [–masc,+fem]
- c. neuter = [–masc,–fem]
- d. [ ] = [+masc,+fem]

Underspecification:
The idea then is that inflection markers do not have to be characterized by fully specified morpho-syntactic features; they can also be characterized by *underspecified* morpho-syntactic information. For instance:

The marker *-em* is not characterized as [+dat,+masc,–fem,–pl] or as [+dat,–masc,–fem,–pl]. Rather, this marker is characterized by a feature specification that is underspecified with

Paradigm 7: German noun inflection, inflection classes [5]-[8]

	[5] *Planet*$_m$ 'planet'	[6] *Ziege*$_f$ 'goat'	[7] *Maus*$_f$ 'mouse'	[8]I *Drangsal*$_f$ 'distress'
nom/sg	Planet-Ø	Ziege-Ø	Maus-Ø	Drangsal-Ø
acc/sg	Planet-en	Ziege-Ø	Maus-Ø	Drangsal-Ø
dat/sg	Planet-en	Ziege-Ø	Maus-Ø	Drangsal-Ø
gen/sg	Planet-en	Ziege-Ø	Maus-Ø	Drangsal-Ø
nom/pl	Planet-en	Ziege-n	Mäus-e	Drangsal-e
acc/pl	Planet-en	Ziege-n	Mäus-e	Drangsal-e
dat/pl	Planet-en	Ziege-n	Mäus-en	Drangsal-en
gen/pl	Planet-en	Ziege-n	Mäus-e	Drangsal-e

Paradigm 8: Noun inflection in German (simplified)

	$[1]_{m,n}$	$[2]_m$	$[3]_{n,m}$	$[4]_{m,n}$	$[5]_m$	$[6]_f$	$[7]_f$	$[8]_f$
[+nom,–pl]	-Ø	-Ø	-Ø	-Ø	-Ø	-Ø	-Ø	-Ø
[+acc,–pl]	-Ø	-Ø	-Ø	-Ø	-(e)n	-Ø	-Ø	-Ø
[+dat,–pl]	-Ø	-Ø	-Ø	-Ø	-(e)n	-Ø	-Ø	-Ø
[+gen,–pl]	-(e)s	-(e)s	-(e)s	-(e)s	-(e)n	-Ø	-Ø	-Ø
[+nom,+pl]	-(e)	-"(e)	-"er	-(e)n	-(e)n	-(e)n	-"(e)	-(e)
[+acc,+pl]	-(e)	-"(e)	-"er	-(e)n	-(e)n	-(e)n	-"(e)	-(e)
[+dat,+pl]	-(e)n	-"(e)n	-"ern	-(e)n	-(e)n	-(e)n	-"(e)n	-(e)n
[+gen,+pl]	-(e)	-"(e)	-"er	-(e)n	-(e)n	-(e)n	-"(e)	-(e)

respect to gender: [+dat,–fem,–pl].

Observation:
The same situation arises with case features. Consider again paradigm 1. The marker *-es* is employed for both nominative neuter and accusative neuter contexts. This syncretism is in line with a basic Indo-European principle (see (5)), and thus certainly not accidental.

(5) *Reconstructed case system of Proto-Indo-European, singular only*

	*e/o stems		other stems	
	MASC/FEM	NEUT	MASC/FEM	NEUT
NOM	*-*s*	*-*m*	*-*s*/*-Ø	*-Ø
VOC	*-Ø	*-*m*	*-Ø	*-Ø
ACC	*-*m*	*-*m*	*-*m*	*-Ø

The syncretism with *-e* in nominative feminine and accusative feminine contexts in German looks systematic in the same way (the same may also hold for the plural).

Analysis (Jakobson (1962a;b), Bierwisch (1967)):
The cases are decomposed into combinations of primitive features.

(6) *Decomposition of case features in German*:

a. nominative = [–obj,–obl]
b. accusative = [+obj,–obl]
c. dative = [+obj,+obl]
d. genitive = [–obj,+obl]

Consequence:
Nominative and accusative form a natural class.
Genitive and dative form a natural class.
Accusative and dative form a natural class.
Nominative and genitive form a natural class.
Nominative and dative do *not* form a natural class.
Accusative and genitive do *not* form a natural class.

3.3. Alternative Accounts of Syncretism

Side remark:
Deriving syncretism by (feature decomposition and) underspecification is a well-established research strategy. However, there are also other theoretical approaches to syncretism, including those in (7) (none of these alternative approaches is inherently incompatible with underspecification).

(7) *Alternative approaches*:

a. *Paradigm geometry*
Refs.: Johnston (1996), McCreight & Chvany (1991), Plank (1991b), Postma (1998), Gallmann (2004).
The main idea is that syncretism are derivable from an appropriate placement of the various paradigm cells (e.g., adjacency of paradigm cells in appropriately revised, or designed, paradigms).
b. *Rules of referral*
Refs.: Zwicky (1985), Corbett & Fraser (1993), Stump (2001)
Rules of referral state the identity of markers but make no further attempt to actually derive it.
c. *Impoverishment rules*
Refs.: Bonet (1991), Noyer (1992; 1998), Halle & Marantz (1993; 1994), Bobaljik (2002b), Frampton (2002)
Impoverishment rules are a central building block of Distributed Morphology. Impoverishment rules reduce morpho-syntactic feature specifications on the way from syntax to morphology; morphology then operates on simplified structures, and a *retreat to the general case* results.

4. Underspecification and Competition

4.1. Consequence of Underspecification

Underspecification typically has the effect of producing a *competition* of different markers for one and the same morpho-syntactic contexts.

1. Such a competition can be resolved by invoking an *extrinsic ordering* of inflection markers (alternatively, of rules that introduce these markers).
Refs.: Bierwisch (1967), Wurzel (1987; 1998), Halle (1994).

2. An alternative (and conceptually far more attractive) concept relies on the notion of *specificity*. Cf. the *Subset Principle* (accompanied by a notion of specificity), the *Elsewhere Principle*, the *Blocking Principle*, *Panini's Principle*, the *Proper Inclusion Principle*, etc.
Refs.: Kiparsky (1973), Di Sciullo & Williams (1987), Fanselow (1991), Anderson (1992), Lumsden (1992), Noyer (1992), Williams (1994), Halle (1997), Williams (1997), Wiese (1999), Stump (2001).

4.2. A Simple Approach Employing Underspecification

Preliminary assumption:
Assume as given (a) a stem and (b) the smallest set of fully specified morpho-syntactic feature structures for this stem encoding the range of possible word forms. This set includes both features that are inherent to the stem, like (for nouns) inflection class and gender, and features that are variable and non-inherent, like (for nouns) case and number. This information creates a paradigm whose cells need to be filled. For each pair of (a) and (b), the correct word form (or filled paradigm cell) is determined by choosing a compatible inflection marker according to the Subset Principle.

(8) *Subset Principle*:
An inflection marker F is merged with a stem S for a fully specified feature structure M iff (i) and (ii) hold:
(i) The morpho-syntactic features of F are a subset of the morpho-syntactic features of M.
(ii) F is the most specific inflection marker among those that satisfy (i).

(9) *Specificity of Inflection Markers*:
An inflection marker F_i is more specific than an inflection marker F_j iff F_i has more (relevant) morpho-syntactic features than F_j.

Note:

- The following analysis combines aspects of the analyses in Bierwisch (1967), Blevins (1995) (most importantly), Wunderlich (1997b), Wiese (1999), Müller (2003), Trommer (2005b).
- Assumption: Plural does not have gender features in German.
- Assumption: The morphological exponents are either consonantal or ə; an additional ə with consonantal markers does not have to be morphologically encoded (it is added in the phonological component).

(10) *Marker entries*

a. /n/ ↔ [+pl,+obj,+obl]
b. /m/ ↔ [–fem,+obj,+obl]
c. /s/ ↔ [–fem,+obl]

d. /r/ ↔ [+obl]

e. /n/ ↔ [+mask,–fem,+obj,–obl]
f. /r/ ↔ [+mask,–fem,–obl]
g. /s/ ↔ [–fem,–obl]
h. /e/ ↔ [ ]

(11) *Interaction*

dies	masc.sg. [+m,-f]	neut.sg. [–m,–f]	fem.sg. [–m,+f]	pl. [+pl]
nom [–obj,–obl]	**r** s e	**s** e	**e**	**e**
acc [+obj,–obl]	**n** r s e	**s** e	**e**	**e**
dat [+obj,+obl]	**m** s r e	**m** s r e	**r** e	**n** r e
gen [–obj,+obl]	**s** r e	**s** r e	**r** e	**r** e

5. Further Instantiations of Grammatical Categories

Observation:
There is similar evidence for decomposition and underspecification for virtually all (instances of) grammatical categories: number, person, tense, aspect, inflection class, ...

5.1. Numerus und Person im Englischen

(12) *Das englische Verb 'be' im Präsens*

	Singular	Plural
1	am	are
2	are	are
3	is	are

(13) *Unterspezifikationsanalyse*:

a. /am/ ↔ [1,–pl]
b. /is/ ↔ [3,–pl]
c. /are/ ↔ [ ]

Bemerkung: /are/ ist nicht vollständig ohne Spezifikation. Vermerkt muss mindestens sein, dass es sich um eine finite Verbform von 'be' handelt.

(14) *Reguläre englische Verben in Präsens und Präterium*:

	pres	past
1 sg	work	worked
2 sg	work	worked
3 sg	works	worked
1 pl	work	worked
2 pl	work	worked
3 pl	work	worked

5.2. Numerus im Gotischen

(15) *Pronomina, Nomina, Verben im Gotischen*

	Pronomen/Nominativ		*Nomen*/Nominativ	*Verb* ('nehmen'), Präsens	
	1.Pers.	3.Pers.	Gast	1. Person	2. Person
Singular	ik	is	gast	nima	nimiþ
Dual	wit	eis	gasteis	nimoːs	nimand
Plural	weis	eis	gasteis	nimam	nimand

(16) *Numerusmerkmale*:

a. Singular = [+sg,–pl]
b. Dual = [–sg,–pl]
c. Plural = [–sg,+pl]

(17) *Unterspezifikationsanalyse*:

a. /is/ ↔ [1.Pers,Nom,+sg,–pl]
b. /eis/ ↔ [3.Pers,Nom,–sg]

5.3. Genus im Norwegischen

Im Norwegischen (bokmål) gibt es zwei Genera (Neutrum und Utrum) und zwei Numeri (Singular und Plural). Wie im Deutschen gibt es eine starke und eine schwache Deklination der Adjektive.

(18) *Adjektivdeklination im Norwegischen*

STARK	Utrum	Neutrum
Singular	Ø	t
Plural	e	e

SCHWACH	Utrum	Neutrum
Singular	e	e
Plural	e	e

(19) *Unterspezifikationsanalyse*:

a. /Ø/ ↔ [–neut,–pl,+stark]
b. /t/ ↔ [+neut,–pl,+stark]
c. /e/ ↔ [ ]

5.4. Person im Isländischen

(20) *Konjugation im Isländischen*

[A] Schwache Verben, Klasse 1: *krefja* ('fordern')

	Präsens	Präteritum
1.Sg.	kref	krafði
2.Sg.	krefur	krafðir
3.Sg.	krefur	krafði
1.Pl.	krefjum	kröfðum
2. Pl.	krefjið	kröfðuð
3. Pl.	krefja	kröfðu

[B] Starke Verben, Klasse 3: *sleppa* ('entschlüpfen')

	Präsens	Präteritum
1.Sg.	slepp	slapp-Ø
2.Sg.	sleppur	slappst
3.Sg.	sleppur	slapp-Ø
1.Pl.	sleppum	sluppum
2.Pl.	sleppið	sluppuð
3.Pl.	sleppa	sluppu

(21) *Personmerkmale im Isländischen*:

a. 1. Person = [+1,–2]
b. 2. Person = [–1,+2]

c. 3. Person = [–1,–2]

5.5. Person im Wambon

(22) *Konjugation im Wambon (Trans New-Guinea)*

a. andet-*ep*-mbo
essen-1.SG-PRÄT

b. andet-*Ø*-mbo
essen-2./3.SG-PRÄT

(23) *Unterspezifikationsanalyse*

a. /ep/ ↔ [+1,–2]
b. /Ø/ ↔ [ ]

Oder:

(24) *Unterspezifikationsanalyse*

a. /ep/ ↔ [+1,–2]
b. /Ø/ ↔ [–1]

5.6. Person im Hunzib

(25) *Konjugation im Hunzib (Nakh-Dagestanisch)*:

a. də hĩyaa-*č* əcu
1.PRON öffnen-1./2.PRÄS Tür
'Ich werde die Tür öffnen.'

b. mə bok'o.l-*čo* heƛe
2.PRON sammeln-1./2.PRÄS Walnüsse
'Du wirst Walnüsse sammeln.'

c. oλul hĩyaa-*Ø* əcu
DEM öffnen-3.PRÄS Tür
'Sie/er öffnet die Tür.'

(26) *Personmerkmale im Hunzib*:

a. 1. Person = [+1,–3]
b. 2. Person = [–1,–3]
c. 3. Person = [–1,+3]

5.7. Kasus im Tschechischen 1

(27) *Deklination der Nomina im Tschechischen*

	masc1 –anim	masc2 +anim	masc3 +anim	masc4 –anim	fem1	fem2	neutr1	neutr2	neutr3
Singular									
Nom	-Ø	-Ø	-Ø	-Ø	-e	-a	-Ø	-o	-í
Akk	-Ø	-e	-a	-Ø	-i	-u	-Ø	-o	-í
Gen	-e	-e	-a	-a/u	-e	-y	-e	-a	-í
Dat	-i	-i/ovi	-u/ovi	-u	-i	-ě	-i	-u	-í
Lok	-i	-i/ovi	-u/ovi	-u	-i	-ě	-i	-u	-í
Ins	-em	-em	-em	-em	-i	-ou	-em	-em	-ím
Dual									
Nom					-e	-y		-a	-í
Akk					-e	-y		-a	-í
Gen					-ou	-ou		-ou	-í
Dat					-ám	-ám		-ům	-ím
Lok					-ou	-ou		-ou	-ích
Ins					-ama	-ama		-y	-íma
Plural									
Nom	-e	-i/ove	-i/ove	-y	-e	-y	-a	-a	-í
Akk	-e	-e	-y	-y	-e	-y	-a	-a	-í
Gen	-ů	-ů	-ů	-ů	-í	-Ø	-Ø	-Ø	-í
Dat	-ům	-ům	-ům	-ům	-ím	-ám	-ům	-ům	-ím
Lok	-ích	-ích	-ech	-ech	-ích	-ách	-ech	-ech	-ích
Ins	-i	-i	-y	-y	-emi	-ámi	-y	-y	-ími

5.8. Kasus im Tschechischen 2

(28) *Singular der Deklinationen masc2 und fem1*:

	masc2 +anim	fem2
Singular		
Nominativ	-Ø	-a
Akkusativ	-e	-u
Genitiv	-e	-y
Dativ	-i/ovi	-ě
Lokativ	-i/ovi	-ě
Instrumental	-em	-ou

(29) *Kasusmerkmale im Tschechischen*

a. Nominativ = [–obl,–obj,–präp]
b. Akkusativ = [–obl,+obj,–präp]
c. Genitiv = [+obl,+obj,–präp]
d. Dativ = [+obl,+obj,+präp]
e. Lokativ = [+obl,–obj,+präp]
f. Instrumental = [+obl,–obj,–präp]

6. Further Evidence for Morphomic Features

Note:
In some cases it looks like feature decomposition alone does not suffice to account for systematic cases of syncretism because the syncretism spans *two categories*. Arguably, this goes for syncretisms involving feminine/singular and plural in German pronominal inflection (see paradigm 1): However, feminine and plural do not form a natural class in any obvious sense that would be predicted by the distribution of these categories in the syntax.

Another case:
Verb inflection in Boraana Oromo (Afro-Asiatic; Kenya).

(30) *Verb infleciton in Boraana Oromo* (Stroomer (1995))

		aff,main	aff,neg	aff,sub	neg,sub
present/sg	1	-a	-u	-u	-ne
	2	-ta	-tu	-tu	-ne
	3masc	-a	-u	-u	-ne
	3fem	-ti	-tu	-tu	-ne

Observation:
It looks like 3masc and 1 form a natural class, as do 3fem and 2: The syncretisms span gender and person. If these instances of syncretism are to be accounted for via underspecification, the features involved must be non-syntactic and abstract – i.e., morphomic (see Bonami & Boyé (2010) for a general approach along these lines).

7. Theories of Inflection

Stump (2001) devises a useful taxonomy of theories of inflection.

(31) *Stump's taxonomy of theories of inflection*:

incremental	realizational
lexical	inferential

1. *Incremental analysis*:
   Inflection markers add morpho-syntactic features that would otherwise not be present on a word form.
2. *Realizational analysis*:
   Inflection markers do not add morpho-syntactic features; all pieces of morpho-syntactic information is independently available.
3. *Lexical analysis*:
   Inflection markers are associated with (possibly abstract) morphemes that exist independently, as separate objects in the mental lexicon.
4. *Inferential analysis*:
   Inflection markers do not have morpheme status and do not exist independently, as separate objects.

Some theories

(32) a. lexical-incremental:
Lieber (1992), Wunderlich (1996; 1997c;b) (Minimalist Morphology)
b. lexical-realizational:
Halle & Marantz (1993; 1994) (Distributed Morphology)
c. inferential-incremental:
hardly attested
d. inferential-realizational:
Matthews (1991), Anderson (1992), Corbett & Fraser (1993), Aronoff (1994), Stump (2001), Blevins (2004) (word (or stem) and paradigm approaches)

Differences Abstracting away from underspecification, (33) shows different treatments.

(33) a. Lexial approaches (incremental or realizational):
$studentu_{[+N,+dat,+masc,-pl]} \Leftarrow /\text{student}/_{[+N,+masc,class[1]]} + /\text{u}/_{[+dat,+masc,-pl,class[1]]}$
$diesem_{[+N,+dat,+masc,-pl]} \Leftarrow /\text{dies}/_{[+D]} + /\text{em}/_{[+dat,+masc,-pl]}$
b. Inferential-realizational approaches:
$studentu_{[+N,+dat,+masc,-pl]}$ ⇐ word form of the stem /student/ for the specification [+dat,–pl]
$diesem_{[+D,+dat,+masc,-pl]}$ ⇐ word form of the stem /dies/ for the specification [+dat,+masc,–pl]

Comment
The type of theory sketched above is lexical (i.e., inflection markers exist as separate objects) and realizational (i.e., inflection markers do not contribute new features that the word form would not have otherwise). However, as will become clear, this approach differs significantly from Distributed Morphology.

Note:
Roughly the same distinction as between lexical and inferential theories had already been proposed by Hockett (1954): *item-and-arrangement* approaches vs. *item-and-process* approaches.

8. Empirical Evidence for Realizational Theories

8.1. Extended Exponence

(34) *Extended exponence* (Matthews (1972a; 1974)):
The morpho-syntactic properties that are associated with an inflected word, can be realized by more than one morphological exponent in a word.

(35) *Plural formation with diminutives in Breton*:
a. bagig ‘small boat’
b. bagoùigoù ‘small boats’

(36) *Negative preterite forms in Swahili*:
a. tu-li-taka ‘we wanted’

b. ha-tu-ku-taka ‘we did not want’
ku = neg.pret, ha = neg.

(37) *Participle 2 in German*:

a. sprechen
b. ge-sproch-en (3 exponents)

(38) *Standard ways out → extended exponence*:

- *Feature decomposition*:
  Upon closer inspection, there is in fact no extended exponence.
- *Contextual features*:
  The second exponent only uses the features of the first exponent as secondary, contextual features.
- *Enrichment*:
  There is a rule that copies the relevant features prior to morphological realization.
- *Denial*:
  Features can be realized more than once without any problems.

(39) *Abstract example*:
Kind-er-n – Kind-PL-PL.DAT

a. PL = [–sg,+pl]
er ↔ [–sg], *n* ↔ [+pl,+obj,+obl]
b. [+pl] ≠ ([+pl])
er ↔ [+pl], *n* ↔ [+obj,+obl]([+pl])
c. Ø → [+pl]/[+pl],[+obj,+obl]__
er ↔ [+pl], *n* ↔ [+obj,+obl,+pl]
d. *er* ↔ [+pl], *n* ↔ [+obj,+obl,+pl]

8.2. Amorphematic Exponence

In many cases a morphological exponent does not look like an affix; here it is a priori difficult to analyze it as a lexical item.

(40) *Umlaut with plurals in German*:

a. Mutter – Mütter
b. Tal – Täler

(41) *Ablaut with strong verbs in German*:

a. werfen – warfen
b. gießen – gossen

(42) *Subtractive perfect morphology in Papago (Uto-Aztecan)* (Anderson (1992, 65), Aronoff & Fudeman (2005, 47)):

Imperfekt			Perfekt		
Sg.		Pl.	Sg.		Pl.
him	‘gehend’	hihim	hi:	‘ging’	hihi
hi:nk	‘bellend’	hihink	hi:n	‘bellte’	hihin
gatwid	‘schießend’	gagtwid	gatwi	‘schoss’	gagtwi
‘elpig	‘schälend’	‘e‘elpig	‘elpi	‘schälte’	‘e‘elpi

Way out: amorphematic exponence

Assumption:
There are empty affixes with diacritic elements that encode the non-affixial properties.

(43) *Plural markers in German*:

a. *”Ø* ↔ [+pl,KlasseXY]
(zero exponent with a floating feature)
b. *”(e)* ↔ [+pl,KlasseXY]
(optionally realizable ə with a floating umlaut feature)

(44) Subtractive perfect exponent in Papago:
$^{[-1]}Ø$ ↔ [+perf]

(45) Semantics of the diacritic elements:

a. *”X* = a vowel undergoes umlaut if it is closest to X and can in principle be affected by umlaut.
b. $^{[-1]}Ø$ = the closest segment to the left of X is deleted.

Note:
Influential analyses of this type have been developed by McCarthy (1981) (for binyanim in Arabic) and Marantz (1982) (for reduplication). Also see Trommer (2011; 2014; 2015) for a recent optimality-theoretic approach.

9. Word and Paradigm Approaches

- All approaches mentioned so far presuppose that inflected words are separable into a *stem* and one or more *inflectional exponent(s)*.
- In strict *Wort and Paradigm Approaches*, this assumption is not made (cf., e.g., Matthews (1991), Blevins (2004)). Here the inflected word is a primitive of grammar. Nevertheless, generalizations can be established over the set of all inflected word forms in a paradigm, and these generalizations can to some extent trace the effects of morphological rules of inflection.

Final remark:
In principle, mixed approaches are conceivable, e.g.:

- Some complex word forms are derived by rules of inflection, others aren’t (e.g., weak vs. strong verbs in German or English).

- Some aspects of complex word forms are derived by concatenation of two lexical items; in addition, there can be rules of inflection that affect a stem without lexical material being involved (e.g., plural by affixation vs. plural by umlaut in German).

II. Distributed Morphology 1

Refs.: Halle & Marantz (1994; 1993)

10. Halle & Marantz (1994) on Clitic Object Pronouns in Spanish

Goal:
Halle and Marantz set out to introduce some basic assumptions of Distributed Morphology on the basis of the system of clitic object pronouns in Spanish.

Question:
Where does the name *Distributed Morphology* come from?

Answer (Halle & Marantz (1993, 111-112&171)):
"We have called our approach *Distributed Morphology* (hereafter DM) to highlight the fact that the machinery of what traditionally has been called morphology is not concentrated in a single component of the grammar, but rather is distributed among several different components."

"The term *Distributed Morphology* and the general view that it incorporates resulted from discussions with David Pesetsky."

Assumption:
The basic element of morphology is the *vocabulary item*. A vocabulary item pairs phonological features on the one hand with morpho-syntactic (and semantic) features on the other. The latter features encode the possible *context of insertion* of the vocabulary item; the former is also sometimes called *signal*.

(46) *Structure of vocabulary items*:
/phonological features/ ↔ [morpho-syntactic features]

Three central assumptions of Distributed Morphologie:
(i) *late insertion*
(ii) *underspecification*
(iii) *syntactic hierarchical structure all the way down*

10.1. Late Insertion

(47) *Late Insertion*:
Morphology follows syntax; morphology realizes abstract syntactic structures. The syntax itself merely deals with abstract categories that are bundles of morpho-syntactic and semantic features: so-called *f-morphemes* (functional morphemes) and so-called *l-morphemes* (lexical morphemes).
[At least, late insertion holds for f-morphemes; as for l-morphemes, proponents of Distributed Morphology do not necessarily agree, and both options have been pursued in Distributed Morphology.]
Syntactic X^0 categories (i.e., morphemes) are morphologically realized by insertion of vocabulary items (*vocabulary insertion*, VI). This way, (f-) morphemes get phonological features.

Consequences of late insertion

Remark:
A crucial assumption is the distinction between (abstract) *morphemes* and (concrete) *vocabulary items* (inflection markers, inflectional exponents). This difference is not recognized in (standard) theories that rely on *early insertion*.

Observation:
In contrast to early insertion, late insertion leaves room for possible modifications of syntactic structures with their morpho-syntactic features before morphological realization (vocabulary insertion) takes place. One such operation that changes syntactic structures before morphology applies is *impoverishment*.

10.2. Underspecification

(48) *Underspecification*:
The morpho-syntactic features (which make up the 'context of insertion') of vocabulary items are often underspecified. Such an underspecification makes a simpler, more economical description of inflectional systems possible, and it significantly contributes to an account of instances of syncretism.

Remark:
As a consequence of underspecification, constraints are needed that regulate the correct insertion of vocabulary items and decide the competition between different vocabulary items in the case of conflict: Subset Principle, Specificity.

10.3. Syntactic Hierarchical Structure All the Way Down

(49) *Syntactic Hierarchical Structure All the Way Down*:
Morphological insertion is sensitive to syntactic operations that manipulate (f- or l-) morphemes and create word forms: head movement, syntactic lowering.
In addition, genuinely morphological operations (which apply after syntax but before insertion) manipulate syntactic items and respect syntactic principles (to a certain degree). Among these purely morphological operations are *merger*, *fusion*, *fission*, and *impoverishment*.

10.4. Structure of the Grammar

Observation:
In practise, Distributed Morphology typically (though not necessarily) envisages syntactic structures that employ many different functional categories. In that respect, the approach is very much compatible with a certain type of syntactic approach developed within the general Principles and Parameters framework (or, possibly, the Minimalist Program); see, e.g, studies based on *cartography*.

(50) *Structure of the grammar*:
Syntax $\longrightarrow$ Logical Form (Semantics)
$\downarrow$
Morphology (Morpheme/feature insertion, merger, fusion, fission, impoverishment)
vocabulary insertion
$\downarrow$
Phonology

Side remark (Arregi & Nevins (2012, ch. 6)):
Assuming a Distributed Morphology approach, there are various operations that apply post-syntactically (after all regular syntactic operations) but before phonological realization: *copying*, *fission*, *dissimilation*, *impoverishment*, *metathesis*). Here the order is relevant, and it follows from how close to syntax, or close to phonology, a given post-syntactic operation is: Rules where concepts like hierarchy play a role apply before rules that mention phonological features.

10.5. Impoverishment

An important concept: impoverishment:
Refs.: Bonet (1991), Noyer (1992; 1998), Halle & Marantz (1993; 1994), Bobaljik (2002b), Frampton (2002), Harley (2004)

Impoverishment rules reduce morpho-syntactic feature bundles between syntax and morphology; rules of the morphological component (like vocabulary insertion) then operate on impoverished (simplified) structures, and this effects a *retreat to the general case*.

Note:
The classical concept of impoverishment fully corresponds to (and in a way complements) underspecification of vocabulary items:
(i) underspecification of vocabulary items: "underspecification"
(ii) underspecification of syntactic categories: "impoverishment"

10.6. Syntax vs. Morphology

Observation:
(i) Normally, underspecification of morpho-syntactic features does not play any role whatsoever in the syntax.
(ii) Therefore, impoverishment of syntactic structures can only apply *after* syntax has done its work.
(iii) Hence, impoverishment (or, more generally, underspecification of syntactic structures) is possible only in theories that rely on late insertion.

10.7. Examples

(51) *An abstract example* (Halle & Marantz (1994)):
a. *Category X*:
(i) $P_A \leftrightarrow [F_1,F_2]$ (vocabulary item A)
(ii) $P_B \leftrightarrow [F_1]$ (vocabulary item B)

b. $[_X\ F_1,F_2,F_3]$ (f-morpheme)
c. $F_2 \rightarrow \emptyset$ / [X[ ] Y] (impoverishment)
d. [$[_X\ F_1,\sout{F_2,}F_3]$ Y] (f-morpheme after impoverishment, before insertion)
e. Insertion applies to P_B, not to P_A (even though the latter is more specific).

(52) *A concrete example: Adjectival markers in Norwegian* (Harley & Noyer (2003), Sauerland (1996)):

a. *Vocabulary items*:
(i) /t/ ↔ [–pl,+neut] /Adj__
(ii) Ø ↔ [–pl,–neut] /Adj__
(iii) /e/ ↔ [ ] /Adj__
b. *Impoverishment*:
[±neut] → Ø in syntactic contexts with wek inflection

Paradigm 9: Adjectival markers in Norwegian

STRONG	[–neut]	[+neut]
[–pl]	Ø	/t/
[+pl]	/e/	/e/

WEAK	[–neut]	[+neut]
[–pl]	/e/	/e/
[+pl]	/e/	/e/

10.8. Clitic Object Pronouns in Spanish

(53) *Structure of object clitics* (as with nouns):
$[_{Det}\ [_{Det}$ Det Theme] Number]

Assumption:
Vocabulary insertion applies cyclically, from left to right (from the stem to the edge), according to the *Subset Principle*.

Subset Principle and Specificity

(54) *Subset Principle* (Halle (1997)):
A vocabulary item V is inserted into a functional morpheme M iff (i) and (ii) hold:
(i) The morpho-syntactic features of V are a subset of the morpho-syntactic features of M.
(ii) V is the most specific vocabulary item that satisfies (i).

(55) *Specificity of vocabulary items*:
A vocabulary item V_i is more specific than a vocabulary item V_j iff V_i has more morpho-syntactic features than V_j.

Vocabulary Insertion 1: Det markers

(56) *Det markers* ('stems'):
/n/$_{[I]}$ ↔ [1.Pers] /__[+pl]
/m/$_{[III]}$ ↔ [1.Pers]
/Ø/ ↔ [2.Pers] /__[+pl]
/t/$_{[III]}$ ↔ [2.Pers]
/l/ ↔ [ ] /__[case]
/s/$_{[III]}$ ↔ [ ]

Assumption:
After insertion of the stems, but *before* insertion of theme vowels and number markers, the two *redundancy rules* in (57-a) and (57-b) apply, in this order.

(57) *Redundancy rules*:
a. [ ] → [III] /__[dat]
b. [ ] → [II] /__[+fem]

Remark:
At least redundancy rule (57-a) should possibly be understood in such a way that it applies only in the context [3.Pers]:
[ ] → [III] /__[dat],*[3.Pers]*
Otherwise, it seems that wrong predictions would be made for [2.Pers]-dative contexts. But see below.

Vocabulary Insertion 2: Theme vowels

(58) *Theme vowels and inflection class features*:
/e/ ↔ [III]
/a/ ↔ [II]
/o/ ↔ [ ]

Vocabulary Insertion 3: Number markers

(59) *Number markers*:
/s/ ↔ [+pl]
(Ø ↔ [ ])

All Vocabulary Items

(60) *Det markers* ('stems'):
/n/$_{[I]}$ ↔ [1.Pers] /__[+pl]
/m/$_{[III]}$ ↔ [1.Pers]
/Ø/ ↔ [2.Pers] /__[+pl]
/t/$_{[III]}$ ↔ [2.Pers]
/l/ ↔ [ ] /__[case]
/s/$_{[III]}$ ↔ [ ]

(61) *Redundancy rules*:
a. [ ] → [III] /__[dat,3.Pers]
b. [ ] → [II] /__[+fem]

(62) *Theme vowels and inflection class features*:
/e/ ↔ [III]
/a/ ↔ [II]
/o/ ↔ [ ]

(63) *Number markers*:
/s/ ↔ [+pl]
(Ø ↔ [ ])

Paradigm 10: Clitic object pronouns in Spanish

[−pl]	[3.Pers] [+masc]	[3.Pers] [+fem]	[2.Pers]	[1.Pers]
Acc	/l/-/o/-Ø	/l/$_{[\mathbf{II}]}$-/a/-Ø	/t/$_{[III]}$-/e/-Ø	/m/$_{[III]}$-/e/-Ø
Dat	/l/$_{[\mathbf{III}]}$-/e/-Ø	/l/$_{[\mathbf{III}]}$-/e/-Ø	/t/$_{[III]}$-/e/-Ø	/m/$_{[III]}$-/e/-Ø
Refl	/s/$_{[III]}$-/e/-Ø	/s/$_{[III]}$-/e/-Ø	/t/$_{[III]}$-/e/-Ø	/m/$_{[III]}$-/e/-Ø
[+pl]	[3.Pers] [+masc]	[3.Pers] [+fem]	[2.Pers]	[1.Pers]
Acc	/l/-/o/-/s/	/l/$_{[\mathbf{II}]}$-/a/-/s/	Ø-/o/-/s/	/n/$_{[I]}$-/o/-/s/
Dat	/l/$_{[\mathbf{III}]}$-/e/-/s/	/l/$_{[\mathbf{III}]}$-/e/-/s/	Ø-/o/-/s/	/n/$_{[I]}$-/o/-/s/
Refl	/s/$_{[III]}$-/e/-Ø	/s/$_{[III]}$-/e/-Ø	Ø-/o/-/s/	/n/$_{[I]}$-/o/-/s/

10.9. Comments

Remark:
The inflection class features typeset in boldface in paradigm 10 do not come from inflection markers, but from the two redundancy rules.

Problem: How can the distribution of number markers be derived in the Refl-Plural domain?

Questions

- What is the theory-internal reason for the (few) differences between accusative and dative marking? And what is the reason for the (few) gender-related differences?
  Not a single inflection marker (vocabulary item) bears case features; case features are only mentioned in redundancy rule (57-a). Similarly for gender features and (57-b).

- The analysis involves a highly specific zero marker for stem positions. This assumption may not be completely unproblematic (from the point of view of iconicity at least). What is the theory-internal task of this zero marker? And why can be problem not be avoided by a slightly different specificaiton of the context of insertion of some marker? How would the whole system have to be changed so as to be able to dispense with the highly specific zero marker?
  The zero marker blocks /t/. /t/ could in principle be restricted to singular contexts; but then /l/ or /s/ would have to be inserted instead. Consequently, these latter markers would also have to be classified as incompatible with 2.Person contexts. Such an approach might eventually be viable, but it contradicts the assumption that one marker is usually radically underspecified. (We will come back to this issue.)

Questions 2

- Inflection class [I] is the default class; the vocabulary item /o/ in (58) does not depend on the presence of this feature for insertion. Why, then, is the stem marker /n/ equipped with this feature in order to trigger subsequent /o/ insertion (in contrast to /l/ and /Ø/). Perhaps this assumption can simply be dispensed with?
  A problem can only arise if a redundancy rule can apply in this context that instantiates a different inflection class feature. By assumption, [+fem] is irrelevant for [1.Pers]; therefore, the only problem would be created by the dative-related rule (57-a). However, as noted above, this rule may only hold for [3.Pers] contexts; would it also apply in [2.Pers] contexts, Ø would also need class information ([I]). Thus, the sole remaining scenario under which [I] would be needed for /n/ would be one where (57-a) holds for [1.Pers] [3.Pers], but not for [2.Pers].

- Why do vocabulary insertion and the redundancy rules have to apply cyclically, from the center to the periphery?
  Insertion of a stem marker and the two redundancy rules create the context for theme vowel insertion. Among the redundancy rules, the order of application is crucial; and similarly, the fact that both rules only apply after insertion of stem markers is very important.

Note:
At this point, Distributed Morphology ceases to be fully realizational.

10.10. Observations

First observation:
In American varieties of Spanish, the clitic pronoun /os/ for 2. person plural contexts is missing.

Analysis:
This can be traced back to *impoverishment rule*.

(64) *Impoverishment rule for [2.Pers]*:
[2.Pers] → Ø /[+pl]

Consequence:
There is a *retreat to the general case*: In the plural, the [2.Pers] features is deleted. Therefore, Ø cannot be inserted, and the same goes for /t/. As a result, the most specific remaining stem marker is /l/. Consequently, /los/ shows up in the context [2.Pers,+pl,Acc]. Still, to ensure that the output form is /les/ and not /los/ in [2.Pers.,+pl,Dat] contexts, (57-a) needs to be able to apply before theme vowel insertion. (In this context, Halle & Marantz (1994, 283) state: "Note also that like other 3. Person clitics and unlike its singular counterpart, the erstwhile 2. Person Plural clitic is subject to Case distinctions.") This means that the redundancy rule at hand cannot be confined to 3. Person. No problem arises if [3.Pers] is

characterized by an absence of features.

Second observation:
"Spurious *se*": *se* shows up if a clitic 3. Person Dative pronoun is adjacent to a clitic 3. Person Accusative pronoun.

Analysis:
Again, an impoverishment rule is at work.

(65) *Impoverishment rule for [Dative]*:
[Dat] → Ø /__[+Acc]

Consequence:
In Acc-Dat contexts, /l/ is blocked for the dative position because there is no case feature left. Therefore, the maximally nonspecific form /s/ is used.

Spurious 'se'

(66) *Spurious* se (based on Bonet (1995)):
a. el premio, *lo* dieron a Pedro ayer
the price [3.Acc] have[3.Pl] to Pedro yesterday
b. A Pedro, *le* dieron el premio ayer
to Pedro [3.Dat] gave[3.Pl] the price yesterday
c. A Pedro, el premio *se lo* dieron ayer (**le lo*, **lo le*)
to Pedro the price *se* [3.acc] gave[3.Pl] yesterday
'Yesterday, they gave Pedro the price.'

Interaction of impoverishment rules
Prediction:
The two impoverishment rules just discussed can interact in varieties of American Spanish.

(67) [2.Pers,Dat]+Theme+[+pl] & [3.Pers,Acc]+Theme+[–pl]
⇒ [ ]+Theme+[+pl] & [3.Pers,Acc]+Theme+[–pl]
a. *European Spanish*:
Os lo di 'I gave it to you.'
b. *American Spanish*:
Se lo di 'I gave it to you.'

Syntactic structure all the way down:
So far, we have evidence for (i) late insertion (because of impoverishment) and (ii) underspecification (motivated by syncretism). What's still missing is evidence for (iii) syntactic hierarchical structure all the way down. The argument can be provided on the bsis of Spanish *imperatives*, which may co-occur with clitic object pronouns.

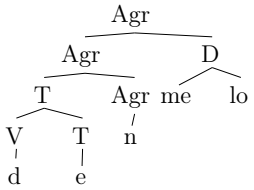
(68) *2.Pers.Plural imperatives with clitic pronouns, Spanish*:
a. d- e- n- l- o- s
give IMP 2.PL 3. ACC THEME PL
'You give them (to someone).'
b. d- e- *n*- m- e- l- o
give IMP 2.PL 1.DAT THEME 3.ACC THEME
'You give it to me!'

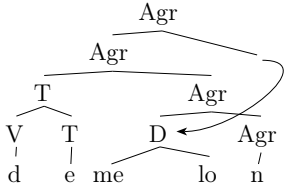
(69) *2.Pers.Plural imperatives with clitic pronouns, Carribean Spanish* :
a. d- e- n- l- o- s
give IMP 2.PL 3. ACC THEME PL
'You give them (to someone).'
b. d- e- m- e- l- o- *n*
give IMP 1.DAT THEME 3.ACC THEME 2.PL
'You give it to me!'

Generalization:
In Carribean Spanish (or, more precisely, a version thereof), clitic pronouns that have no plural suffix end up in the middle of the imperative verb – after the imperative marker, but before the plural suffix of the verb.

Analysis:
The clitic cluster is a D(eterminer) category. Post-syntactically (but pre-vocabulary insertion), it is left-adjoined to Agr by means of the operation of *merger*, and therefore comes to be part of the verb.

10.11. Structures

(70) *Structure in Standard Spanish*:


(71) *Structure in Carribean Spanish*:


Comment:
This operation illustrates that inflectional morphology is sensitive to subtleties of syntactic phrase structure. The observable effect cannot possibly be purely phonological in nature because there are cases where /n/ is a part of the imperative verb but *not* a plural sufix; and these cases do not trigger a reordering of the clitic pronouns.

(72) *No reordering with other kinds of /n/*:

a. pon-me(-lo)
'You put (it) for me!'

b. *po-me(-lo)-n
'You put (it) for me!'

Consequence for Other Theories

Claim:
This systematic morphological effect cannot be captured in other, classical theories of inflection (e.g., in word and paradigm approaches) because the account presupposes that (a) highly articulate syntactic structure is needed for morphology, and (b) syntactic structure needs to be modifiable before morphology.

The Trigger for Impoverishment

What triggers impoverishment is that (in Carribean Spanish) abstract morphemes with person and case features need to show up to the left of an abstract morpheme with a plural feature. Therefore, there is no reordering if the clitic pronoun itself is plural:

(73) a. d-e-n- l-o-s *de-lo-n-s, *de-los-n
b. d-e-n- n-o-s *de-no-n-s, *de-nos-n

Like other kinds of *merger*, this merger operation satisfies a general *peripherality condition*: If (e.g.) *me* in (74) comes to show up to the left of an abstract morpheme with a plural feature, it cannot satisfy the condition by merger, "since it does not fall at the right periphery of the relevant domain" (p. 287). (On the other hand, there is no reason for such a movement because *me* already is located to the left of a plural morpheme.)

(74) a. d- e- n- m- e- l- o- s
geben IMP 2.PL 1.DAT THEME 3. ACC THEME PL
'You give them to me.'

b. *d- e- m- e- n- l- o- s
geben IMP 1.DAT THEME 2.PL 3. ACC THEME PL
'You give them to me.'

Concluding remark:
Data such as (69-b) argue against the existence of paradigms as genuine objects of grammar (rather, they are epiphenomena). Here is why: If the set of possible word forms for a verb were to be fully characterized by a paradigm, this would also mean that, e.g., the combinations of all possible clitic pronouns with verbs would have to be part of this paradigm. Such an approach would be implausible.

11. Halle & Marantz (1993): Fusion and Fission

Background:
Fusion vs. *merger*:
(i) Merger leads to independently available morphemes that separately trigger vocabulary insertion.
(ii) In contrast, fusion combines two morphemes in such a way that only one vocabulary item can be inserted after the operation has taken place.
(iii) Thus: Merger is *not* (as in nuclear physics) the same thing as fusion.

(75) *Fusion* (Halle & Marantz (1993, 116)):

a. Fusion takes two terminal nodes (morphemes) M_1 and M_2 that are sisters, and fuses them into a single terminal node M_α.
b. M_α has the features of both M_1 and M_2.
c. At this point, only *one* vocabulary item *V* can be inserted in M_α; insertion is regulated by the Subset Principle.

Assumption:
In the syntax, there is a functional head *Case* and a functional head *Number* in nominal domains. In the case of fusional noun inflection in Indo-European languages, there is post-syntactic fusion of the two heads into a single morpheme.

Fission

(76) *Fission*; based on Halle & Marantz (1993, 166ff)):

a. Fission separates a feature bundle β from a terminal node (morpheme) M_α, such that two terminal nodes M_1 and M_2 come into existence.
b. M_1 has the features β; M_2 has the features of M_α–β.

Note:
For Halle and Marantz, fission is the opposite of fusion: It takes a signle morpheme and creates two morphemes by splitting of features.

Side remark:
The concept of *fission* in Noyer (1992), Trommer (1999a) is different. (This latter version may be a bit more widely adopted in the recent literature.)
The two concepts of fission

(77) *Fission*$_a$ (Halle & Marantz (1993)):

a. Fission separates a feature bundle β from a terminal node (morpheme) M_α, such that two terminal nodes M_1 and M_2 come into existence.
b. M_1 has the features β; M_2 has the features of M_α–β.

(78) *Fission*$_b$ (Noyer (1992)): If insertion of a vocabulary item V with the morpho-syntactic features β takes place into a fissioned morpheme M with the morpho-syntactic features α, then α is split up into β and α–β, such that (a) and (b) hold:

a. α–β is available for further vocabulary insertion.
b. β is not available for further vocabulary insertion.

12. Verb Agreement in Georgian

Example:
Agreement markers on the verb in Georgian (based on Anderson (1992); also see Stump (2001)). Halle & Marantz (1993, 116ff) analyse the agreement marking on the verb by presupposing functional clitic morphemes that have undergone fusion.

(79) *Paradigm*

With a 3.Pers object – X paints 3.Pers.:

a.	v-xatav	"I paint him."
b.	v-xatav-t	"We paint him."
c.	Ø-xatav	"You$_{sg}$ paint him."
d.	Ø-xatav-t	"You$_{pl}$ paint him."
e.	xatav-s	"He paints him."
f.	xatav-en	"They paint him."

With a 3.Pers subject – 3.Pers. paints X

g.	m-xatav-s	"He paints me."
h.	gv-xatav-s	"He paints us."
i.	g-xatav-s	"He paints you$_{sg}$."
j.	g-xatav-(s-)t	"He paints you$_{pl}$."
k.	xatav-s	"He paints him."
l.	xatav-s	"He paints them."

With 1.Pers. and 2.Pers. – 1.Pers. paints 2.Pers. or 2.Pers. paints 1.Pers.

m.	g-xatav	"I paint you."
n.	m-xatav	"You paint me."
o.	g-xatav-t	"We paint you$_{sg}$/youpl."
	or	"Ipaint you$_{pl}$."
p.	gv-xatav	"You$_{sg}$ paint us."
q.	gv-xatav-t	"You$_{pl}$ paint us."

Fusion → fission → insertion
Assumptions about fusion:
(i) The clitic cluster incorporates, under a single head, all pronominal 1.Pers and 2.Pers arguments (normally, this does not hold for 3.person arguments; there are exceptions that will be ignored here).
(ii) The terminal nodes in the clitic cluster fuse into a single terminal node.
(iii) After fusion, the rule of fission in (80) applies.
(iv) Finaly, vocabulary insertion takes place.

(80) *Fission of clitic clusters in Georgian*:
[$_{\text{Cl}}$ ... [+pl] ...] + stem → [+pl] + Cl + stem, where

a. linear order is irrelevant; and
b. fission does not apply if [+pl] is part of an argument bearing the features [+1],[DAT].

Further assumptions

1. A fused T/Agr-head (tense/agreement head) follows the clitic cluster and the verb stem. This head agrees with a [NOM]-marked argument with respect to person and number. the vocabulary items that are inserted in T/Agr are organised according to so-called "screeves".
   ("Screeves": loanword from Georgian; specific conjugation patterns that are roughly comparable to tenses.)

2. A (phonologically oriented) *readjustment rule* applying after vocabulary insertion deletes an /-s/ with 3.Pers.Sg. before a plural /-t/.

3. An *impoverishment rule* deletes a terminal plural-node if the latter follows some T/Agr-node with the features [+3],[+pl].

Vocabulary items

(81) *Vocabulary items for clitic positions*:

a. /gv-/ ↔ [+1],[DAT],[+pl]
b. /m-/ ↔ [+1],[DAT]
c. /g-/ ↔ [+2],[DAT]
d. /v-/ ↔ [+1]
e. Ø ↔ [+2]

(5) *Vocabulary items for plural*:

f. /-t/ ↔ [+pl]

(82) *Vocabulary items for T/Agr in the examples above*:

a. Ø ↔ [+1] oder [+2]
b. /-s/ ↔ [+3],[–pl]
c. /-en/ ↔ [+3],[+pl]

Specificity problems
Question:
It is really clear whether the competition of vocabulary items in (81) can always be resolved by specificity. As noted by Halle and Marantz, additional assumptions may be called for for cases like (81), for the choice of (b) vs. (c) (in other contexts, where "both sets [in a clitic cluster] in principle might be DAT"; Halle & Marantz (1993, 120)). A similar reasoning applies in the case of (d) vs. (e). Halle and Marantz consider two options.

1. Specificity is sensitive to appropriate feature hierarchies, here:
   [+1] > [+2].

2. There is an extrinsic ordering of vocabulary items.

Stump's Critique
Side Remark:
Stump (2001, 281, fn.3) claims that Halle & Marantz (1993) need an extrinsic ordering in their analysis of verb agreement in Georgian: "The ordering of /g-/ before /v-/ [...] is just stipulated." This does not have to be the case: the vocabulary item /g-/ in (81) has more

features in its context of insertion than the vocabulary item /v-/ in (81).
(An indeterminacy with respect to specificity could only arise if an element α can only be more specific than another element β if the features of α are a proper superset of the features of β. Something along these lines has indeed been proposed, but it is not the case under present assumptions.)

Syntax

(83) *Syntactic structure for vocabulary insertion*:

1			2	3	4
[Cl	{Pers.,CASE,NUM}	{Pers.,CASE,NUM}]	[stem]	[T/Agr]	[+pl]

Remarks on (83):

1. Position 1 contains the clitic cluster and up to two case and Φ feature bundles (1. or 2. Person).
2. Position 2 encodes the verb stem.
3. Position 3 contains a case and Φ feature bundle that realizes agreement with the subject (i.e., the nominative-marked argument).
4. Position 4 is only activated under fission. By assumption, it does not have to be stipulated that the [+pl] feature that has been split off from the clitic cluster is realized as a (final) suffix; this is supposed to follow from the suffixal status of the vocabulary item /-t/, which is the only one that fits in this context.

Derived paradigm for xatav *in Georgian*:

Subj→ Obj↓	1.Sg.	1.Pl.	2.Sg.	2.Pl.	3.Sg.	3.Pl.
1.Sg.	–	–	m-xatav-Ø	m-xatav-t	m-xatav-s	m-xatav-en
1.Pl.	–	–	gv-xatav-Ø	gv-xatav-t	gv-xatav-s	gv-xatav-en
2.Sg.	g-xatav-Ø	g-xatav-t	–	–	g-xatav-s	g-xatav-en
2.Pl.	g-xatav-t	g-xatav-t	–	–	g-xatav-(s-)t	g-xatav-en
3.Sg.	v-xatav-Ø	v-xatav-t	Ø-xatav-Ø	Ø-xatav-t	Ø-xatav-s	Ø-xatav-en
3.Pl.	v-xatav-Ø	v-xatav-t	Ø-xatav-Ø	Ø-xatav-t	Ø-xatav-s	Ø-xatav-en

Comments:

- /-s/ in 3.Sg.→2.Pl. contexts is deleted via readjustment.
- In 1.Pl.→2.Pl. context, there should be two /-t/ markers if nothing else is said.
- In (e.g.) 1.Sg.→3.Pl. or 2.Sg.→3.Pl. contexts, there is no /-t/ because 3.Pers. clitics do not undergo incorporation.
  Alternative (?): [±pl]-impoverishment with 3.Pers. in the clitic cluster.

Conclusion: Georgian verb agremeent

Conclusion:

- *Fusion* is needed in this approach because two arguments need to be encoded in transitive contexts in Georgian, but evidently, there is only enough space for the encoding of one argument in the relevant position in front of the verb.
- *Fission* is needed in this approach because the argument that has "lost" in the preverbal (and is not encoded there) can at least be encoded with respect to number, in the post-verbal position (see 1.Pers.Pl.→2.Pers.Sg.: *g-xatav-t*).

13. Verbflexion im Englischen

Relevante morphologische Operationen:

1. Verschmelzung (*merger*) von T und V.
2. Insertion eines Agr-Morphems (auch bekannt unter dem Terminus *Dissoziierung* (*dissociation*)).
3. Fusion (*fusion*) von T und Agr.
4. Readjustment von Vokabularelementen in T/Agr.

13.1. Satzstruktur im Englischen

(84) They sleep late

a. *Oberflächenstruktur (Input für Morphologie):*
[CP C [TP [DP [D {[+3,+pl]}]] [T′ [T {[–part,–prät]}] [VP V AP]]]]

b. *Struktur nach Verschmelzung von T und V unter Adjazenz*:
[CP C [TP [DP [D {[+3,+pl]}]] [T′ [VP [V V [T {[–part,–prät]}]] AP]]]]

c. *Struktur nach Insertion von Agr und Fusion von T und Agr unter Schwesternschaft*:
[CP C [TP [DP [D {[+3,+pl]}]] [T′ [VP [V V [T [T {[–part,–prät]}] [Agr {[+3,+pl]}] AP]]]]

13.2. Bemerkungen zur Satzstruktur

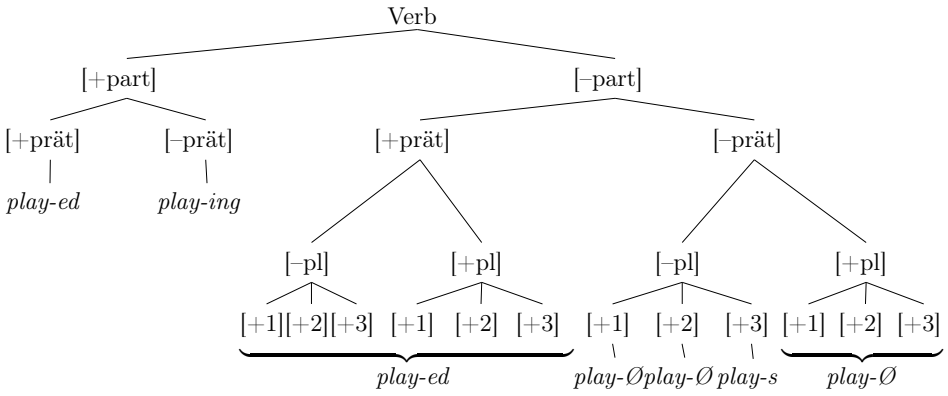
1. Der Schritt in (84-b) wird oft als Resultat von Senkung (*lowering*) in der Syntax angesehen (so von Chomsky (1995, ch.2)). Hier ist es jedoch eine genuin morphologische Verschmelzung unter Adjazenz, die V und T verbindet (Halle & Marantz (1993, 134)).

2. - Die Insertion von Agr in (84-c) verletzt die *Inklusivitätsbedingung* (*Inclusiveness Condition*) von Chomsky (1995; 2001), derzufolge nach Beginn einer Derivation keine neuen, noch nicht in der Numeration vorhandenen Elemente mehr eingeführt werden dürfen.
   - Andererseits deckt sich das Fehlen von Agr in der Syntax mit der Annahme in Chomsky (1995, ch.10) und Chomsky (2000; 2001), dass semantisch leere funktionale Kategorien (wie AgrP) in der Syntax nichts verloren haben.

- "Agr morphemes are added to heads at morphological structure (MS) in accordance with language-particular requirements about what constitutes a morphologically well-formed word in that language." (Halle & Marantz (1993, 135)).
- Die morpho-syntaktischen Merkmale werden vom Subjekt auf das eingesetzte Agr-Morphem kopiert.

13.3. Paradigma der Verbflexion im Englischen

Abzuleitendes Paradigma für Verbflexion im Englischen:



13.4. Vokabularelemente für englische Verbflexion

(85) *Vokabularelemente für fusionierte T/Agr-Morpheme im Englischen*:

a. /-n/ ↔ [+part,+prät] / X + __, wobei X = ∼*hew, ∼prove, go, beat, ...*
b. Ø ↔ [+prät] / Y + __, wobei Y = *beat, drive, bind, sing, ...*
c. /-t/ ↔ [+prät] / Z + __, wobei Z = *dwell, buy, send, ...*
d. /-d/ ↔ [+prät]
e. /-ing/ ↔ [+part]
f. /-z/ ↔ [+3,–pl]
g. Ø ↔ [ ]

Notation:
∼ = Verben, die optional /-d/ oder /-n/ nehmen.

13.5. Bemerkungen zu den Vokabularelementen

- *Spezifizität*:
  - Per Annahme zählen kontextuelle Merkmale bei der Ermittlung von Spezifizität nicht mit.
  - Für die Ordnung in (85-def) reicht das einfachste Spezifizitätskonzept (GröSSe von Merkmalsmengen) nicht (Annahme: [+3,–pl] ist *nicht* spezifischer als [+prät]; wenn dem so wäre, würde ja auch im Präteritum ein /-z/ bei der 3.Pers.Sg. erwartet). Hier hilft entweder eine universelle Hierarchie wie
    Tempusmerkmale > *Aspektmerkmale* > Φ-*Merkmale*,
    oder eine extrinsische Ordnung.

- *Nullmarker*:
  - Der Nullmarker Ø kommt hier zweimal vor; einmal als unspezifizierter Default-Marker, ein anderes Mal als spezifischer Marker. Letzteres mag man für problematisch halten. Halle & Marantz (1993, 127, 133f.) sagen dazu:
  - "Since in language there is an arbitrary relation between the morpho-syntactic and phonological features of a Vocabulary item (Saussure's *arbitraire du signe*), it is not surprising that the relationship between morpho-syntactic and phonological features is one-to-many. Thus, phonological Ø is the phonological realization of two distinct sets of features in [(85)]." (p. 127)
  - "We recognize at least two types of zero morphemes, leaving open the question of whether these are actually distinct. [...] It may be that Universal Grammar provides a zero spell-out as the default phonological realization of a morpheme in the unmarked case. This possibility in no way undermines the existence of zero morphemes." (pp. 133-134).
  - (Dass hier zweimal von "zero morpheme" die Rede ist, ist u.U. missverständlich: Gemeint sind ja nicht die abstrakten f-Morpheme, in die hinein Einsetzung erfolgt, sondern die Vokabularelemente, die f-Morpheme realisieren.)

13.6. Phonologische Korrekturen: Readjustment Rules

Beobachtung:
Damit ist die Analyse noch nicht ganz am Ende; in vielen Fällen müssen noch phonologische Korrekturen am soweit durch Syntax und Morphologie determinierten Ergebnis vorgenommen werden. Dies leisten *readjustment rules*.

(86) *Notwendigkeit weiterer Veränderungen*:

a. (i) beat – beat – beat-en
drive – drove - driv-en
break – broke – brok-en
fall – fell – fall-en
(ii) put – put – put
sing – sang – sung
bind – bound – bound
come – came – come
b. dwell – dwel-t – dwel-t
leave – lef-t – lef-t
send – sen-t – sen-t
buy – bough-t – bough-t
c. (i) prove – prove-d – prov-en
do – di-d – do-ne

(ii) yell – yell-ed – yell-ed
tell – tol-d – tol-d

(87) *Readjustment rules*:

a. Reim → /u/ / X __ [+prät],
wobei X-Reim = *shall, will, can, stand*.

b. Reim → /i/ / Y __ [+prät,–part],
Reim → /ʌ/ / Y __ [+prät,+part], [–prät,+3,-pl],
wobei Y-Reim = *do*.

c. Reim → /e/ / Z __ [+prät], [–prät,+3,–pl],
wobei Z-Reim = *say*.

d. V → [+hinten,+gerundet] / W __ U [+prät],
wobei WVU = *sell, tell*.

e. C → Ø / Q __ [+prät], <[–prät,+3,–pl]>, wobei QC = *make,* <*have*>

13.7. Suppletion

Grundannahme:
Sehr viel morphonologische Stammvariation ist vorhersagbar; echte, willkürliche Suppletion gibt es kaum. In den wenigen Fällen, wo es echte Suppletivformen gibt (wie bei *go – went*), liegen zwei unterschiedliche Vokabularelemente vor. Diese haben dieselben substantiven Merkmale; aber sie unterscheiden sich so, dass eines der beiden Elemente (*went-*) noch die kontextuellen Merkmale [__[+prät,–part]] aufweist.
(Das Fehlen von massivem Gebrauch von Suppletivformen wird im Übrigen als Argument gegen Andersons (1992) inferentiell-realisationalen Ansatz betrachtet: "Since suppletion is not of central importance in the morphology of English or of any other language, the approach did not seem to us to be on the right track" (p. 113).)

III. Distributed Morphology 2

Fission and Impoverishment

Refs.: Frampton (2002)

14. Basic Assumptions

Central claims:
(i) Person features as they are standardly assumed (1, 2, 3) for verbal conjugations must be decomposed into combinations of more primitive features [±1], [±2]. Vocabulary items can be underspecified with respect to these features. This captures instances of person syncretism.
(ii) The analysis requires post-syntactic operations: impoverishment and fission. As far as it can count as successful, it therefore provides an argument for Distributed Morphology.

(88) *Impoverishment*:
Impoverishment rules reduce morpho-syntactic feature bundles on the way from syntax to morphology; morphology then operates on simplified, "impoverished" structures, and we get a *retreat to the general case*.

Remark:
The concept of impoverishment employed here is the standard one. In contrast, fission is defined as in Halle & Marantz (1993) (fission$_a$), but rather as in Noyer (1992) (also see Trommer (1999b;a)).

(89) *Fission$_a$* (Halle & Marantz (1993)):

a. Fission separates a feature bundle β from a terminal node (morpheme) M_α, such that two terminal nodes M_1 and M_2 come into existence.

b. M_1 has the features β; M_2 has the features of M_α–β.

(90) *Fission$_b$* (Noyer (1992)): If insertion of a vocabulary item V with the morpho-syntactic features β takes place into a fissioned morpheme M with the morpho-syntactic features α, then α is split up into β and α–β, such that (a) and (b) hold:

a. α–β is available for further vocabulary insertion.

b. β is not available for further vocabulary insertion.

Note:
Fission of a morpheme is recursive; i.e., after insertion of a vocabulary item, a morpheme (assuming that it has morpho-syntactic features left) is again subject to fission, and so on (until no features are left).

(91) *Subset Principle* (Halle (1997)):
A vocabulary item *V* is inserted into a functional morpheme *M* iff (i) and (ii) hold:

(i) The morpho-syntactic features of *V* are a subset of the morpho-syntactic features of *M*.

(ii) *V* is the most specific vocabulary item that satisfies (i).

Terminological remark:
Frampton calls this principle the "Principle of Decreasing Specificity" (PDS).

(92) *Specificity of vocabulary items*:
A vocabulary item V_i is more specific than a vocabulary item V_j iff V_i has more morpho-syntactic features than V_j.

15. Syncretism in English Verb Inflection

(93) a. *be*

	pres	past
1 sg	am	was
2 sg	are	were
3 sg	is	was
1 pl	are	were
2 pl	are	were
3 pl	are	were

b. *work*

	pres	past
1 sg	work	worked
2 sg	work	worked
3 sg	works	worked
1 pl	work	worked
2 pl	work	worked
3 pl	work	worked

(94) *Generalizations*:
a. In past tense contexts, there is a syncretism of 1.Pers.Sg. and 3.Pers.Sg.
b. In the plural, there are no person distinctions.

Assumption:
These two generalizations are not accidental. Therefore, they should not folow from arbitrary properties of vocabulary items. Rather, they should be derived from impoverishment rules that systematically reduce and simplify syntactic features structures for the purposes of morphological realization. Consequently, certain kinds of syncretism can be classified as system-defining properties.

Observation:
At least the 1./3. syncretism is a fundamental property of all Germanic languages. (It holds in Gothic, German, Icelandic, etc.)

Basic problem:
How can the 1./3. syncretism be derived by invoking the concept of natural classes of persons?

Plank (1991a, 19):
This shows that syncretism can show up without any "similarity in meaning"; the reason would be that 1. and 3.Pers. intuitively do not form a natural class ("no natural class on any plausible criterion").

Assumption (Wiese (1994)):
1. and 3.Pers. are indeed a natural class (that can then be referred to by inflection markers via underspecification); the only thing that needs to be done is to decompse inflection markers accordingly.

(95) *Decomposition of inflection markers in Wiese's work*:
a. [±demonstrative]
b. [±addressing]

(96) *Persons in Wiese's system*:
a. [–d,–a] = 1. Pers.
b. [+d,+a] = 2. Pers.
c. [+d,–a] = 3. Pers.
d. [–d,+a] = – (1. Pers. incl.?)

Result:
1. and 3. Person form a natural class: [–addressing]
Note:
Independently, Frampton suggests a similar decomposition (based on work by Noyer (1992)).

(97) *Decomposition of person features in Frampton's analysis*:
a. [±1]
b. [±2]

Consequently:
(i) [+a] in Wiese's system = [+2]
(ii) [–a] in Wiese's system = [–2] in Frampton's system
(iii) [+d] in Wiese's system = [–1] in Frampton's system
(iv) [–d] in Wiese's system = [+1] in Frampton's system

Result:
Again, 1.Person and 3.Person form a natural class: [–2].

(98) *Persons in Frampton's system*:
a. [+1,–2] = 1. Pers.
b. [–1,+2] = 2. Pers.
c. [–1,–2] = 3. Pers.
d. [+1,+2] = 1. Pers. inkl.

Note:
In Frampton's analysis, the primitive features are given semantic interpretations; whether [+1,+2] can be interpreted in a coherent way is assumed to be subject to language-specific parametrization. In (e.g.) Indo-European languages, the combination is not available, due to a lack of semantic coherence.

Side remark:
The system of decomposed person features is not yet adequate to account for all cases of person syncretism that have been observed in the literature (for concreteness, there is good evidence that 1. and 2.Person also form a natural class). We can ignore this complication for the time being.

(99) *Vocabulary items: 'be'*:

a. /am/ ↔ [+1,–2,–pl,–past]
b. /ɪ/ ↔ [–2,–pl,–past]
c. /are/ ↔ [–past]
d. /was/ ↔ [–2,–pl,+past]
e. /were/ ↔ [+past]

Problem:
The syncretism is now derivable by decomposing person features, but it is analyzed as going back to an arbitrary lexical entry (cf. (99-d)) rather than as a system-wide generalization.
Assumptions about syntactic structure

(100) a. *Simplified clause structure before head movement*:
$[_{\text{AgrP}}\ [_{\text{Agr}'}\ \text{Agr}\ [_{\text{TP}}\ [_{\text{T}'}\ \text{T}\ [_{\text{VP}}\ \ldots\ \text{V}\ \ldots\ ]]]]]$
b. *Result of head movement*:
$[_{\text{Agr}}\ [_{\text{T}}\ \text{V}\ \text{T}\ ]\ \text{Agr}\ ]$

Note:
This generates the abstract paradigms in (101). (These abstract paradigms are not to be viewed as genuine objects of the grammar; they have the status of generalizations about which fully specified categories need to be filled by vocabulary insertion. In line with virtually all work carried out in Distributed Morphology, Frampton assumes that paradigms are not entitities that morphological constraints can refer to.)

(101) *Specifications that need to be realized by vocabulary items, version 1*:

a. V + [–past] + $\begin{bmatrix}[+1,–2,–pl] & [+1,–2,+pl]\\ [–1,+2,–pl] & [+1,+2,+pl]\\ [–1,–2,–pl] & [–1,–2,+pl]\end{bmatrix}$

b. V + [+past] + $\begin{bmatrix}[+1,–2,–pl] & [+1,–2,+pl]\\ [–1,+2,–pl] & [+1,+2,+pl]\\ [–1,–2,–pl] & [–1,–2,+pl]\end{bmatrix}$

Assumption:
(101) is simplified by impoverishment.

(102) *Impoverishment for plural contexts in English*:
[±1,±2] → Ø/__[+pl]

(103) *Specifications that need to be realized by vocabulary items, version 2 (after impoverishment)*:

a. V + [–past] + $\begin{bmatrix}[+1,–2,–pl] & [+pl]\\ [–1,+2,–pl] & [+pl]\\ [–1,–2,–pl] & [+pl]\end{bmatrix}$

b. V + [+past] + $\begin{bmatrix}[+1,–2,–pl] & [+pl]\\ [–1,+2,–pl] & [+pl]\\ [–1,–2,–pl] & [+pl]\end{bmatrix}$

Consequence:
There can be no vocabulary items that are sensitive to person differences in the plural (or if there are, they will never be able to surface).

16. Syncretism in Old English Verb Inflection

(104) Weak verbs: *dēmen* ('deem')

	pres	past
[+1,–2,–pl]	dēm-e	dēm-d-e
[–1,+2,–pl]	dēm-est	dēm-d-est
[–1,–2,–pl]	dēm-eþ	dēm-d-e
[+1,–2,+pl]	dēm-aþ	dēm-d-on
[–1,+2,+pl]	dēm-aþ	dēm-d-on
[–1,–2,+pl]	dēm-aþ	dēm-d-on

(105) Strong verbs: *singan* ('sing')

	pres	past
[+1,–2,–pl]	sing-e	sang
[–1,+2,–pl]	sing-est	sung-e
[–1,–2,–pl]	sing-eþ	sang
[+1,–2,+pl]	sing-aþ	sung-on
[–1,+2,+pl]	sing-aþ	sung-on
[–1,–2,+pl]	sing-aþ	sung-on

(106) Suppletive verbs: *sindon* ('be')

	pres	past
[+1,–2,–pl]	eam	wæs
[–1,+2,–pl]	eart	wær-e
[–1,–2,–pl]	is	wæs
[+1,–2,+pl]	sindon	wær-on
[–1,+2,+pl]	sindon	wær-on
[–1,–2,+pl]	sindon	wær-on

Assumption:
The instances of systematic syncretism in the plural, and with 1. and 3. Pers. Sg. in past tense contexts, are to be derived by involing impoverishment rules.

(107) *Impoverishment*:

a. [+past] becomes a privative feature [past], [–past] is deleted.
b. [+pl] becmes a privative feature [pl], [–pl] is deleted.
c. [±1] → Ø/[past]__.
d. [±1,±2] → Ø/__[pl].

Note:
(107-cd) are the important rules.
(It is not fully clear to me whether (107-ab) are needed at all. Frampton introduces these rules as 'privativization rules", but is seems that we are dealing with impoverishment rules

here.)

Consequence:
From (101), we don't just get (103); rather, we get the abstract paradigm (108). (108) exhaustively defines the possible insertion contexts for Old English verb inflection markers.

(108) *Specifications that need to be realized by vocabulary items, version 3 (after privativization and two applications of impoverishment)*:

a. V + $\begin{bmatrix} [+1,-2] & [pl] \\ [-1,+2] & [pl] \\ [-1,-2] & [pl] \end{bmatrix}$

b. V + [past] + $\begin{bmatrix} [-2] & [pl] \\ [+2] & [pl] \\ [-2] & [pl] \end{bmatrix}$

(109) *Vocabulary items*:

a. /wæs/ ↔ *sindon*/__[–2,past]
b. /wær/ ↔ *sindon*/__[past]
c. Ø ↔ [past]/V_{strong}__
d. /d/ ↔ [past]
e. Ø ↔ [–2]/V_{strong},[past]__
f. /e/ ↔ [+2]/V_{strong},[past]__
g. /eþ/ ↔ [–1,–2]
h. /est/ ↔ [+2]
i. /e/ ↔ [–2]
j. /on/ ↔ [pl]/[past]__
k. /aþ/ ↔ [pl]

(110) a. V + $\begin{bmatrix} [+1,-2] & [pl] \\ [-1,+2] & [pl] \\ [-1,-2] & [pl] \end{bmatrix}$ b. V + [past] + $\begin{bmatrix} [-2] & [pl] \\ [+2] & [pl] \\ [-2] & [pl] \end{bmatrix}$

Problem:
Why are no inflection markers inserted with suppletive forms of *sindon* in the present tense?

Solution:
sindon (= V) and Agr fuse when they are adjacent (i.e., if T[past] does not intervene).

(111) a. /eam/ ↔ *sindon*,[+1,–2]
b. /eart/ ↔ *sindon*,[+2]
c. /is/ ↔ *sindon*,[–2]
d. /sindon/ ↔ *sindon*,[pl]

Complexity:
Frampton notes that, given the Subset Principle, (a) first the vocabulary items have to be determined that fit into a given context, and (b) then the most specific marker (among those that are compatible) must be determined. Assuming impoverishment, both processes

are substantially shorter. Therefore (so the idea), a theory that employs impoverishment is attractive, and preferable, from the point of view of complexity (other things being equal).

17. Syncretism in German Verb Inflection

(112) Weak verbs: *believe*

	pres	past
[+1,–2,–pl]	glaub-e	glaub-te
[–1,+2,–pl]	glaub-st	glaub-te-st
[–1,–2,–pl]	glaub-t	glaub-te
[+1,–2,+pl]	glaub-en	glaub-te-n
[–1,+2,+pl]	glaub-t	glaub-te-t
[–1,–2,+pl]	glaub-en	glaub-te-n

(113) Strong verbs: *sing*

	pres	past
[+1,–2,–pl]	sing-e	sang
[–1,+2,–pl]	sing-st	sang-st
[–1,–2,–pl]	sing-t	sang
[+1,–2,+pl]	sing-en	sang-en
[–1,+2,+pl]	sing-t	sang-t
[–1,–2,+pl]	sing-en	sang-en

(114) Suppletive verbs: *be*

	pres	past
[+1,–2,–pl]	bin	war
[–1,+2,–pl]	bi-st	war-st
[–1,–2,–pl]	is-t	war
[+1,–2,+pl]	sind	war-en
[–1,+2,+pl]	seid	war-t
[–1,–2,+pl]	sind	war-en

(115) *Impoverishment rules, German*:

a. [+past] becomes a privative feature [past], [–past] is deleted.
b. [+pl] becomes a privative feature feature [pl], [–pl] is deleted.
c. [±1] → Ø/[past]__.
d. [±1] → Ø/__[pl].

(116) *Specifications that need to be realizied by vocabulary items (after privativization and two applications of impoverishmen*:

a. V + $\begin{bmatrix} [+1,-2] & [-2,pl] \\ [-1,+2] & [+2,pl] \\ [-1,-2] & [-2,pl] \end{bmatrix}$

b. V + [past] + $\begin{bmatrix} [-2] & [-2,pl] \\ [+2] & [+2,pl] \\ [-2] & [-2,pl] \end{bmatrix}$

(117) *Vocabulary items*:

a. Ø ↔ [past]/V_{strong}__
b. /te/ ↔ [past]
c. /e/ ↔ [+1,–2]
d. /t/ ↔ [–1,–2]
e. /n/ ↔ [–2,pl]
f. /t/ ↔ [+2,pl]
g. /st/ ↔ [+2]

(118) a. V + $\begin{bmatrix} [+1,–2] & [–2,pl] \\ [–1,+2] & [+2,pl] \\ [–1,–2] & [–2,pl] \end{bmatrix}$ b. V + [past] + $\begin{bmatrix} [–2] & [–2,pl] \\ [+2] & [+2,pl] \\ [–2] & [–2,pl] \end{bmatrix}$

18. Kabyle-Berber

Language: Afro-Asiatic, Algeria

Plot:
There is no evidence for impoverishment here in the domain of conjugation, but there is evidence for (i) the decomposition of person features, and (ii) fission.

(119) *Fission$_b$* (Noyer (1992)): If insertion of a vocabulary item V with the morpho-syntactic features β takes place into a fissioned morpheme M with the morpho-syntactic features α, then α is split up into β and α–β, such that (a) and (b) hold:

a. α–β is available for further vocabulary insertion.
b. β is not available for further vocabulary insertion.

(120) *Completive verbal paradigm*:

	sg	pl
1masc	wala-ɣ	n-wala
1fem	wala-ɣ	n-wala
2masc	t-wala-d'	t-wala-m
2fem	t-wala-d'	t-wala-m-t
3masc	i-wala	wala-n
3fem	t-wala	wala-n-t

(121) *Abstract paradigm*:

V + $\begin{bmatrix} [+1,–2,–pl,–fem] & [+1,–2,+pl,–fem] \\ [+1,–2,–pl,+fem] & [+1,–2,+pl,+fem] \end{bmatrix}$ $\begin{bmatrix} [–1,+2,–pl,–fem] & [–1,+2,+pl,–fem] \\ [–1,+2,–pl,+fem] & [–1,+2,+pl,+fem] \end{bmatrix}$ $\begin{bmatrix} [–1,–2,–pl,–fem] & [–1,–2,+pl,–fem] \\ [–1,–2,–pl,+fem] & [–1,–2,+pl,+fem] \end{bmatrix}$

Note:
For every vocabulary item, it must be listed whether it is a suffix or a prefix (indicated by a hyphen accompanying the exponent in question).

(122) *Vocabulary items*:

a. /i-/ ↔ [–1,–2,–pl,–fem]
b. /-n/ ↔ [–1,–2,+pl]
c. /n-/ ↔ [+1,+pl]
d. /-ɣ/ ↔ [+1]
e. /-m/ ↔ [+2,+pl]
f. /-d'/ ↔ [+2]
g. /t-/ ↔ [–1]
h. /-t/ ↔ [+fem]/[–1,+pl]__

Note:
The system recognizes both *discontinuous bleeding* and *fission*.

- Discontinuous bleeding: An exponent may block another exponent even though the two markers have a different status as suffix or prefix: There is competition for a single (abstract, morphematic) position (a functional category). Thus, /t-/ is discontinuously bled by /-n/ (and regularly by /i-/); /-ɣ/ is dicontinously bled by /n-/.
- Fission: An exponent may co-occur with another exponent even though there is only a single (abstract, morphematic) position (a functional category), irrespectively of their status as suffix or prefix: Feature decomposition, subanalysis. Thus, /t-/ can co-occur with /-d'/ because the two exponents realize different primitive features ([-1] vs. [+2]). In contrast, the /-t/ suffix (basically a [+fem] exponent) instantiates *extended exponence* and must therefore resort to a secondary (contextual) feature specification (so as to preclude it from showing up in first person contexts).

19. Extension of Frampton's analysis in Müller (2006a;b)

(5) a. *Weak verb inflection*: *believe*

	Present	Past
[1,sg]	glaub-e	glaub-te
[2,sg]	glaub-st	glaub-te-st
[3,sg]	glaub-t	glaub-te
[1,pl]	glaub-en	glaub-te-n
[2,pl]	glaub-t	glaub-te-t
[3,pl]	glaub-en	glaub-te-n

b. *Strong verb inflection*: *call*

	Present	Past
[1,sg]	ruf-e	rief
[2,sg]	ruf-st	rief-st
[3,sg]	ruf-t	rief
[1,pl]	ruf-en	rief-en
[2,pl]	ruf-t	rief-t
[3,pl]	ruf-en	rief-en

c. *Suppletive verb inflection*: *sein*

	Present	Past
[1,sg]	bin	war
[2,sg]	bi-st	war-st
[3,sg]	is-t	war
[1,pl]	sind	war-en
[2,pl]	seid	war-t
[3,pl]	sind	war-en

(123) *Two impoverishment rules for verb inflection in German*:

a. [±1] → Ø/[–2,–pl,+past]__

b. $[\pm 1] \rightarrow \emptyset / [-2,+pl]\_\_$

(124) *Marker inventory*:

a. /te/ ↔ [+past,–strong]
b. /s/ ↔ [+2,–pl]
c. /n/ ↔ [–2,+pl]
d. /t/ ↔ [–1]
e. /(e)/ ↔ [ ]

(125) *Vocabulary insertion into impoverished T morphemes in German*

T	[–past] [–strong]	[–past] [+strong]
[+1,–2,–pl]	/e/	/e/
[–1,+2,–pl]	/s/-/t/	/s/-/t/
[–1,–2,–pl]	/t/	/t/
[~~+1,~~–2,+pl]	/n/	/n/
[–1,+2,+pl]	/t/	/t/
[~~+1,~~–2,+pl]	/n/	/n/

T	[+past] [–strong]	[+past] [+strong]
[~~+1,~~–2,–pl]	/te/	/Ø/
[–1,+2,–pl]	/te/-/s/-/t/	/s/-/t/
[~~+1,~~–2,–pl]	/te/	/Ø/
[~~+1,~~–2,+pl]	/te/-/n/	/n/
[–1,+2,+pl]	/te/-/t/	/t/
[~~+1,~~–2,+pl]	/te/-/n/	/n/

20. Appendix: Pike on German Verbs

20.1. The Idea

Observation:
There is evidence that the individual word forms are composed of smaller units: *partial syncretism.*

Partial Syncretism in the Suppletive Paradigm: Subanalysis

(126) *Pike's (1965) subanalysis of verb inflection with sein ('be') in German*:

1.sg	b		ɪ	n	
2.sg	b		ɪ	s	t
3.sg			ɪ	s	t
1.pl	z		ɪ	n	t
2.pl	z	a	ɪ		t
3.pl	z		ɪ	n	t
inf	z	a	ɪ	n	

Claim (Baerman et al. (2005)):
"Whatever the merits of such an analysis, it is not one which is compatible with most morphological models".

Side remark: Pike's (1965) article contains two further analyses of inflectional phenomena in German: a subanalysis of definite article inflection (*der, die, das*, etc), and a subanalysis of personal pronouns, including suppletion phenomena (*ich, mich, mir, meiner*, etc.).

Observation: Pike-style analyses have independently been developed for these phenomena in current morphological theories:

- Wunderlich (1997b), Wiese (1999) on the inflection of definite articles
- Wiese (2001b), Fischer (2006) on the inflection of personal pronouns

Subanalysis in Current Morphological Theories

Question:
Do we have to assume that the verb forms in (126) are *morphological constructions* (i.e., not decomposable)?

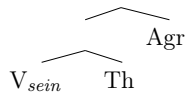
Answer:
Probably not:

Subanalysis is pursued in many current morphological theories (see Müller (2008) for detailed argumentation):

- *Distributed Morphology*: noun inflection in Latvian and Russian (Halle (1992; 1994)), Afro-Asiatic prefix conjugation (Noyer (1992)), argument encoding markers on verbs in Georgian and Potawatomi (Halle & Marantz (1993)), Spanish object clitics (Halle & Marantz (1994)), verb inflection in Kiowa (Harbour (2003)), noun inflection in Icelandic (Müller (2005)), verb inflection in Menominee (Trommer (2006b), Nevins (2007)), various other phenomena (papers collected in Müller & Trommer (2006))
- *Paradigm Function Morphology* (and other stem-and-paradigm approaches): Bulgarian verb inflection (Stump (2001)), argument encoding markers on verbs in Georgian and Potawatomi (Anderson (1992))
- *Minimalist Morphology* (Wunderlich (1996; 1997c))
- *Network Morphology* (Brown & Hippisley (2012))
- *Nanosyntax* (Caha (2009))
- *Optimality* (cf. the material in second part of this course)

20.2. Pike's (1965) Subanalysis of German Verb Inflection in Distributed Morphology

(127)



(128) *Vocabulary insertion rules in Distributed Morphology*

a. (i) /b/ ↔ V$_{sein}$ /__ [–3,–pl]
   (ii) /z/ ↔ V$_{sein}$ /__ [+pl]
b. (i) /a/ ↔ [+β] /__ V$_{sein}$, [–1,+2,+pl]
   (ii) /ɪ/ ↔ [+α] /__ V$_{sein}$
c. (i) /Ø/ ↔ [–1,+2] /__ V$_{sein}$, [+pl]
   (ii) /s/ ↔ [–1,±2] /__ V$_{sein}$, [–pl]
   (iii) /n/ ↔ [–2] /__ V$_{sein}$

(iv) /Ø/ ↔ [–pl] /__ V_{sein}, [+1]
(v) /t/ ↔ V_{sein}, [±pl]

IV. Paradigm Function Morphology

Ref.: Stump (2001)

21. Annahmen

(129) *Grundannahme*:
Die Verknüpfung eines Wortes mit einer bestimmten Menge von morphosyntaktischen Eigenschaften determiniert eine Kette von Regelanwendungen, die die Flexionsform des Wortes bestimmen.

(130) Traditionelle Terminologie:
a. *Wort* ('Wort', 'Lexem'): z.B. BUCH; Wörter haben Paradigmen.
b. *Wortform* ('Flexionsform des Wortes'): z.B. *Buches*; Wortformen sind Teile von Paradigmen.

(131) *Paradigmen* (Behauptung):
In dieser Theorie sind Paradigmen keine Epiphänomene; vielmehr "konstituieren sie ein zentrales Prinzip der morphologischen Organisation". Paradigmen sind das Ergebnis von *Paradigmenfunktionen*

(132) Drei Typen morphologischer Ausdrücke:
a. *Wurzel* ('root'): die "ultimative Default-Form" eines Lexems (Wortes).
b. *Stamm* ('stem'): ein Ausdruck, an den Flexionsexponenten angefügt werden können (jede Wurzel ist ein Stamm, nicht jeder Stamm ist eine Wurzel).
c. *Wortform* ('word'(!)): eine freie, voll flektierte Form, die eine Paradigmenzelle besetzt

(133) *Realisierungsregeln*:
Paradigmenfunktionen werden durch speziellere Realisierungsregeln definiert.

(134) Informelles Beispiel:
Der Wert der Paradigmenfunktion (<*Mutter*-,{dativ,plural}>) ergibt sich aus dem Ergebnis der Anwendung zweier Realisationsregeln – einer, die die Umlautvariante des Stamms wählt, und einer, die *-n* suffigiert.

Terminologie:
<*Mutter*-,{dativ,plural}> ist ein *FPSP* ('form/property-set pairing').

(135) *Regelblöcke*:
a. Die Realisierungsregeln einer Sprache sind in Blöcke organisiert.
b. Regeln im selben Blick konkurrieren miteinander; nur die spezifischste Regel kann applizieren (Paninis Prinzip; Spezifizitätsprinzip).
c. Regeln in verschieden Blöcken konkurrieren nicht; so treten in einer Wortform verschiedene Exponenten hintereinander.

Bemerkung:
Die Exponenten kommen durch Regeln in eine Wortform und haben keinen eigenständigen Status. Die Theorie ist also *amorphematisch* (vgl. Anderson (1992)).
Slogan: *Paradigmenfunktionen sind statische Wohlgeformtheitsbedingungen für Zellen.*

(136) *Wohlgeformte Menge morphosyntaktischer Eigenschaften*:
Eine Menge τ von morphosyntaktischen Eigenschaften für ein Lexem der Kategorie C ist wohlgeformt in einer Sprache L nur dann, wenn τ die folgenden Bedinungen in L erfüllt.

a. Für jede Eigenschaft F:v$\in\tau$ gilt: F:v ist für Lexeme der Kategorie C zugänglich und v ist ein erlaubter Wert für F.
b. Für jedes morphosyntaktische Merkmal F, das v_1, v_2 als mögliche Werte hat, gilt: Wenn $v_1 \neq v_2$ und F:$v_1\in\tau$, dann F:$v_2\notin \tau$.

(137) *Extension*:
Falls σ und τ wohlgeformte Mengen morphosyntaktischer Eigenschaften sind, ist σ eine Extension von τ gdw. (a) und (b) gelten.

a. Für jedes atomwertige Merkmal F und jeden erlaubten Wert v für F gilt: Wenn F:v$\in\tau$, dann F:v$\in\sigma$.
b. Für jedes mengenwertige Merkmal F und jeden erlaubten Wert p für F gilt: Wenn F:p$\in\tau$, dann F:p$'\in\tau$, wobei p$'$ eine Extension von p ist.

(138) *Unifikation*:
Falls σ und τ wohlgeformte Mengen morphosyntaktischer Merkmale sind, ist die Unifikation ρ von σ und τ die kleinste wohlgeformte Menge von morphosyntaktischen Eigenschaften, so dass ρ eine Extension sowohl von σ, als auch von τ ist.

(139) a. {TNS:pres,AGR:{PER:1,NUM:pl}} ist Extension von {AGR:{PER:1,NUM:pl}}, {AGR:{NUM:pl}}, { }, usw.
b. {TNS:pres,MOOD:ind,AGR:{PER:1,NUM:pl}} ist die Unifikation von {TNS:pres,AGR:{PER:1}} und {TNS:pres,MOOD:ind,AGR:{NUM:pl}}

(140) *Eigenschaftskookkurrenzrestriktionen* (bulgarische Verbformen; Ausschnitt):
Eine Menge τ von morphosyntaktischen Eigenschaften für ein Lexem der Kategorie V ist wohlgeformt nur, wenn τ eine wohlgeformte Extension σ hat, so dass gilt:

a. σ ist eine Extension von {VFORM:fin} gdw. für ein zulässiges α gilt: σ ist eine Extension von {MOOD:α}. (wenn Finitheit, dann Modus (Ind oder Konj))
b. Wenn σ eine Extension ist von {MOOD:impv}, dann ist σ eine Extension von {AGR:{PER:2}. (wenn Imperativ, dann 2. Person)
c. Für jedes zulässige α gilt: σ ist eine Extension von {TNS:α} gdw. σ eine Extension ist von {MOOD:indic} oder von {VFORM:pple}. (V hat Tempus wenn es Ind. oder Partizip ist)
d. Für jedes zulässige α gilt: σ ist eine Extension von {AGR:{GEN:α}} gdw. σ eine Extension ist von {VFORM:pple}, und σ ist eine Extension von {AGR:{PERS:α}} gdw. σ eine Extension ist von {VFORM:fin}. (Wenn Genus, dann Partizip; wenn Person, dann Finitheit)

(141) *Vollständigkeit* von Mengen morphosyntaktischer Merkmale:
Eine Menge σ von morphosyntaktischen Merkmalen für ein Lexem einer Kategorie ist vollständig gdw. (a) und (b) gelten:

a. σ ist wohlgeformt.
b. Für jede Menge morphosyntaktischer Merkmale τ (so dass σ nicht eine Extension von τ ist) gilt: die Unifikation von τ und σ ist nicht wohlgeformt.

Definitionen 3
Paradigmenfunktionen:
Eine Paradigmenfunktion ist eine Funktion in der Menge der FPSPs, die auf einem *Wurzelpaar* <X,σ> appliziert (wobei X die Wurzel eines Lexems L ist und σ eine vollständige Menge morphosyntaktischer Eigenschaften für L ist) und eine σ-Zelle <Y,σ> im Paradigma von L ergibt.

(142) *Format von Paradigmenfunktionen*:
PF(<X,σ>) = <Y,σ>

Realisierungsregeln ('realization rules', 'rules of exponence'):
Eine Realisierungsregel ist eine Funktion in der Menge der FPSPs. Im Unterschied zu einer Paradigmenfunktion muss aber das Argument nicht unbedingt ein Wurzelpaar sein, und der Wert muss nicht unbedingt eine Paradigmenzelle sein.

(143) *Format von Realisierungsregeln*:
$RR_{n,\tau,C}$(<X,σ>) = <Y$'$,σ>

Terminologie:

- n: Blockindex
- τ: Eigenschaftsmengenindex (die wohlgeformte Menge morphosyntaktischer Eigenschaften, die die Regel durch ihre Anwendung realisiert; σ muss Extension von τ sein → *Unterspezifikation*)
- C: Klassenindex (Klasse der Lexeme, deren Paradigmen die Regel mit definieren kann)
- Y$'$: im Default Y, aber Möglichkeit der Überschreibung durch morphonologische Regeln

22. Bulgarische Verbflexion

(144) *Vier imperfektive Verben im Bulgarischen*:

a. KRAD ('stehlen'): 1.St. = *krad*, 2.St. = *krád*
b. IGRÁJ ('spielen'): 1.St. = *igráj*, 2.St. = *igrá*
c. KOVA ('fälschen'): 1.St. = *kov*, 2.St. = *kova*
d. DÁVA ('geben'): 1.St. = *dáva*, 2.St. = *dáva*

Zwei Stämme:
1. Stamm: Präsens, Imperfekt
2. Stamm: Aorist

Zwei abstrakte binäre Flexionsklassenmerkmale: [±t(runcating)], [±c(onsonantal)]:
[–t]: 1./2. Stamm: identisch zur Wurzel
[+t]: 1. Stamm: C, 2. Stamm: V
Auf diese Flexionsklassenmerkmale (auch unterspezifiziert) wird in Realisierungsregeln und morphonologischen Regeln Bezug genommen.

(145) a. KRAD ('stehlen'): [–t,+c]
b. IGRÁJ ('spielen'): [+t,+c]
c. KOVA ('fälschen'): [+t,–c]

d. DÁVA (‘geben’): [–t,–c]

Paradigmen der bulgarischen Verbflexion

(146) *Abstrakte Paradigmen des Indikativs ohne morphonologische Regeln*:

Konjugation		KRAD [–t,+c]	DÁVA [–t,–c]	IGRÁJ [+t,+c]	KOVA [+t,–c]
Präsens	1sg	*krad-e-ə*	*dáva-e-m*	*igráj-e-ə*	*kov-e-ə*
	2sg	*krad-e-š*	*dáva-e-š*	*igráj-e-š*	*kov-e-š*
	3sg	*krad-e–e*	*dáva-e-e*	*igráj-e-e*	*kov-e-e*
	1pl	*krad-e-m*	*dáva-e-me*	*igráj-e-m*	*kov-e-m*
	2pl	*krad-e-te*	*dáva-e-te*	*igráj-e-te*	*kov-e-te*
	3pl	*krad-e-ət*	*dáva-e-ət*	*igráj-e-ət*	*kov-e-ət*
Imperfekt	1sg	*krad-A-x*	*dáva-A-x*	*igráj-A-x*	*kov-A-x*
	2sg	*krad-A-x-e*	*dáva-A-x-e*	*igráj-A-x-e*	*kov-A-x-e*
	3sg	*krad-A-x-e*	*dáva-A-x-e*	*igráj-A-x-e*	*kov-A-x-e*
	1pl	*krad-A-x-me*	*dáva-A-x-me*	*igráj-A-x-me*	*kov-A-x-me*
	2pl	*krad-A-x-te*	*dáva-A-x-te*	*igráj-A-x-te*	*kov-A-x-te*
	3pl	*krad-A-x-a*	*dáva-A-x-a*	*igráj-A-x-a*	*kov-A-x-a*
Aorist	1sg	*krád-o-x*	*dáva-o-x*	*igrá-o-x*	*kova-o-x*
	2sg	*krád-e*	*dáva-e*	*igrá-e*	*kova-e*
	3sg	*krád-e*	*dáva-e*	*igrá-e*	*kova-e*
	1pl	*krád-o-x-me*	*dáva-o-x-me*	*igrá-o-x-me*	*kova-o-x-me*
	2pl	*krád-o-x-te*	*dáva-o-x-te*	*igrá-o-x-te*	*kova-o-x-te*
	3pl	*krád-o-x-a*	*dáva-o-x-a*	*igrá-o-x-a*	*kova-o-x-a*

Realisierungsregeln

(147) a. *Block A*:
A1 $RR_{A,\{TNS:aor\},V}(<X,\sigma>) =_{def} <Y',\sigma>$, wobei Y der 2. Stamm von X ist.
A2 $RR_{A,\{\ \},V}(<X,\sigma>) =_{def} <Y',\sigma>$, wobei Y der 1. Stamm von X ist.

b. *Block B & Block C*:
B1 $RR_{B,\{TNS:pres\},V}(<X,\sigma>) =_{def} <Xe',\sigma>$
B2 $RR_{B,\{TNS:impf\},V}(<X,\sigma>) =_{def} <XA',\sigma>$
B3 $RR_{B,\{TNS:aor,PRET:yes\},V}(<X,\sigma>) =_{def} <Xo',\sigma>$
B4/C1 Wenn n = **B** oder **C**:
$RR_{n,\{TNS:aor,PRET:yes,AGR:\{PER:3,NUM:sg\}\},V}(<X,\sigma>) =_{def} <X',\sigma>$
C2 $RR_{C,\{PRET:yes\},V}(<X,\sigma>) =_{def} <Xx',\sigma>$

c. *Block D*:
D1 $RR_{D,\{TNS:pres,AGR:\{PER:1,NUM:sg\}\},V}(<X,\sigma>) =_{def} <Xə',\sigma>$
D2 $RR_{D,\{TNS:pres,AGR:\{PER:1,NUM:sg\}\},[CONJ:-T,-C]}(<X,\sigma>) =_{def} <Xm',\sigma>$
D3 $RR_{D,\{TNS:pres,AGR:\{PER:2,NUM:sg\}\},V}(<X,\sigma>) =_{def} <Xš',\sigma>$
D4 $RR_{D,\{AGR:\{PER:3,NUM:sg\}\}}(<X,\sigma>) =_{def} <Xe',\sigma>$
D5 $RR_{D,\{TNS:pres,AGR:\{PER:1,NUM:pl\}\},([CONJ:+T]\cup[CONJ:+C])}(<X,\sigma>) =_{def} <Xm',\sigma>$
D6 $RR_{D,\{AGR:\{PER:1,NUM:pl\}\},V}(<X,\sigma>) =_{def} <Xme',\sigma>$

D7 $RR_{D,\{AGR:\{PER:2,NUM:pl\}\},V}(<X,\sigma>) =_{def} <Xte',\sigma>$
D8 $RR_{D,\{TNS:pres,AGR:\{PER:3,NUM:pl\}\},V}(<X,\sigma>) =_{def} <Xət',\sigma>$
D9 $RR_{D,\{AGR:\{PER:3,NUM:pl\}\},V}(<X,\sigma>) =_{def} <Xa',\sigma>$

(148) *Verweisregel* (‘rule of referral’; informelle Variante):
Im Präteritum (Aorist und Imperfekt) richtet sich die 2.Pers.Sg. nach der 3.Pers.Sg.

Regelanwendung 1: Spezifizität

(149) *Paninis Prinzip*:
Es sei σ eine vollständige Menge von morphosyntaktischen Eigenschaften für Lexeme der Kategorie V. Dann ist $PF(<X,\sigma>) =_{def} Nar_D(Nar_C(Nar_B(Nar_A(<X,\sigma>))))$

(150) *Nar_n-Notation*:
Falls $RR_{n,\tau,C}$ die **engste** Regel in Block n ist, die auf $<X,\sigma>$ **anwendbar** ist, so repräsentiert ‘$Nar_n(<X,\sigma>)$’ das Resultat der Anwendung von $RR_{n,\tau,C}$ auf $<X,\sigma>$.

(151) *Enge und Anwendbarkeit* (vereinfacht):
a. $RR_{n,\sigma,C}$ ist enger als $RR_{n,\tau,C}$ gdw. σ eine Extension von τ ist und $\sigma \neq \tau$.
b. $RR_{n,\tau,C}$ ist anwendbar auf $<X,\sigma>$ gdw. $RR_{n\tau,C}(<X,\sigma>$ definiert ist.

(152) *Regel-Argument-Kohärenz*:
$RR_{n\tau,C}(<X,\sigma>$ ist definiert gdw. (a) σ eine Extension von τ ist (s.o.); (b) L-Index(X) $\in$ C ist; und (c) σ eine wohlgeformte Menge von morphosyntaktischen Eigenschaften für L-Index(X) ist.

Regelanwendung 2: Identitätsfunktion

(153) *Default der Identitätsfunktion*:
$\boxed{RR_{n,\{\ \},U}(<X,\sigma>) =_{def} <X,\sigma>}$

Bemerkung:
Dies ist so etwas wie ein Nullmarker, der als minimal spezifische Regel in jedem Block (n ist eine Variable über allen Regelblöcken, U über allen Lexemklassen) zur Verfügung steht und dafür sorgt, dass es immer weiter geht. Beispiel:

(154) Beispiel:
a. σ = {VFORM:fin, VCE:act, TNS:pres, PRET:no, MOOD:indic, AGR:{PER:1,NUM:pl}}
b. $Nar_C(<kradé,\sigma>) = RR_{C,\{\ \},U}(<kradé,\sigma>) = <kradé,\sigma>$

Regelanwendung 3: Verweisregeln und Synkretismus
Manche Synkretismen kann man im Prinzip durch *Unterspezifikation*, auch bzgl. *abstrakter morphosyntaktischer Merkmale* ableiten ([pret:yes/no] ist ein solches); oder durch vollständige Unterspezifikation bzgl. einer grammatischen Kategorisierung (vgl. den Synkretismus bei der 3.Pers.Pl. im Aorist und Imperfekt: D9 vs. D8). Es gibt aber auch andere Synkretismen, wo Stump nicht diesen Weg geht: Bisher hatten wir die folgende informelle Version einer Verweisregel, die einen systematischen Synkretismus bei der 2.Pers.Sg. und der 3.Pers.Sg. ableitet.

(155) *Verweisregel* (informelle Variante):
Im Präteritum (Aorist und Imperfekt) richtet sich die 2.Pers.Sg. nach der 3.Pers.Sg.

Jetzt kann die Regel präziser formuliert werden:

(156) *Verweisregel* (saubere Variante):
Angenommen, (a)–(c) sind der Fall:
a. τ ist eine beliebige vollständige Extension von {PRET:yes, AGR:{PERS:2,NUM:sg}}.
b. n ist ein beliebiger Regelblock in A-D.
c. $\sigma' = \sigma/\{\text{AGR:}\{\text{PER:3}\}\}$. (lies: σ modifiziert durch {AGR:{PER:3}})
Dann gilt:
$RR_{n,\tau,V}(<X,\sigma>) =_{def} <Y,\sigma>$, wobei $Nar_n(<X,\sigma'>) = <Y,\sigma'>$

Konkrete Paradigmen des Indikativs inkl. Morphonologie

Konjugation		KRAD [–t,+c]	DÁVA [–t,–c]	IGRÁJ [+t,+c]	KOVA [+t,–c]
Präsens	1sg	*krad-ɔ́*	*dáva-m*	*igráj-ə*	*kov-ɔ́*
	2sg	*krad-é-š*	*dáva-š*	*igrá-e-š*	*kov-é-š*
	3sg	*krad-é*	*dáva*	*igrá-e*	*kov-é*
	1pl	*krad-é-m*	*dáva-me*	*igrá-e-m*	*kov-é-m*
	2pl	*krad-é-te*	*dáva-te*	*igrá-e-te*	*kov-é-te*
	3pl	*krad-ɔ́t*	*dáva-t*	*igráj-ət*	*kov-ɔ́t*
Imperfekt	1sg	*krad-'á-x*	*dáva-x*	*igrá–ex*	*kov-'á-x*
	2sg	*krad-é-š-e*	*dáva-š-e*	*igrá-e-š-e*	*kov-é-š-e*
	3sg	*krad-é-š-e*	*dáva-š-e*	*igrá-e-š-e*	*kov-é-š-e*
	1pl	*krad-'á-x-me*	*dáva-x-me*	*igrá-e-x-me*	*kov-'á-x-me*
	2pl	*krad-'á-x-te*	*dáva-x-te*	*igrá-e-x-te*	*kov-'á-x-te*
	3pl	*krad-'á-x-a*	*dáva-x-a*	*igrá-e-x-a*	*kov-'á-x-a*
Aorist	1sg	*krád-o-x*	*dáva-x*	*igrá-x*	*ková-x*
	2sg	*krád-e*	*dáva*	*igrá*	*ková*
	3sg	*krád-e*	*dáva*	*igrá*	*ková*
	1pl	*krád-o-x-me*	*dáva-x-me*	*igrá-x-me*	*ková-x-me*
	2pl	*krád-o-x-te*	*dáva-x-te*	*igrá-x-te*	*ková-x-te*
	3pl	*krád-o-x-a*	*dáva-x-a*	*igrá-x-a*	*ková-x-a*

Annahme:
Für jede Realisierungsregel gibt es eine ungeordnete Menge Φ_R von morphonologischen Regeln, die bei jeder Anwendung die Evaluation der Realisierungsregel beschränken.
Morphonologische Regeln und Metageneralisierungen

(157) *Regeln* (Φ_R): Falls $RR_{n,\tau,C}(<X,\sigma>) =_{def} <Y',\sigma>$, so gilt:
a. Wenn der L-Index(X) ∈ [CONJ:–T,–C] und Y = X[Vokal]Z, dann fehlt [Vokal] in Y′.
b. Wenn X = W[Vokal_1] und Y = X[Vokal_2]Z, dann fehlt [Vokal_1] in Y′, und [Vokal_2] wird betont in Y′ gdw. [Vokal_1] in Y betont wird.
c. Wenn X = W[Vokal_1] und Y = X[Vokal_2]Z, dann fehlt [Vokal_2] in Y′.

d. Wenn Y unbetont ist, dann wird Y′ auf seiner letzten Silbe betont.
e. Wenn X = WC (C ein Velar mit Č als alveopalatalem Gegenstück), Y = XVZ, und V ein vorderer Vokal, dann hat Y′ Č anstelle von C.
f. Wenn Y = W*Á*Z, dann hat Y′ ein *e* anstelle von Á.
g. Wenn Y = W*Á*C_1VZ und V ist ein vorderer Vokal, dann hat Y′ ein *é* anstelle von *Á*.
h. Wenn Y = W*Á*Z, dann hat Y′ *á* (mit Palatalisierung eines unmittelbar vorangehenden Konsonanten) anstelle von *Á*.

(158) *Metageneralisierungen*:
a. Für jede Regel R in Block **B**, **C** oder **D** gilt: (157-ae) ∈ Φ_R.
b. Für jede Regel R in Block **B**, **C** oder **D** gilt: (157-b) ∈ Φ_R gdw. R eine Extension von {TNS:pres} realisiert; ansonsten: (157-c) ∈ Φ_R.
c. Falls R in Block **B** ist, gilt: (157-d) ∈ Φ_R.
d. Falls R in Block **D** ist, gilt: (157-fh) ∈ Φ_R.
e. (157-g) ∈ $\Phi_{\mathbf{D4}}$, $\Phi_{\mathbf{B1}}$.

23. Wettbewerb

Argumentkodierung im Georgischen
Stand der Dinge bisher:
Der Wettbewerb zwischen Realisierungsregeln in einem Block wird durch die spezifischste (engste) Regel gewonnen (das Paninische Prinzip). Es stellt sich aber heraus, dass es hiermit Probleme geben kann, so dass noch mehr gesagt werden muss.

Beispiel:
Realisationsregeln für argumentkodierende Präfixe im Georgischen in (159) (Stump (2001, 70)). (Das System der Argumentkodierung im Georgischen ist notorisch komplex; hier wird nur ein ganz kleiner Ausschnitt abgehandelt.)

(159) a. $RR_{\text{pref},\{AGR(su):\{PER:1\}\},V}(<X,\sigma>) =_{def} <vX',\sigma>$
b. $RR_{\text{pref},\{\text{AGR(ob):}\{\text{PER:1}\}\},V}(<X,\sigma>) =_{def} <mX',\sigma>$
c. $RR_{\text{pref},\{\text{AGR(ob):}\{\text{PER:1,NUM:pl}\}\},V}(<X,\sigma>) =_{def} <gvX',\sigma>$
d. $RR_{\text{pref},\{AGR(ob):\{PER:2\}\},V}(<X,\sigma>) =_{def} <gX',\sigma>$

Problem:
Was ist die korrekte V-Realisierung für "Ich werde dich töten"? Die morphosyntaktischen Merkmalsmengen von (159-a) und (159-d) stehen nicht zueinander in einem Extensionsverhältnis; also sollten beide passen. Empirisch ist aber korrekt, dass (159-d) angewendet wird und so (159-a) blockiert.

(160)

Präverb	Präfix	Stamm	Suffix	
mo-	g-	klav		'Ich werde dich töten'
*mo-	v-	klav		'Ich werde dich töten'
mo-	g-	klav	-t	'Ich werde euch töten'

Lösungen für das Dilemma

(161) *Extrinsische Regelordnung* (Anderson (1992)):

Regel (159-d) appliziert per Stipulation vor Regel (159-a).

(162) *Expandierter Modus* (Stump (2001)):
Regeln können aufgeblasen werden und sind dann maximal spezifisch.

(163) *Regelformate*:

a. Unexpandierter Modus:
$RR_{n,\tau,C}(<X,\sigma> =_{def} <Y',\sigma>$

b. Expandierter Modus:
$RR_{n,\leftarrow\tau\rightarrow,C}(<X,\sigma> =_{def} <Y',\sigma>$

"$\leftarrow \tau \rightarrow$" bedeutet vereinfacht, dass τ maximal erweitert wird.
Konklusion: Regel (159-d) im Georgischen arbeitet im expandierten Modus:

(164) $RR_{\text{pref},\leftarrow\{AGR(ob):\{PER:2\}\}\rightarrow,V}(<X,\sigma>) =_{def} <gX',\sigma>$

24. Synkretismus

Typen von Synkretismus

Erste Unterscheidung:
Ganzwortsynkretismen vs. *Blocksynkretismen*. Beide sollen erklärt werden (vgl. dazu aber Baerman et al. (2005)).

Zweite Unterscheidung:

- unidirektionaler Synkretismus — Verweisregel
- bidirektionaler Synkretismus — Bidirektionales Verweisprinzip
- unstipulierter Synkretismus — Unterspezifikation
- stipulierter (z.B. symmetrischer) Synkretismus — Metaregeln für symmetrischen Synkretismus

Unidirektionaler Synkretismus Der Synkretismus in der 2./3.Pers.Sg. Prät (Aorist und Imperfekt) im Bulgarischen ist unidirektional:

- In allen Tempora können Formen der 3.Pers.Sg. eine Endung *-e* haben.
- Nur in den Präteritaltempora haben Formen der 2.Pers.Sg. eine Endung *-e*.

(165) *Verweisregel* (mit expandiertem Modus):
Wenn n ein beliebiger Regelblock in A-D ist, dann gilt:
$RR_{n,\leftarrow\{pret:yes,agr:\{per:2,num:sg\}\}\rightarrow,V}(<X,\sigma>) =_{def} <Y,\sigma>$, wobei
$Nar_n(<X,\sigma/\{\text{AGR:}\{\text{PER:3}\}\}>) = <Y,\sigma//\{\text{AGR:}\{\text{PER:3}\}\}>$

Bidirektionaler Synkretismus 1
Rumänische Verbflexion:

- Alle außer 1. Konjugation: 1.Sg. = 3.Pl. in indikativischen Paradigmen.

- Manchmal ist die 3.Pl. der abhängige Teil: *a umplea*, *a şti*. (Die *u*-Form taucht nur in der 1.Sg. in der 1. Konjugation auf.)
- Manchmal ist die 1.Sg. der abhängige Teil: *a fi*. (Der Stamm *sínt* taucht auch sonst im Plural auf.)

(166) Präsens-Indikativ-Formen einiger rumänischer Verben:

	a invita einladen	*a umplea* füllen	*a şti* wissen	*a fi* sein
Konjugation:	1	2	4	4
1sg	invít	úmpl-u	ştí-u	sínt
2sg	invíţ-i	úmpl-i	ştí-i	èţt-i
3sg	invít-a	úmpl-e	ştí-e	éţt-e
1pl	invitá-m	úmple-m	ştí-m	sínte-m
2pl	invitá-ţi	úmple-ţi	ştí-ţi	sínte-ţi
3pl	invít-a	úmpl-u	ştí-u	sínt

Bidirektionaler Synkretismus 2
Annahmen:

- Jede Verweisregel $RR_{n,\tau,C}$ hat eine *Verweisdomäne* D, mit C als Teilmenge von D.
- Die Existenz einer Verweisregel impliziert die Existenz einer inversen Verweisregel, gemäss (167).

(167) *Bidirektionales Verweisprinzip*:
Die Existenz einer Verweisregel *'$RR_{n,\tau,C}(<X,\sigma>) =_{def} <Y,\sigma>$, wobei $Nar_n(<X,\sigma/\rho>) = <Y,\sigma/\rho>$'* mit Verweisdomäne D impliziert die Existenz einer zweiten Verweisregel *'$RR_{n,\tau/\rho,D-C}(<X,\sigma>) =_{def} <Y,\sigma>$, wobei $Nar_n(<X,\sigma/\tau>) = <Y,\sigma/\tau>$'* mit Verweisdomäne D.

(Wenn eine Regel C als Verweisdomäne hat – der Normalfall –, dann ist die inverse Regel uninteressant, weil sie sich auf eine leere Menge von Ausdrücken beziehen muss.)
Bidirektionaler Synkretismus 3

(168) Erste Verweisregel:
Falls $n = 0$ oder 1: $RR_{n,\{\text{agr}(su):\{\text{per:1,num:}sg\}\},a\ fi}(<X,\sigma>) =_{def} <Y,\sigma>$, wobei
$Nar_n(<X,\sigma/\{\text{AGR(su):}\{\text{PER:3,NUM:pl}\}\}>) = <Y,\sigma/\{\text{agr(su):}\{\text{per:3,num:pl}\}\}>$
Verweisdomäne: V

(169) Implizierte Verweisregel:
Falls $n = 0$ oder 1: $RR_{n,\{\text{agr}(su):\{\text{per:3,num:}pl\}\},V-a\ fi}(<X,\sigma>) =_{def} <Y,\sigma>$, wobei
$Nar_n(<X,\sigma/\{\text{AGR(su):}\{\text{PER:1,NUM:sg}\}\}>) = <Y,\sigma/\{\text{AGR(su):}\{\text{PER:1,NUM:sg}\}\}>$
Verweisdomäne: V

Symmetrischer Synkretismus
Verbflexion im Hua (auch: Yagaria; Neu Guinea):
Formen der 2.Sg. und der 1.Pl. haben immer dieselbe Endung (ein Blocksynkretismus, kein Ganzwortsynkretismus), in allen Tempora und Modi. Man sieht aber nicht, wie es sich hier um eine natürliche Klasse handeln könnte; und der Synkretismus ist auch nicht direktional.

(170) *Metaregel für symmetrischen Synkretismus*:
$RR_{n,\tau,C}(<X,\sigma>) =_{def} <Y,\sigma> \leftrightarrow RR_{n,\tau/\rho,C}(<X,\sigma>) =_{def} <Y,\sigma>$

(171) *Metaregel für Hua*:
Es sei τ eine Extension von {AGR(su):{PER:2,NUM:sg}}. Dann: $RR_{II,\tau,V}(<X,\sigma>) =_{def} <Y,\sigma> \leftrightarrow RR_{II,\tau/\{agr(su):\{per:1,num:pl\}\},V}(<X,\sigma>) =_{def} <Y,\sigma>$

Alternative (Chomsky (1965), Chomsky & Halle (1968)): α-Notation: Variable über Merkmalswerten.

(172) a. [+1,–2],[+pl]
b. [–1,+2],[–pl]
c. α-Notation: [α1,–α2],[αpl]

25. Appendix: Pike's (1965) Subanalysis of German Verb Inflection in Paradigm Function Morphology

(173) $RR_{n,\tau,C}(<X,\sigma>) =_{def} <Y,\sigma>$

(174) *Pike's (1965) subanalysis of verb inflection with sein ('be') in German*:

	A	B	C	D	E
1.sg	b		ɪ	n	
2.sg	b		ɪ	s	t
3.sg			ɪ	s	t
1.pl	z		ɪ	n	t
2.pl	z	a	ɪ		t
3.pl	z		ɪ	n	t
inf	z	a	ɪ	n	

(175) *Realization rules in Paradigm Function Morphology*

a. **Block A**:
A1 $RR_{A,\{AGR:\{PER:3,NUM:sg\}\},sein}(<X,\sigma>) =_{def} <Y,\sigma>$, where Y is X's First Stem.
A2 $RR_{A,\{AGR:\{NUM:sg\}\},sein}(<X,\sigma>) =_{def} <Y,\sigma>$, where Y is X's Second Stem.
A3 $RR_{A,\{\ \},sein}(<X,\sigma>) =_{def} <Y,\sigma>$, where Y is X's Third Stem.

b. **Block B**:
B1 $RR_{B,\{AGR:\{PER:2,NUM:pl\}\},sein}(<X,\sigma>) =_{def} <Xa,\sigma>$.

c. **Block C**:
C1 $RR_{C,\{\ \},sein}(<X,\sigma>) =_{def} <Xi,\sigma>$.

d. **Block D**:
D1 $RR_{D,\{AGR:\{PER:2,NUM:pl\}\},sein}(<X,\sigma>) =_{def} <X,\sigma>$.
D2 $RR_{D,\{AGR:\{NUM:sg\}\},sein}(<X,\sigma>) =_{def} <Xs,\sigma>$.
D3 $RR_{D,\{\ \},sein}(<X,\sigma>) =_{def} <Xn,\sigma>$.
D4 $RR_{D,\{AGR:\{Per:1,NUM:sg\}\},sein}(<X,\sigma>) =_{def} <Y,\sigma>$, where $Nar_D(<X,\sigma/\{AGR:\{Num:pl\}\}>) = <Y,\sigma/\{AGR:\{Num:pl\}\}>$

e. **Block E**:
E1 $RR_{E,\{AGR:\{PER:1,NUM:sg\}\},sein}(<X,\sigma>) =_{def} <X,\sigma>$.
E2 $RR_{E,\{\ \},sein}(<X,\sigma>) =_{def} <Xt,\sigma>$.

(176) *Identity Function Default*:
$RR_{n,\{\ \},U}(<X,\sigma>) =_{def} <X,\sigma>$

V. Paradigm Economy

Ref.: Carstairs (1987), Carstairs-McCarthy (1994), Müller (2007b)

26. Introduction

Background:
(i) In Distributed Morphology, paradigms do not exist as genuine objects that, e.g., grammatical constraints can refer to. Rather, paradigms are epiphenomena – essentially, empirical generalizations that need to be derived in some way.
(ii) This view is incompatible with a more traditional view according to which paradigms exist as genuine entities in the grammar.

(177) *Some constraints on paradigms*:

a. The Paradigm Economy Principle (Carstairs (1987))
b. The No Blur Principle (Carstairs-McCarthy (1994))
c. The Basic Instantiated Paradigm Principle (Williams (1994) vs. Bobaljik (2002b))
d. Optimal Paradigms (McCarthy (2003) vs. Bobaljik (2003) – we will discuss this later in the course)

Observation:
(i) Constraints like the Paradigm Economy Principle and No Blur restrict the number of possible inflection classes that can be generated on the basis of a given set of inflection markers (for a given grammatical category).
(ii) If such constraints cannot be adopted for principled reasons, there is a danger that the theory is not restrictive enough.
(iii) Principled reasons that preclude adopting constraints on the number of possible inflection classes (on the basis of a given marker inventory):

- non-existence of paradigms in morphological theory
- decomposition of inflection class features in order to account for *trans-paradigmatic syncretism*.

(Compare Noyer's (2005) Interclass Syncretism Constraint, which is similar in its effects to No Blur, and fundamentally incompatible with a decomposition of inflection class features.)

27. Excursus: Trans-Paradigmatic Syncretism and Decomposition of Inflection Class Features

Note:
Intra-paradigmatic syncretism can be accounted for by decomposing privative case featues into more primitive, binary case features that are cross-classified (yielding natural classes of cases). These primitive features are semantics-based in Jakobson (1962a), Jakobson (1962b), Neidle (1988), Franks (1995)), and syntax-based in Bierwisch (1967), Wiese (1999), Müller (2002b); we adopt the latter view.

T_{11}: Syncretism within and across inflection classes in Russian

	I_m	$II_{f,m}$	III_f	IV_n
nom	Ø	a	Ø	o
acc	Ø/a	u	Ø	o
dat	u	e	i	u
gen	a	i	i	a
inst	om	oj	ju	om
loc	e	e	i	e

(178) *Decomposition of cases in Russian*: [±subject], [±governed], [±oblique]

nominative:	[+subj,–gov,–obl]
accusative:	[–subj,+gov,–obl]
dative:	[–subj,+gov,+obl]
genitive:	[+subj,+gov,+obl]
instrumental:	[+subj,–gov,+obl]
locative:	[–subj,–gov,+obl]

Note:
Trans-paradigmatic syncretism can be accounted in the same way by decomposing privative class features into more primitive, binary class features that are cross-classified (yielding natural classes of inflection classes); see Halle (1992) on Latvian noun inflection ([±marginal], [±marked] in addition to the "standard" class features A, B); Nesset (1994) on Russian noun inflection ([±nom-end] and [a/igen-end]); Oltra Massuet (1999) on verbal inflection in Catalan; Stump (2001) on verbal inflection in Bulgarian; Müller (2005) on Icelandic noun inflection; Trommer (2005a) on Amharic verbs. Also see Börjesson (2006) (Slovene noun declension), Opitz (2006) (Albanian noun declension), and Weisser (2006) (Croatian noun declension).

(179) *Decomposition of inflection classes in Russian*: [±α], [±γ]

I:	[+α,–γ]	$zavod_m$ ('factory')
II:	[–α,+γ]	$komnat_f$ ('room'), $muščin\text{-}_m$ ('man')
III:	[–α,–γ]	$tetrad'_f$ ('notebook')
IV:	[+α,+γ]	$mest_n$ ('place')

(180) *Inflection markers (singular)*:

a. /oj/: {[+N],[–α,+γ],[+subj,–gov,+obl]}
b. /ju/: {[+N],[–α,–γ],[+subj,–gov,+obl]}
c. /om/: {[+N],[+α],[+subj,–gov,+obl]}
d. /e/: {[+N],[–α,+γ],[–subj,+gov,+obl]}
e. /e/: {[+N],[¬(–α,–γ)],[–gov,+obl]}
f. /o/: {[+N],[+α,+γ],[–obl]}
g. /Ø/: {[+N],[–γ],[–obl]}
h. /i/: {[+N],[–α],[+obl]}
i. /u/: {[+N],[–subj,+gov]}
j. /a/: {[+N]}

Note:
Underspecified class information is underlined in inflection marker specifications.

→ End of excursus. Back to paradigm economy.

Two possible strategies:
(i) argue that the question of how inflection classes can be constrained is irrelevant from a synchronic perspective;
(ii) argue that restrictions on the number of possible inflection classes (based on a given marker inventory) follow from independently motivated assumptions, without invoking specific constraints that explicitly impose restrictions on possible inflection classes.
I adopt the latter strategy.

A *meta-principle* that restricts possible inflectional systems (null hypothesis for both child and linguist) (Alexiadou & Müller (2008)):

(181) *Syncretism Principle*:
Identity of form implies identity of function
(within a certain domain, and unless there is evidence to the contrary).

Claim:
Accompanied by two simple and widely accepted auxiliary assumptions (which I call *Elsewhere* and *Blocking*), the Syncretism Principle significantly restricts the number of possible inflection classes by itself:

(182) *Inflection Class Economy Theorem*:
Given a set of n inflection markers, there can be at most 2^{n-1} inflection classes, independently of the number of grammatical categories that the markers have to distribute over.

28. Paradigm Economy

28.1. The Paradigm Economy Principle

Background question:
What is the largest number of inflection classes (paradigms) which a given array of inflectional resources can be organized into?

(183) *The Paradigm Economy Principle* (Carstairs (1987, 51)):
When in a given language L more than one inflectional realization is available for some bundle or bundles of non-lexically-determined morphosyntactic properties associated with some part of speech N, the number of macroparadigms for N is no greater than the number of distinct "rival" macroinflections available for that bundle which is most genereously endowed with such rival realizations.

Consequence:
The number of (macro-) inflection classes does not exceed the greatest number of allomorphs.

(184) *An impossible paradigm* (Carstairs-McCarthy (1998)):

	Class A	Class B	Class C	Class D
Cell 1	a	a	f	f
Cell 2	b	e	e	e
Cell 3	c	c	h	h
Cell 4	d	d	d	g

- number of inflection classes: 4
- greatest number of allomorphic variation: 2

(185) *Hungarian present indefinite verb inflection*

	Indicative	Subjunctive
Sg 1	ok, ek, ök, om, em, öm	ak, ek am em
2	(a)sz, (e)sz, ol, el, öl	Ø, ál, él
3	Ø, ik	on, en, ön, ék
Pl 1	unk, ünk	unk, ünk
2	(o)tok, (e)tek, (ö)tök	atok, etek
3	(a)nak, (e)nek	anak, enek

Logical possibility:
Given complete independence of distribution of markers over (macro-) inflection classes: *276.480* inflection classes.

Actual (macro-) inflection classes:
very few. How many exactly?

(186) *Some Hungarian verbs*

Indicative					
	olvasni 'read'	ülni 'sit'	enni 'eat'	érteni 'understand'	írni 'write'
Sg 1	olvas-ok	ül-ök	esz-em	ért-ek	ír-ok
2	olvas-ol	ül-sz	esz-el	ért-esz	ír-sz
3	olvas-Ø	ül-Ø	esz-ik	ért-Ø	ír-Ø
Pl 1	olvas-unk	ül-ünk	esz-unk	ért-ünk	ír-unk
2	olvas-tok	ül-tök	esz-tek	ért-etek	ír-tok
3	olvas-nak	ül-nek	esz-nek	ért-enek	ír-nak
Subjunctive					
Sg 1	olvas-ak	ülj-ek	egy-em	értj-ek	irj-ak
2	olvas-Ø/-ál	ülj-Ø/-él	egy-él	értj-Ø/-él	írj-Ø/-ál
3	olvas-on	ülj-en	egy-ek	értj-en	írj-on
Pl 1	olvas-unk	ülj-ünk	egy-ünk	értj-ünk	írj-unk
2	olvas-atok	ülj-etek	egy-etek	értj-etek	írj-atok
3	olvas-anak	ülj-enek	egy-enek	értj-enek	írj-anak

Conclusion:
Abstracting away from differences that are (morpho-) phonologically predictable, there are

only two (macro-) inflection classes: the *normal* conjugation and the *ik* conjugation (each with a back-vowel and a front-vowel version).

(187) *Hungarian present indefinite conjugations: analysis*

	Indicative		Subjunctive	
	normal	ik	normal	ik
Sg 1	ok	om	ak	am
2	ol (after sibilants) asz (elsewhere)	ol	Ø/ál	Ø/ál
3	Ø	ik	on	ék
Pl 1	unk	unk	unk	unk
2	(o)tok	(o)tok	(o)tok	(o)tok
3	(a)nak	(a)nak	(a)nak	(a)nak

Observation:
The Paradigm Economy Principle crucially relies on the notion of macro-paradigm (or macro-inflection class).

(188) *Macro-Paradigm*:
A macro-paradigm consists of:

a. any two or more similar paradigms whose inflectional differences either can be accounted for phonologically, or else correlate consistently with differences in semantic or lexically determined syntactic properties (like gender);
or
b. any paradigm which cannot be thus combined with other paradigm(s).

(189) *German noun inflection*

	I: masc, neut $Hund_m$ ('dog'), $Schaf_n$ ('sheep')	II: masc $Baum_m$ ('tree') $FloSS_n$ ('raft')	III: neut, masc $Buch_n$ ('book'), $Mann_m$ ('man')	IV: masc, neut $Strahl_m$ ('ray') $Auge_n$ ('eye')
nom/sg	Ø	Ø	Ø	Ø
acc/sg	Ø	Ø	Ø	Ø
dat/sg	Ø	Ø	Ø	Ø
gen/sg	(e)s	(e)s	(e)s	(e)s
nom/pl	(e)	”(e)	”er	(e)n
acc/pl	(e)	”(e)	”er	(e)n
dat/pl	(e)n	”(e)n	”ern	(e)n
gen/pl	(e)	”(e)	”er	(e)n

	V: masc ('weak') $Planet_m$ ('planet')	VI: fem $Ziege_f$ ('goat')	VII: fem $Maus_f$ ('mouse')	VIII: fem $Drangsal_f$ ('distress')
nom/sg	Ø	Ø	Ø	Ø
acc/sg	(e)n	Ø	Ø	Ø
dat/sg	(e)n	Ø	Ø	Ø
gen/sg	(e)n	Ø	Ø	Ø
nom/pl	(e)n	(e)n	”(e)	(e)
acc/pl	(e)n	(e)n	”(e)	(e)
dat/pl	(e)n	(e)n	”(e)n	(e)n
gen/pl	(e)n	(e)n	”(e)	(e)

German noun inflection and paradigm economy:
The classification in (189) is that of Alexiadou & Müller (2008), but there is a similar taxonomy of inflection classes in Carstairs (1986, 8). (Carstairs actually has 14 inflection classes, including ones with *s* as a plural marker.)

Observation:
The greatest number of allomorphic variation is 4 (nom/acc/gen plural; 5 if /s/ is included).

Conclusion:
There can at most be 4 (5) macro-inflection classes.

(190) *Macro-inflection classes for German noun declension*

a. III (*”er*-plural)
b. V (so-called 'weak masculines')
c. IV/VI (*en*-plural; gen/sg *s* for masc/neut; gen/sg Ø for fem)
d. II/VII (*”e*-plural; gen/sg *s* for masc/neut; gen/sg Ø for fem)
e. I/VIII (*e*-plural; gen/sg *s* for masc/neut; gen/sg Ø for fem)

Problem:
It seems that (190-de) must be combined into a single macroclass, with Umlaut accounted for independently (viz., (morpho-) phonologically). Carstairs (1987, 58): Stem allomorphy does indeed not give rise to different macro-inflection classes (there is “a distinction between affixal and non-affixal inflection”).

(191) *Russian noun inflection*

a. Singular

	Ia/Ib$_m$	IIa/IIb$_{f,m}$	IIIa/IIIb$_f$	IVa/IVb$_n$
nom/sg	Ø	a	Ø	o
acc/sg	*Ø/a*	u	Ø	o
dat/sg	u	e	i	u
gen/sg	a	i	i	a
inst/sg	om	oj	ju	om
loc/sg	e	e	i	e

b. Plural

	Ia/Ib$_m$	IIa/IIb$_{f,m}$	IIIa/IIIb$_f$	IVa/IVb$_n$
nom/pl	y	y	i	a
acc/pl	*y/ov*	*y/Ø*	*i/ej*	*a/Ø*
dat/pl	am	am	jam	am
gen/pl	ov	Ø	ej	Ø
inst/pl	ami	ami	jami	ami
loc/pl	ax	ax	jax	ax

Problem:

1. If the [acc ← gen] animacy effect with class I noun stems and all plural noun stems gives rise to different inflection classes in each case, the number of inflection classes would have to be *8*.
2. However, the greatest number of allomorphic variation is *4* (accusative singular).

Solution:

- The variation in acc/sg (class 1) and acc/pl (all classes) contexts correlates consistently with differences in semantic properties (*animacy*), and is thus predictable: 8 → 4.
- The differences between class 1 and class 4 are also predictable on the basis of *gender*: 4 → 3.
- Thus, there are only three macro-inflection classes in Russian noun declension.

Conclusion:
Given the concept of macro-paradigm (or macro-inflection class), counter-examples to the Paradigm Economy Principle can be explained away. On this view, if a different inflectional pattern can be described by invoking gender features, semantic features (like animacy), phonological features, or if it involves non-affixal inflection, it is irrelevant for paradigm economy: Only those differences count which are absolutely irreducible.

Problem:
(i) Without a concept like that of a macro-paradigm, the Paradigm Economy Principle would be much too restrictive; it would exclude many of the attested inflection patterns in languages with inflection classes.
(ii) However, assuming such a liberal notion of macro-paradigm reduces the Paradigm Economy Principle's predictive power.

28.2. No Blur

Background:
The No Blur Principle is proposed in Carstairs-McCarthy (1994) as a successor to his earlier Paradigm Economy Principle.

(192) *The No Blur Principle* (Carstairs-McCarthy (1994, 742)):
Within any set of competing inflectional realizations for the same paradigmatic cell, no more than one can fail to identify inflection class unambiguously.

Underlying idea:
There is typically one *elsewhere marker* that is not specified for inflection class, but no more than that.

Note:
Just like the Paradigm Economy Principle, the No Blur Principle blocks (what looks like) a constant *re-use* of inflectional material in various inflection classes, and thereby restricts the number of possible inflection classes over a given inventory of markers. (Comment: However, this is exactly what seems to happen in inflectional systems of various types, again and again. Moreover, No Blur, at least as a tendency, is in conflict with the existence of *trans-paradigmatic syncretism*).

(193) *Strong feminine inflection classes in Icelandic*

	Fa *vél* ('machine')	Fa′ *drottning* ('queen')	Fi *mynd* ('picture')	Fc1 *geit* ('goat')	Fc2 *vík* ('bay')
nom sg	vél-Ø	drottning-Ø	mynd-Ø	geit-Ø	vík-Ø
acc sg	vél-Ø	drottning-u	mynd-Ø	geit-Ø	vík-Ø
dat sg	vél-Ø	drottning-u	mynd-Ø	geit-Ø	vík-Ø
gen sg	vél-ar	drottning-ar	mynd-ar	geit-ar	vík-ur
nom pl	vél-ar	drottning-ar	mynd-ir	geit-ur	vík-ur
acc pl	vél-ar	drottning-ar	mynd-ir	geit-ur	vík-ur
dat pl	vél-um	drottning-um	mynd-um	geit-um	vík-um
gen pl	vél-a	drottning-a	mynd-a	geit-a	vík-a

Analysis (Carstairs-McCarthy (1994, 740-742)):

- Genitive singular and nominative plural are the *leading forms* ('Kennformen'; cf. Wurzel (1987)).
- Markers for gen/sg: *ur* ↔ gen/sg, class Fc2; *ar* ↔ gen/sg.
- Markers for nom/pl: *ar* ↔ nom/pl, class Fa; *ir* ↔ nom/pl, class Fi; *ur* ↔ nom/pl

Problem:
The No Blur Principle makes wrong predictions if the complete system of Icelandic noun declension is taken in to account: In both gen/sg and nom/pl contexts, there is more than one marker that fails to unambiguously identify inflection class.

(194) *The complete system of inflection classes in Icelandic noun inflection* (Kress (1982), Müller (2005)):

	1 Ma	2 Na	3 Fa(′)	4 Mi	5 Fi	6 Mu	7 Mc	8 Fc1	9 Fc2	10 Mw	11 Nw	12 Fw
nom sg	ur	Ø	Ø	ur	Ø	ur	ur	Ø	Ø	i	a	a
acc sg	Ø	Ø	Ø (u)	Ø	Ø	Ø	Ø	Ø	Ø	a	a	u
dat sg	i	i	Ø (u)	Ø	Ø	i	i	Ø	Ø	a	a	u
gen sg	s	s	ar	ar	ar	ar	ar	ar	ur	a	a	u
nom pl	ar	Ø	ar	ir	ir	ir	ur	ur	ur	ar	u	ur
acc pl	a	Ø	ar	i	ir	i	ur	ur	ur	a	u	ur
dat pl	um	um	um	um	um	um	um	um	um	um	um	um
gen pl	a	a	a	a	a	a	a	a	a	a	(n)a	(n)a

Solution:

- No Blur holds only for a set of inflection classes of the same *gender*.
- However, this still does not seem to suffice: In masculine nom/pl contexts, neither *ar* (Ma, Mw) nor *ir* (Mi, Mu) unambiguously identifies inflection class.

Trans-paradigmatic syncretism and No Blur:
This problem is indicative of a more general potential problem that is raised by the No Blur Principle (as well as by Noyer's (2005) related Interclass Syncretism Constraint): Trans-paradigmatic syncretism is a recurring pattern of inflectional systems. This pattern has successfully been addressed by standard techniques (Jakobson (1936), Bierwisch (1967)) involving feature decomposition and underspecification (which permits a reference by inflection marker specifications to natural classes of inflection classes). See Halle (1992), Oltra Massuet (1999), Wiese (1999), Stump (2001), Alexiadou & Müller (2008), Müller (2005), Trommer (2005a), Börjesson (2006), Opitz (2006), Weisser (2006). In all these approaches, more than one of the inflection markers competing for a given instantiation of a grammatical category fails to unambiguously identify inflection class, in violation of the No Blur Principle.

Conclusion:
(i) Paradigm Economy Principle and No Blur Principle (Noyer's Interclass Syncretism Constraint) reduce the set of logically possible inflection classes (based on a given inventory of markers) to a very small set.
(ii) However, these constraints constantly face the danger of being *too* restrictive.
(iii) Furthermore, these constraints are incompatible with the view that paradigms are mere epiphenomena, and with the view that trans-paradigmatic syncretism can be accounted for by invoking class feature decomposition and underspecification.
(iv) This warrants looking for alternative ways of bringing about paradigm economy.

29. Claim

(195) *Inflection Class Economy Theorem*:
Given a set of n inflection markers, there can be at most 2^{n-1} inflection classes, independently of the number of instantiations of the grammatical category that the markers have to distribute over.

Note:
The number of 2^{n-1} inflection classes encodes the powerset of the inventory of markers, minus one radically underspecified marker. For instance: Assuming an abstract system with five markers and six instantiations of a grammatical category (e.g., case), the Inflection Class Economy Theorem states that there can at most be sixteen (i.e., $2^{5-1} = 2^4$) inflection classes, out of the 15.625 (i.e., 5^6) that would otherwise be possible.

Claim:
The Inflection Class Economy Theorem follows under any morphological theory that makes the three assumptions in (196), (197), and (198), which I call 'Syncretism', 'Elsewhere', and 'Blocking'.
(I basically presuppose an approach along the lines of Distributed Morphology (Halle & Marantz (1993; 1994), Noyer (1992)), but things are exactly the same under alternative morphological theories, e.g., Minimalist Morphology (Wunderlich (1996; 1997c)), or Paradigm Function Morphology (Stump (2001)).)

(196) *Syncretism* (first assumption):
The Syncretism Principle holds: For each marker, there is a unique specification of morpho-syntactic features.

Note:
The Syncretism Principle underlies much recent (and, based on the Jakobsonian tradition, some not so recent) work in inflectional morphology; it provides simple and elegant analyses, and it has been empirically confirmed for a variety of inflectional systems in the world's languages.

(197) *Elsewhere* (second assumption):
There is always one elsewhere marker that is radically underspecified with respect to inflection class (and more generally). Other markers may be underspecified to an arbitrary degree (including not at all).

Note:
(i) Underspecification as a means to account for syncretism is employed in most recent theories of inflectional morphology, including Distributed Morphology, Minimalist Morphology, and Paradigm Function Morphology.
(ii) The assumption that there is always one radically underspecified elsewhere marker in inflectional systems is quite common (see, e.g., Stump's (2001) Identity Function Default rule).
(ii-a) It is well-motivated empirically because it can account for 'discontinuous' occurrences of markers in paradigms (where natural classes captured by non-radical underspecification is unlikely to be involved).
(ii-b) It ensures that there are (usually) no paradigmatic gaps in inflectional systems (which should otherwise be an option, given underspecification).

(198) *Blocking* (third assumption):
Competition of underspecified markers is resolved by choosing the most specific marker: For all (competing) markers α, β, either α is more specific than β, or β is more specific than α.

Note:
A Specificity constraint along these lines is adopted in Distributed Morphology (typically as part of the definition of the Subset Principle, see Halle (1997)), in Minimalist Morphology (see Wunderlich (1996; 1997c; 2004)), and in Paradigm Function Morphology (Stump (2001) calls the relevant constraint Panini's Principle).

Consequence:
(i) Syncretism is systematic in the sense that ideally, only one specification of morpho-syntactic features is associated with any given inflection marker.
(ii) For any given fully specified context, there is always one inflection marker that fits.
(iii) For any given fully specified context, there is never more than one inflection marker that fits.
(Elsewhere and Blocking emerge as two sides of the same coin; see 'Completeness' and 'Uniqueness' in Wunderlich (1996, 99).)

Two remaining issues:
(i) How does the Inflection Class Economy Theorem constrain inflectional systems?
(ii) How does the Inflection Class Economy Theorem follow as a theorem from Syncretism, Elsewhere, and Blocking?

30. Illustration

(199) *Two versions of the basic question*:
- a. Given an inventory of markers for a certain domain (e.g., noun inflection), how many inflection classes can there be?
- b. Given an inventory of markers *with associated features encoding a grammatical category (e.g., case)* for a certain domain (e.g., noun inflection), how many inflection classes can there be?

Assumption:
(199-a) is the more interesting question: It does not presuppose that the specification of a marker for a grammatical category (e.g., with respect to case and/or number) is somehow privileged, i.e., more basic than its inflection class features. (Carstairs (1987) only tries to answer (199-b).)

A system without restrictions:
If, in a given domain (e.g., noun inflection), there are n markers for m instantiations of a grammatical category (e.g., case), the markers can be grouped into n^m distinct inflection classes (i.e., the set of m-tuples over an input set with n members). [Thanks to the comp4ling toolbox, UMass linguistics.]
Note:
(i) The letters *a*, *b*, and *c* stand for the three markers.

Abstract example 1: 3 markers, 4 cases: 81 (= 3^4) possible inflection classes

a a a a	a b c a	b a b a	b c a a	c a c a	c c b a
a a a b	a b c b	b a b b	b c a b	c a c b	c c b b
a a a c	a b c c	b a b c	b c a c	c a c c	c c b c
a a b a	a c a a	b a c a	b c b a	c b a a	c c c a
a a b b	a c a b	b a c b	b c b b	c b a b	c c c b
a a b c	a c a c	b a c c	b c b c	c b a c	c c c c
a a c a	a c b a	b b a a	b c c a	c b b a	
a a c b	a c b b	b b a b	b c c b	c b b b	
a a c c	a c b c	b b a c	b c c c	c b b c	
a b a a	a c c a	b b b a	c a a a	c b c a	
a b a b	a c c b	b b b b	c a a b	c b c b	
a b a c	a c c c	b b b c	c a a c	c b c c	
a b b a	b a a a	b b c a	c a b a	c c a a	
a b b b	b a a b	b b c b	c a b b	c c a b	
a b b c	b a a c	b b c c	c a b c	c c a c	

(ii) All four-letter rows (4-tuples separated by either a vertical line or a line break) correspond to one inflection class, with the first marker in a row being used for the first instantiation of case (e.g., nominative), the second one for the second instantiation of case (e.g., accusative), the third one for the third instantiation of case (e.g., dative), and the fourth one for the fourth instantiation of case (e.g., genitive).
(iii) It is unlikely that a language can be found in which eighty-one inflection classes have been generated on the basis of three markers and four instantiations of a grammatical category.

(200) *Predictions for example 1*
- a. Paradigm Economy Principle, worst case scenario:
  3 inflection classes: the size of the inventory
- b. No Blur Principle, worst case scenario:
  9 inflection classes: ((3-1)×4)+1
- c. Inflection Class Economy Theorem, worst case scenario:
  4 inflection classes: 2^{3-1}

(201) *Explanation of worst case scenarios, Paradigm Economy Principle*:
All three markers can be allomorphs for a single case specification (e.g., *a*, *b*, and *c* can all be accusative markers); still, there can then only be three distinct inflection classes.

(202) *Explanation of worst case scenarios, No Blur Principle*:
- a. There is one default marker (say, *a*).
- b. One class consists only of default markers (*aaaa*).
- c. All the other inflection classes differ from this class by replacing one of the *a*'s with either *b* or *c* (*baaa*, *abaa*, *aaba*, *aaab*, *caaa*, *acaa*, *aaca*, *aaac*), so that all classes respect the No Blur Principle.
- d. Adding another class with more than one *b*, or more than one *c*, or a – perhaps minimal – combination of *b*'s and *c*'s (cf. *bbaa*, or *aacc*, or *abca*, etc.) will invariably lead to a violation of the No Blur Principle because either *b* or *c* (or both) will cease to be inflection-class specific.
- e. In general, the No Blur Principle predicts that there can at most be ((n-1)×m)+1 inflection classes, for n markers and m instantiations of a grammatical category:

Every marker except for one – the default marker, hence "–1" – can appear for a given instantiation of a grammatical category only in one inflection class; and "+1" captures a class consisting exclusively of default markers.

Note:
Assuming default markers that are specific with respect to instantiations of a grammatical category (such that, e.g., *a* is the default marker for the first instantiation, *b* for the second, *c* for the third, and perhaps again *a* for the fourth) instead of an extremely general default marker *a*, does not change things: This would be compatible with No Blur, but it could not increase the number of possible inflection classes. In the case at hand, the maximal set of inflection classes would include *abca*, *bbca*, *cbca*, *aaca*, *acca*, *abaa*, *abba*, *abcb*, *abcc*.

Abstract example 2: 5 markers, 3 cases: 125 (= 5^3) possible inflection classes

a a a	a d a	b b a	b e a	c c a	d a a	d d a	e b a	e e a	
a a b	a d b	b b b	b e b	c c b	d a b	d d b	e b b	e e b	
a a c	a d c	b b c	b e c	c c c	d a c	d d c	e b c	e e c	
a a d	a d d	b b d	b e d	c c d	d a d	d d d	e b d	e e d	
a a e	a d e	b b e	b e e	c c e	d a e	d d e	e b e	e e e	
a b a	a e a	b c a	c a a	c d a	d b a	d e a	e c a		
a b b	a e b	b c b	c a b	c d b	d b b	d e b	e c b		
a b c	a e c	b c c	c a c	c d c	d b c	d e c	e c c		
a b d	a e d	b c d	c a d	c d d	d b d	d e d	e c d		
a b e	a e e	b c e	c a e	c d e	d b e	d e e	e c e		
a c a	b a a	b d a	c b a	c e a	d c a	e a a	e d a		
a c b	b a b	b d b	c b b	c e b	d c b	e a b	e d b		
a c c	b a c	b d c	c b c	c e c	d c c	e a c	e d c		
a c d	b a d	b d d	c b d	c e d	d c d	e a d	e d d		
a c e	b a e	b d e	c b e	c e e	d c e	e a e	e d e		

(203) *Predictions for example 2*

a. Paradigm Economy Principle, worst case scenario:
5 inflection classes: the size of the inventory

b. No Blur Principle, worst case scenario:
13 inflection classes: ((5-1)×3)+1
(E.g., assuming *a* as a default marker, *aaa*, *baa*, *aba*, *aab*, *caa*, *aca*, *aac*, *daa*, *ada*, *aad*, *eaa*, *aea*, *aae*)

c. Inflection Class Economy Theorem, worst case scenario:
16 inflection classes: 2^{5-1}

(204) *Predictions for example 3*

a. Paradigm Economy Principle, worst case scenario:
5 inflection classes: the size of the inventory

b. No Blur Principle, worst case scenario:
17 inflection classes: ((5-1)×4)+1
(E.g., *aaaa*, *baaa*, *abaa*, *aaba*, *aaab*, *caaa*, *acaa*, *aaca*, *aaac*, *daaa*, *adaa*, *aada*, *aaad*, *eaaa*, *aeaa*, *aaea*, *aaae*.)

Abstract example 3: 5 markers, 4 cases: 625 (= 5^4) possible inflection classes

a a a a	a c c a	a e e a	b c b a	b e d a	c c a a	c e c a	d b e a	d e b a	e b d a	e e a a														
a a a b	a c c b	a e e b	b c b b	b e d b	c c a b	c e c b	d b e b	d e b b	e b d b	e e a b														
a a a c	a c c c	a e e c	b c b c	b e d c	c c a c	c e c c	d b e c	d e b c	e b d c	e e a c														
a a a d	a c c d	a e e d	b c b d	b e d d	c c a d	c e c d	d b e d	d e b d	e b d d	e e a d														
a a a e	a c c e	a e e e	b c b e	b e d e	c c a e	c e c e	d b e e	d e b e	e b d e	e e a e														
a a b a	a c d a	b a a a	b c c a	b e e a	c c b a	c e d a	d c a a	d e c a	e b e a	e e b a														
a a b b	a c d b	b a a b	b c c b	b e e b	c c b b	c e d b	d c a b	d e c b	e b e b	e e b b														
a a b c	a c d c	b a a c	b c c c	b e e c	c c b c	c e d c	d c a c	d e c c	e b e c	e e b c														
a a b d	a c d d	b a a d	b c c d	b e e d	c c b d	c e d d	d c a d	d e c d	e b e d	e e b d														
a a b e	a c d e	b a a e	b c c e	b e e e	c c b e	c e d e	d c a e	d e c e	e b e e	e e b e														
a a c a	a c e a	b a b a	b c d a	c a a a	c c c a	c e e a	d c b a	d e d a	e c a a	e e c a														
a a c b	a c e b	b a b b	b c d b	c a a b	c c c b	c e e b	d c b b	d e d b	e c a b	e e c b														
a a c c	a c e c	b a b c	b c d c	c a a c	c c c c	c e e c	d c b c	d e d c	e c a c	e e c c														
a a c d	a c e d	b a b d	b c d d	c a a d	c c c d	c e e d	d c b d	d e d d	e c a d	e e c d														
a a c e	a c e e	b a b e	b c d e	c a a e	c c c e	c e e e	d c b e	d e d e	e c a e	e e c e														
a a d a	a d a a	b a c a	b c e a	c a b a	c c d a	d a a a	d c c a	d e e a	e c b a	e e d a														
a a d b	a d a b	b a c b	b c e b	c a b b	c c d b	d a a b	d c c b	d e e b	e c b b	e e d b														
a a d c	a d a c	b a c c	b c e c	c a b c	c c d c	d a a c	d c c c	d e e c	e c b c	e e d c														
a a d d	a d a d	b a c d	b c e d	c a b d	c c d d	d a a d	d c c d	d e e d	e c b d	e e d d														
a a d e	a d a e	b a c e	b c e e	c a b e	c c d e	d a a e	d c c e	d e e e	e c b e	e e d e														
a a e a	a d b a	b a d a	b d a a	c a c a	c c e a	d a b a	d c d a	e a a a	e c c a	e e e a														
a a e b	a d b b	b a d b	b d a b	c a c b	c c e b	d a b b	d c d b	e a a b	e c c b	e e e b														
a a e c	a d b c	b a d c	b d a c	c a c c	c c e c	d a b c	d c d c	e a a c	e c c c	e e e c														
a a e d	a d b d	b a d d	b d a d	c a c d	c c e d	d a b d	d c d d	e a a d	e c c d	e e e d														
a a e e	a d b e	b a d e	b d a e	c a c e	c c e e	d a b e	d c d e	e a a e	e c c e	e e e e														
a b a a	a d c a	b a e a	b d b a	c a d a	c d a a	d a c a	d c e a	e a b a	e c d a															
a b a b	a d c b	b a e b	b d b b	c a d b	c d a b	d a c b	d c e b	e a b b	e c d b															
a b a c	a d c c	b a e c	b d b c	c a d c	c d a c	d a c c	d c e c	e a b c	e c d c															
a b a d	a d c d	b a e d	b d b d	c a d d	c d a d	d a c d	d c e d	e a b d	e c d d															
a b a e	a d c e	b a e e	b d b e	c a d e	c d a e	d a c e	d c e e	e a b e	e c d e															
a b b a	a d d a	b b a a	b d c a	c a e a	c d b a	d a d a	d d a a	e a c a	e c e a															
a b b b	a d d b	b b a b	b d c b	c a e b	c d b b	d a d b	d d a b	e a c b	e c e b															
a b b c	a d d c	b b a c	b d c c	c a e c	c d b c	d a d c	d d a c	e a c c	e c e c															
a b b d	a d d d	b b a d	b d c d	c a e d	c d b d	d a d d	d d a d	e a c d	e c e d															
a b b e	a d d e	b b a e	b d c e	c a e e	c d b e	d a d e	d d a e	e a c e	e c e e															
a b c a	a d e a	b b b a	b d d a	c b a a	c d c a	d a e a	d d b a	e a d a	e d a a															
a b c b	a d e b	b b b b	b d d b	c b a b	c d c b	d a e b	d d b b	e a d b	e d a b															
a b c c	a d e c	b b b c	b d d c	c b a c	c d c c	d a e c	d d b c	e a d c	e d a c															
a b c d	a d e d	b b b d	b d d d	c b a d	c d c d	d a e d	d d b d	e a d d	e d a d															
a b c e	a d e e	b b b e	b d d e	c b a e	c d c e	d a e e	d d b e	e a d e	e d a e															
a b d a	a e a a	b b c a	b d e a	c b b a	c d d a	d b a a	d d c a	e a e a	e d b a															
a b d b	a e a b	b b c b	b d e b	c b b b	c d d b	d b a b	d d c b	e a e b	e d b b															
a b d c	a e a c	b b c c	b d e c	c b b c	c d d c	d b a c	d d c c	e a e c	e d b c															
a b d d	a e a d	b b c d	b d e d	c b b d	c d d d	d b a d	d d c d	e a e d	e d b d															
a b d e	a e a e	b b c e	b d e e	c b b e	c d d e	d b a e	d d c e	e a e e	e d b e															
a b e a	a e b a	b b d a	b e a a	c b c a	c d e a	d b b a	d d d a	e b a a	e d c a															
a b e b	a e b b	b b d b	b e a b	c b c b	c d e b	d b b b	d d d b	e b a b	e d c b															
a b e c	a e b c	b b d c	b e a c	c b c c	c d e c	d b b c	d d d c	e b a c	e d c c															
a b e d	a e b d	b b d d	b e a d	c b c d	c d e d	d b b d	d d d d	e b a d	e d c d															
a b e e	a e b e	b b d e	b e a e	c b c e	c d e e	d b b e	d d d e	e b a e	e d c e															
a c a a	a e c a	b b e a	b e b a	c b d a	c e a a	d b c a	d d e a	e b b a	e d d a															
a c a b	a e c b	b b e b	b e b b	c b d b	c e a b	d b c b	d d e b	e b b b	e d d b															
a c a c	a e c c	b b e c	b e b c	c b d c	c e a c	d b c c	d d e c	e b b c	e d d c															
a c a d	a e c d	b b e d	b e b d	c b d d	c e a d	d b c d	d d e d	e b b d	e d d d															
a c a e	a e c e	b b e e	b e b e	c b d e	c e a e	d b c e	d d e e	e b b e	e d d e															
a c b a	a e d a	b c a a	b e c a	c b e a	c e b a	d b d a	d e a a	e b c a	e d e a															
a c b b	a e d b	b c a b	b e c b	c b e b	c e b b	d b d b	d e a b	e b c b	e d e b															
a c b c	a e d c	b c a c	b e c c	c b e c	c e b c	d b d c	d e a c	e b c c	e d e c															
a c b d	a e d d	b c a d	b e c d	c b e d	c e b d	d b d d	d e a d	e b c d	e d e d															
a c b e	a e d e	b c a e	b e c e	c b e e	c e b e	d b d e	d e a e	e b c e	e d e e															

c. Inflection Class Economy Theorem, worst case scenario:
16 inflection classes: 2^{5-1}

Conclusion so far:
The Inflection Class Economy Theorem restricts possible inflection classes in a way that is roughly comparable to the Paradigm Economy and No Blur Principles.

31. Deriving the Inflection Class Economy Theorem

Recall:
(i) Syncretism: Only one morpho-syntactic feature specification is associated with each marker of the inventory for a given morphological domain (exceptions apart).
(ii) Elsewhere: There is always one marker that in principle fits into every context of fully specified morpho-syntactic features.
(iii) Blocking: There is always only one marker that can in fact be used for any fully specified context of morpho-syntactic features.

(205) *Argument via marker deactivation combinations*:

a. Since each inflection marker M can only be associated with one specification of morpho-syntactic features (because of **Syncretism**), it follows that for each inflection marker M and for each inflection class I, it must be the case that M is either *compatible* with I or *incompatible* with I.
b. A marker is compatible with an inflection class I if it bears no inflection class feature, if it bears fully specified inflection class information that completely characterizes I, or if it is characterized by a set of underspecified inflection class features that is a subset of the fully specified set of features that characterize the inflection class.
c. M is *activated* for I if it is compatible with it; and *deactivated* for I if it is incompatible with it.
(If a marker is activated for an inflection class I, this does not imply that it will actually be used by I – there may well be a more specific marker that blocks it.)
d. **Blocking** ensures that each inflection class can be defined in terms of the markers that are active in it: For all competing markers α and β, it is fixed once and for all by the markers' feature specifications (and independently of inflection classes) that either β is more specific than α, or α is more specific than β.
e. Hence, if the same set of markers is activated for two inflection classes I_1 and I_2, I_1 must be identical to I_2.
f. Conversely, since every marker is either activated or deactivated for any given inflection class, it also follows that if the same set of markers is *deactivated* for two inflection classes I_1 and I_2, I_1 and I_2 must be the same inflection class (because the same set of markers is then activated for I_1 and I_2, because a marker /x/ can only have one specification [ξ], and because specificity relations among competing markers are fixed).
g. In order to determine the maximal number of inflection classes on the basis of a given inventory of markers, it now suffices to successively deactivate all possible marker combinations.

h. Starting with the full inventory of markers, we can proceed by successively deactivating all combinations of markers, which yields class after class.
i. Thus, all markers of the inventory are compatible with class I_1; all except for marker *a* are compatible with class I_2; all except for markers *a, b* are compatible with class I_3; and so forth.
j. However, by assumption (**Elsewhere**), one marker always is the elsewhere (default) marker: It is compatible with all inflection classes because it is radically underspecified; and therefore it cannot be deactivated by definition.
k. Consequently, all possible *marker deactivation combinations* are provided by the *powerset* of the set of all the markers of the inventory minus the elsewhere marker: 2^{n-1}, for n markers.
l. Thus, given a set of n inflection markers, there can be at most 2^{n-1} marker deactivation combinations.
m. Since marker deactivation combinations fully determine possible inflection classes, it now follows that given a set of n inflection markers, there can be at most 2^{n-1} inflection classes.

Note:
This reasoning is independent of the number of instantiations of the grammatical category (e.g., the number of cases) that a set of markers needs to distribute over. In contrast to what is the case under the No Blur Principle, an increase in instantiations of a grammatical category does not induce an increase in possible inflection classes over a given inventory of markers. Hence:

(206) *Inflection Class Economy Theorem*:
Given a set of n inflection markers, there can be at most 2^{n-1} inflection classes, independently of the number of grammatical categories that the markers have to distribute over.

32. Examples

32.1. A First Example

Note:
In order to illustrate the possible marker deactivation patterns, the case categories are now called *1*, *2*, *3*, and *4*. Given an inventory of three markers, there are $2^{3-1} = 4$ deactivation combinations.

(207) *Example 1 revisited*:

a. 3 markers: {a, b, c}
b. 4 cases: 1, 2, 3, 4
c. Deactivation combinations: { {b, c}, {b}, {c}, {} }

Observation:
Of the 81 inflection classes that would logically be possible under, only four remain, given Syncretism, Underspecification, and Blocking (i.e., the Inflection Class Economy Theorem). This result holds under any specificity-induced order of the markers, and under any assignment of case features to markers.

(208) *A possible assignment of case specifications to markers*:

a. Markers:
   (i) /a/ ↔ [ ]
   (ii) /b/ ↔ [12]
   (iii) /c/ ↔ [234]

b. Specificity:
   /b/ > /c/ > /a/

c. Deactivation combinations and inflection classes:
   {b, c} → aaaa
   {b} → accc
   {c} → bbaa
   { } → bbcc

(209) *Another possible assignment of case specifications to markers*:

a. Markers:
   (i) /a/ ↔ [ ]
   (ii) /b/ ↔ [234]
   (iii) /c/ ↔ [4]

b. Specificity:
   /c/ > /b/ > /a/

c. Deactivation combinations and inflection classes:
   {b, c} → aaaa
   {b} → aaac
   {c} → abbb
   { } → abbc

Note:
The question of how the cases 1, 2, 3, 4 are derived from more primitive decomposed features (e.g., how [234] can be a natural class), and how systems with apparently unnatural classes (under minimal decomposition) are derived, is orthogonal.

32.2. A second example

(210) *Example 3 revisited*:

a. 5 markers: {a, b, c, d, e}
b. 4 cases: 1, 2, 3, 4

(211) *A possible choice*:

a. Markers:
   (i) /a/ ↔ [ ]
   (ii) /b/ ↔ [23]
   (iii) /c/ ↔ [14]
   (iv) /d/ ↔ [3]
   (v) /e/ ↔ [34]

b. Specificity:
   /d/ > /e/ > /c/ > /b/ > /a/

c. Deactivation combinations & inflection classes:
   {b, c, d, e} → aaaa
   {b, c, d} → aaee
   {b, c, e} → aada
   {b, c} → aade
   {b, d, e} → caac
   {b, d} → caee
   {b, e} → cadc
   {b} → cade
   {c, d, e} → abba
   {c, d} → abee
   {c, e} → abda
   {c} → abde
   {d, e} → cbbc
   {d} → cbee
   {e} → cbdc
   { } → cbde

(212) *Another possible choice*:

a. Markers:
   (i) /a/ ↔ [ ]
   (ii) /b/ ↔ [ ]
   (iii) /c/ ↔ [1]
   (iv) /d/ ↔ [2]
   (v) /e/ ↔ [34]

b. Specificity:
   /c/ > /d/ > /e/ > /b/ > /a/

c. Deactivation combinations & inflection classes:
   {b, c, d, e} → aaaa
   {b, c, d} → aaee
   {b, c, e} → adaa
   {b, c} → adee
   {b, d, e} → caaa
   {b, d} → caee
   {b, e} → cdaa
   {b} → cdee
   {c, d, e} → bbbb
   {c, d} → bbee
   {c, e} → bdbb
   {c} → bdee
   {d, e} → cbbb
   {d} → cbee
   {e} → cdbb
   { } → ~~cdee~~

(213) *A third possible choice*:

a. Markers:
(i) /a/ ↔ [ ]
(ii) /b/ ↔ [234]
(iii) /c/ ↔ [134]
(iv) /d/ ↔ [123]
(v) /e/ ↔ [123]

b. Specificity:
/d/ > /e/ > /c/ > /b/ > /a/

c. Deactivation combinations & inflection classes:

{b, c, d, e}	→	aaaa
{b, c, d}	→	eeea
{b, c, e}	→	ddda
{b, c}	→	~~dddd~~a
{b, d, e}	→	cacc
{b, d}	→	eeec
{b, e}	→	dddc
{b}	→	~~dddd~~c
{c, d, e}	→	abbb
{c, d}	→	eeeb
{c, e}	→	dddb
{c}	→	~~dddd~~b
{d, e}	→	cbcc
{d}	→	~~cccc~~
{e}	→	~~dddd~~c
{ }	→	~~dddd~~c

(214) *A fourth possible choice*:

a. Markers:
(i) /a/ ↔ [ ]
(ii) /b/ ↔ [1]
(iii) /c/ ↔ [2]
(iv) /d/ ↔ [3]
(v) /e/ ↔ [4]

b. Specificity:
/e/ > /d/ > /c/ > /b/ > /a/

c. Deactivation combinations & inflection classes:

{b, c, d, e}	→	aaaa
{b, c, d}	→	aaae
{b, c, e}	→	aada
{b, c}	→	aade
{b, d, e}	→	acaa
{b, d}	→	acae
{b, e}	→	acda
{b}	→	acde
{c, d, e}	→	baaa
{c, d}	→	baae
{c, e}	→	bada
{c}	→	bade
{d, e}	→	bcaa
{d}	→	bcae
{e}	→	bcda
{ }	→	bcde

Note:
Again, the issue of what the decomposed case and inflection class features that encode the deactivation patterns in systems like (211)–(214) would actually look like is strictly speaking orthogonal to present concerns. Still, for the case at hand, in the worst case there would have to be four binary inflection class features [±α], [±β], [±γ] and [±δ] whose cross-classification yields the sixteen inflection classes (with individual markers underspecified as, e.g., [+α]); two abstract grammatical category features (e.g., case features such as [±governed], [±oblique], as in Bierwisch (1967)) would suffice for all systems but (213), where either reference to negated specifications would be necessary, or a third primitive feature would have to be invoked.

33. Conclusion

Scope of the result:
There may be minor imperfections in inflectional systems that can be traced back to historical factors. In particular, these deviations from optimal design show up in the form of isolated markers that cannot be given unique specifications, resulting in a case of *non-systematic homophony*. In such a situation, the set of possible inflection classes is mildly increased; it is 2^{n-1+x}, for x additional marker specifications required by unresolved, accidental homophony.

Abstractness of inflection markers:
The notion of "marker" is to be understood in a somewhat more abstract way that ignores allomorphic variation which is phonologically or morpho-phonologically conditioned (and not morphologically, as with variation determined by inflection class membership). For instance, Halle (1994) argues that the marker realizations *ov* and *ej* for genitive plural in Russian are allomorphs whose choice is morpho-phonologically determined; on this view, there is but a single marker /ov/, accompanied a single underspecified set of morpho-syntactic features (perhaps involving underspecified inflection class features, as suggested in Alexiadou & Müller (2008) in order to account for fact that this marker exhibits trans-paradigmatic syncretism).

Note:
The same reasoning applies to
(i) the use of *disjunction* or *negation* in marker specifications (see, e.g., Bierwisch (1967), Wunderlich (1996)), but only if contradictory feature specifications are involved;
(ii) the use of variables over feature values in marker specifications (i.e., α notation (see Chomsky (1965), Chomsky & Halle (1968) for the original concept, Noyer (1992), Harley (1994), Johnston (1996), Börjesson (2006), Georgi (2006), Lahne (2006), Opitz (2006) and Alexiadou & Müller (2008) on its use in morphology).

On the other hand:
The 2^{n-1} formula captures worst case scenarios. Overlapping marker specifications reduce the number of possible inflection classes further. Moreover, for an inflectional system to fully exploit the logical possibilities for developing inflection classes as they arise under the Inflection Class Economy Theorem is extremely unlikely – typically, far from all marker deactivation combinations will be employed.

(215) *Consequences for other morphological operations*:

a. *Fission* (Distributed Morphology; Halle & Marantz (1993), Noyer (1992)), *rule blocks* (stem-and-paradigm accounts; Anderson (1992), Stump (2001)). Both concepts give rise to instances of subanalysis, in the sense that what may look like a complex marker at first sight turns out to be best analyzed as a sequence of smaller markers, each with its own specifications (Janda & Joseph (1992), Bierkandt (2006)): unproblematic as long as it is understood that no more than one inflection class can determine a sequence of subanalyzed markers in each case.

b. *Impoverishment* (Distributed Morphology): Given that standard impoverishment (as feature deletion) can be reanalyzed as insertion of a highly specific null marker (Trommer (1999b)), each impoverishment rule also increases the set of n's (for which the powerset is created) by one.

VI. Neurophysiological Evidence for Underspecification

Ref.: Opitz, Regel, Müller & Friederici (2013)

Question:
Is morphological underspecifcation detectable in language processing?

Answer:
Yes.

34. Background

(216) *Decomposition of gender features in German* (Bierwisch (1967) – note that this differs subtly from the last handout):

a. masculine = [+masc,–fem]
b. feminine = [–masc,+fem]
c. neuter = [–masc,–fem]
d. [ ] = [+masc,+fem]

(217) *Decomposition of case features in German* (Bierwisch (1967)):

a. nominative = [–obj,–obl]
b. accusative = [+obj,–obl]
c. dative = [+obj,+obl]
d. genitive = [–obj,+obl]

Morphological Realization: Specificity and Compatibility

(218) *Inventory of exponents for pronominal inflection* (based on Blevins (1995))

a.	/n/ ↔ [+pl,+obj,+obl]	(dat.pl.)
b.	/m/ ↔ [–fem,+obj,+obl]	(dat.masc.sg./neut.sg.)
c.	/s/ ↔ [–fem,+obl]	(gen.masc.sg./neut.sg.)
d.	/r/ ↔ [+obl]	(dat./gen.fem.sg., gen.pl.)
e.	/n/ ↔ [+masc,–fem,+obj,–obl]	(acc.masc.sg.)
f.	/r/ ↔ [+masc,–fem]	(nom.masc.sg.)
g.	/s/ ↔ [–fem]	(nom./acc.neut.sg.)
h.	/e/ ↔ [ ]	(nom./acc.fem.sg./pl.)

(219) *Morphological Realization* ('Panini's Principle', 'Subset Principle', 'Elsewhere Principle', 'Proper Inclusion Principle', 'Blocking Principle'):
A morphological exponent M is chosen for a syntactic context (or paradigm cell) S if (a) and (b) hold.

a. M is compatible with S.
b. M is the most specific exponent among those that satisfy (219-a).

(220) *Compatibility*:
A morphological exponent M is compatible with a syntactic context (or paradigm cell) S if M realizes a *subset* of the morpho-syntactic feature/value pairs of S.

(221) *Specificity*:

A morphological exponent M_1 is more specific than a morphological exponent M_2 if M_1 realizes *more* features than M_2.

A Neurophysiological Study:
The Event-Related Potential Violation Paradigm

Opitz, Regel, Müller & Friederici (2013):

- If underspecification is real, *Compatibility* vs. *Specificity* should also be an inherent part of the language processing system. One should therefore be able to observe separable effects for the violation of each of the criteria.
- The *Event-Related Potential (ERP)* violation paradigm can be used to test this hypothesis in the domain of strong adjective inflection in German.
- *Prediction*: There should be differences in brain potentials between two incorrect conditions whenever they represented different types of violation (of Compatibility and Specificity).
- *Result*: The findings strongly support underspecification: An ERP-component related to morpho-syntactic integration (viz., *left anterior negativity; LAN*) was modulated by violations of Specificity versus Compatibility.
- Furthermore: The neurophysiological evidence helps to distinguish between two kinds of morphological underspecification that have been proposed: It argues for *maximal* rather than *minimal* underspecification.

35. Experiment

Premise:

- Since pronominal inflection involves only closed-class items which are presumably stored as full forms in the mental lexicon, the experimental design made the choice of the strong adjective paradigm mandatory.
- This is unproblematic since the two paradigms are identical except for genitive masculine/neuter singular contexts, where pronominal inflection has an exponent *-es* and strong adjective inflection has an exponent *-en*, with exactly the same role in the system.
- The study focuses on accusative exponents where there is no difference; one can thus look at underspecification-based analyses of pronominal inflection as analyses of strong adjective inflection by extension.

(222) *Material: PPs with accusative NPs of all three genders*

a. durch schlicht-e Struktur
   by plain- FEM.SG.ACC structure. FEM
b. durch schlicht-en Geschmack
   by plain- MASC.SG.ACC taste. MASC
c. durch schlicht-es Design
   by plain- NEUT.SG.ACC design.neut

Maximal vs. Minimal Underspecfication
Two kinds of (extensionally equivalent) underspecification approaches:

- *Maximal underspecification*: minimal number of features on a morphological exponent; reduces complexity of the lexical component.
- *Minimal underspecification*: maximal number of features on a morphological exponent that still accounts for syncretism; might reduce complexity of the processing component; simple learning algorithms exist (Harley (2001), Pertsova (2007), based on *intersecting* the sets of the different (fully specified) environments; as soon as a minimally underspecified exponent can be postulated, the algorithm stops).

Prediction:

1. With maximal underspecification, ungrammatical exponents will, as a tendency, more often be blocked by Specificity.
2. With minimal underspecifiction, ungrammatical exponents will, as a tendency, more often be blocked by Compatibility.
3. Exponents that are blocked in the same way in one approach may therefore be blocked in different ways in the other approach.
4. We expect an identical ERP profile in the first case but not in the second case.

(223) *Inventory of exponents in Blevins (1995), with maximal underspecification*

a.	/n/ ↔ [+pl,+obj,+obl]	(dat.pl.)
b.	/m/ ↔ [–fem,+obj,+obl]	(dat.masc.sg./neut.sg.)
c.	/s/ ↔ [–fem,+obl]	(gen.masc.sg./neut.sg.)
d.	/r/ ↔ [+obl]	(dat./gen.fem.sg., gen.pl.)
e.	*/n/* ↔ [+masc,–fem,+obj,–obl]	(acc.masc.sg.)
f.	/r/ ↔ [+masc,–fem]	(nom.masc.sg.)
g.	*/s/* ↔ [–fem]	(nom./acc.neut.sg.)
h.	*/e/* ↔ [ ]	(nom./acc.fem.sg./pl.)

(224) *Inventory of exponents in Blevins (1995), with minimal underspecification*

a.	/n/ ↔ [+pl,+obj,+obl]	(dat.pl.)
b.	/m/ ↔ [–fem,+obj,+obl,*–pl*]	(dat.masc.sg./neut.sg.)
c.	/s/ ↔ [–fem,+obl,*–obj*,*–pl*]	(gen.masc.sg./neut.sg.)
d.	/r/ ↔ [+obl]	(dat./gen.fem.sg., gen.pl.)
e.	*/n/* ↔ [+masc,–fem,+obj,–obl,*–pl*]	(acc.masc.sg.)
f.	/r/ ↔ [+masc,–fem,*–obl*,*–obj*,*–pl*]	(nom.masc.sg.)
g.	*/s/* ↔ [*–masc*,–fem,*–obl*,*–pl*]	(nom./acc.neut.sg.)
h.	*/e/* ↔ [*–obl*]	

Predictions under Maximal Underspecification

(225) *Two types of illicit agreement, with maximal underspecification (as in (223))*:

a. for feminine phrases:
identical kind of violation (Compatibility)

context features:		[–masc, +fem, –obl, +obj]
correct marker:	-e	[ ]
incompatible (incorr.1):	-(e)n	[+**masc,** –**fem**, –obl, +obj]
incompatible (incorr.2):	-(e)s	[–**fem**]

b. for masculine phrases:
identical kind of violation (Specificity)

context features:		[+masc, –fem, –obl, +obj]
correct:	-(e)n	[+masc, –fem, –obl, +obj]
compatible (incorr.1):	-(e)s	[–fem]
compatible (incorr.2):	-e	[ ]

c. for neuter phrases:
different kind of violation (Compatibility vs. Specificity)

context features:		[–masc, –fem, –obl, +obj]
correct:	-(e)s	[–fem]
incompatible (incorr.1):	-(e)n	[+**masc**, –fem, –obl, +obj]
compatible (incorr.2):	-e	[ ]

Predictions under Minimal Underspecification

(226) *Two types of illicit agreement, with minimal underspecification (as in (224))*:

a. for feminine phrases:
identical kind of violation (Compatibility)

context features:		[–masc, +fem, –obl, +obj, –pl]
correct marker:	-e	[–obl]
incompatible (incorr.1):	-(e)n	[+**masc,** –**fem**, –obl, +obj, –pl]
incompatible (incorr.2):	-(e)s	[–masc, –**fem**, –obl, –pl]

b. for masculine phrases:
different kind of violation (Compatibility vs. Specificity)

context features:		[+masc, –fem, –obl, +obj, –pl]
correct:	-(e)n	[+masc, –fem, –obl, +obj, –pl]
incompatible (incorr.1):	-(e)s	[–**masc**, –fem, –obl, –pl]
compatible (incorr.2):	-e	[–obl]

c. for neuter phrases:
different kind of violation (Compatibility vs. Specificity)

context features:		[–masc, –fem, –obl, +obj, –pl]
correct:	-(e)s	[–masc, –fem, –obl, –pl]
incompatible (incorr.1):	-(e)n	[+**masc**, –fem, –obl, +obj, –pl]
compatible (incorr.2):	-e	[–obl]

Predictions:
(A) No, (B) Maximal, (C) Minimal Underspecification

(227) *Predictions: assumed processing differences for different incorrect markers*

		model		
		without underspec.	with underspecification	
noun gender		categorical	maximal	minimal
feminine	(*corr. e*)	s = n	$s^2 = n^2$	$s^2 = n^2$
neuter	(*corr. s*)	e = n	$e^1 < n^2$	$e^1 < n^2$
masculine	(*corr. n*)	e = s	$e^1 = s^1$	$e^1 < s^2$

Notational conventions:
[1] signals a violation of Specificity; [2] signals a violation of Compatibility; α=β indicates the same type of violation/the same processing; and α<β indicates a different type of violation/different processing

36. Method

Items:

- 180 nouns (60 masculine, 60 feminine, 60 neuter)
- matched for length, frequency, plausibility, familiarity, derived/non-derived
- each item in 3 different correctness conditions (correct, incorrect1, incorrect2)
- = 540 experimental items
- 3 randomized lists, 240 items each list:
  - all 180 nouns (60 correct, 60 incorr1, 60 incorr2)
  - 60 correct fillers

(228) *Experimental design/conditions*

	masculine NP 'without new discount'	neuter NP 'without new genre'	feminine NP 'without new probe'
correct	ohne neuen Rabatt	ohne neues Genre	ohne neue Sonde
incorrect 1	ohne neues Rabatt	ohne neuen Genre	ohne neuen Sonde
incorrect 2	ohne neue Rabatt	ohne neue Genre	ohne neues Sonde

Participants

- 42 German native speakers
- 21 male, 21 female
- all right-handed

Procedure

- visual word-by-word presentation:
  400ms each word, 300ms ISI

- recording of EEG (51 electrodes according to the international 10-20 system)
- compared ERP for the processing of the noun (establishing/validation of agreement)
- grammaticality judgement after each trial (producing behavioural data)

Technical details

- grand averages were obtained for 1200ms epochs beginning 200 ms prior to the presentation of the critical stimuli (i.e., the nouns)
- time windows for analysis: 300-550ms; 600-900ms
- 4 Regions Of Interest (ROI), each containing 6 electrodes:
  left anterior: F5, F3, FC5, FC3, C5, C3
  right anterior: F4, F6, FC4, FC6, C4, C6
  left posterior: CP5, CP3, P5, P3, PO7, PO3
  right posterior: CP4, CP6, P4, P6, PO4, PO8
  (midline)

Presentation

(229)

-*-	[ ]	prep	[ ]	adj	[ ]	noun	[ ]
500ms	300ms	400ms	300ms	400ms	300ms	400ms	800ms

Results: Electrophysiological Data; Left-Anterior Negativity

	Anterior Sites				Posterior Sites		Midline Sites	
	left anterior		right anterior					
	df	F	df	F	df	F	df	F
Marker	2,82	14.23***	2,82	17.71***	2,82	11.26**	2,82	14.25***
Gender x Marker	4,164	6.13**	4,164	2.49(*)	4,164	2.37(*)	4,164	2.39(*)
Feminine								
Marker	2,82	8.44***	2,82	6.19**	2.82	5.01**	2,82	3.02(*)
cor vs incor1	1,41	13.9***	1,41	8.64**	1,41	n.s.	1,41	n.s.
cor vs incor2	1,41	6.40*	1,41	8.74**	1,41	8.41**	1,41	n.s
incor1 vs incor2	1,41	n.s.	1,41	n.s.	1,41	n.s.	1,41	n.s.
Neuter								
Marker	2,82	17.49***	2.82	11.53***	2,82	7.87***	2,82	12.93***
cor vs incor1	1,41	36.59***	1,41	25.54***	1,41	10.71**	1,41	19.41***
cor vs incor2	1,41	12.78**	1,41	9.47**	1,41	10.12**	1,41	16.16**
incor1 vs incor2	1,41	4.17*	1.41	n.s.	1.41	n.s.	1,41	n.s.
Masculine								
Marker	2,82	n.s.	2,82	n.s.	2,82	n.s.	2,82	n.s.

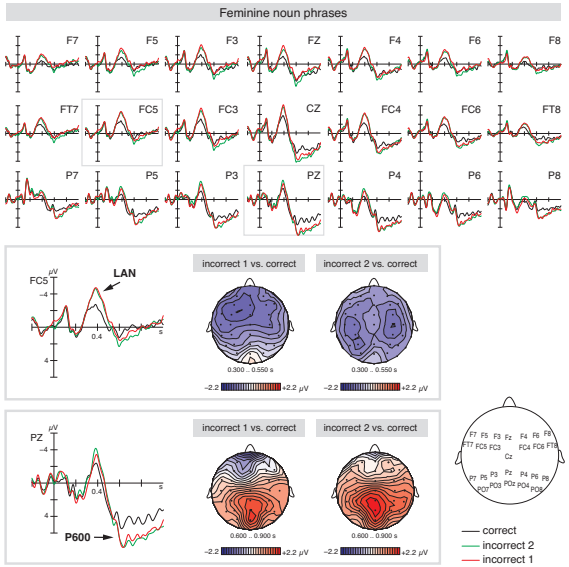
Effects of the step-down ANOVAs for anterior and posterior sites and the ANOVAs for the midline sites of the 300–550 ms latency window

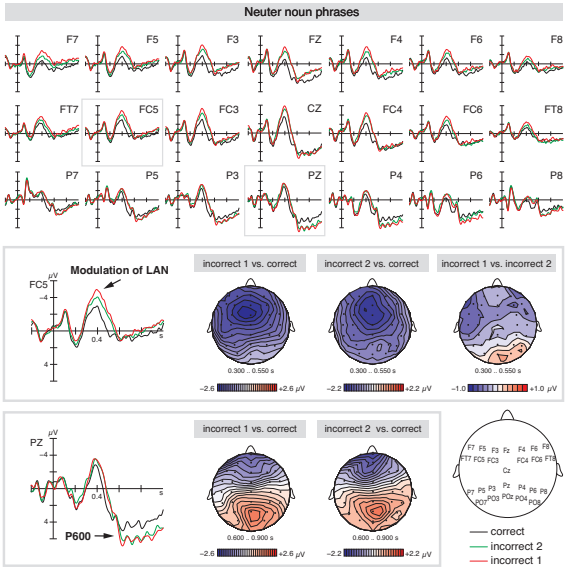
Abbreviations used in this table: cor = correct; incor1 = incorrect1; incor2 = incorrect2; (*) = p<.10; * = p<.05; ** = p<.01; *** = p<.001; n.s. = not significant.

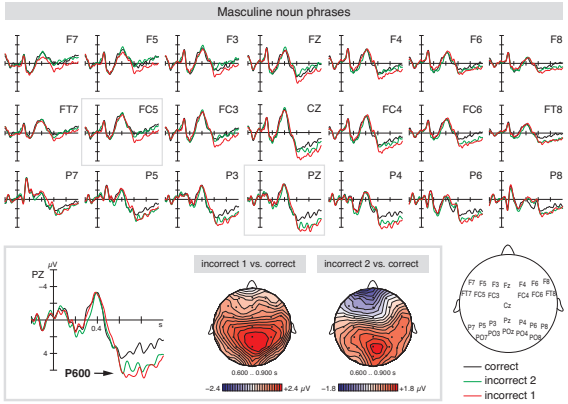
Results: Electrophysiological Data; P600

	Anterior Sites		Posterior Sites		Midline Sites	
	df	F	df	F	df	F
Marker	2,82	n.s.	2,82	10.07***	2,82	6.146**
Gender	2,82	n.s.	2,82	3.45*	2,82	2.62(*)
Gender x Marker	4,164	3.72**	4,164	n.s.	4,164	2.44(*)
Feminine						
Marker	2,82	2.71(*)			2,82	5.42**
cor vs incor1	1,41	n.s.			1,41	n.s.
cor vs incor2	1,41	n.s.			1,41	9.40**
incor1 vs incor2	1,41	n.s.			1,41	n.s.
Neuter						
Marker	2,82	n.s.			2,82	n.s.
Masculine						
Marker	2,82	4.88**			2,82	5.21**
cor vs incor1	1,41	9.25**			1,41	12.73***
cor vs incor2	1,41	n.s.			1,41	n.s.
incor1 vs incor2	1,41	n.s.			1,41	n.s.

Effects of the step-down ANOVAs for anterior and posterior sites and the ANOVAs for the midline sites of the 600-900 ms latency window







37. Discussion: Two Main Results

(230) Background

a. Left-Anterior Negativity (LAN): indicative of morpho-syntactic violations (but see below for a qualification)
b. P600: indicative of reanalysis and repair

- LAN:

1. In *feminine* contexts, where /e/ is correct, the two incorrect exponents /n/ and /s/ produce the same effect.

2. In *neuter* contexts, where /s/ is correct, the two incorrect exponents /s/ and /e/ produce different effects. (This is the main result of the study.)
3. In *masculine* contexts, where /n/ is correct, the two incorrect exponents /s/ and /e/ produce the same effect. Surprisingly, the *correct* marker /n/ also produces this effect. (This is also an interesting result.)

- P600: This effect showed up in the same way with all incorrect exponents.
- The LAN effects with *incorrect* forms in *neuter* contexts gives rise to a direct argument for underspecification.
- The LAN effect with *correct* forms in *masculine* contexts gives rise to a more indirect argument for underspecification.

38. Comparing Incorrect Conditions for Each Gender

(231) *Predictions and results*

	Predictions				
	without underspec.	with underspecification		Results	
noun gender	categorical	maximal	minimal	LAN	P600
feminine	s = n	$s^2 = n^2$	$s^2 = n^2$	s = n	s = n
neuter	e = n	$e^1 < n^2$	$e^1 < n^2$	$e < n^*$	e = n
masculine	e = s	$e^1 = s^1$	$e^1 < s^2$	e = s	e = s

Conclusions:

- The different LAN effect with /e/ and /n/ in neuter contexts strongly argues for the reality of a difference between *Compatibility* and *Specificity*, i.e., for underspecification.
- The absence of a LAN effect with /e/ and /s/ in masculine contexts strongly argues for *maximal* rather than *minimal* underspecification.

39. An Effect of Feature Matching

Question:
Why is there a LAN effect for correct masculine forms that is indistinguishable from the LAN effect for the two incorrect forms?

Answer: This is an effect of feature matching.

(232) *Proposal*:

a. [PP P [NP A N]] is parsed incrementally.
b. P is read in; [+obj,–obl] (= acc) is available at this point.
c. A is encountered. Gender information on A becomes available (if there is any): [+masc,–fem] with /n/, [–fem] with /s/, and no gender feature with /e/; A's case specification (if there is any) is now accessible. P-A agreement is carried out, comparing the case features of P and A. If there are no conflicts, potentially missing case features of the preposition are copied onto the adjective, yielding full case specifications on A.

d. N enters the structure. It has specified gender information and fully specified number information, but no case information whatsoever yet. A-N agreement is carried out; the morpho-syntactic features of N are matched with the morpho-syntactic features of A.

Agreement Evaluation

(233) *Sizes of feature sets in well-formed NPs before A-N agreement*

a. durch — by — $[\ -obl, +obj\ ]$ | schlichten — plain.MASC — $\begin{bmatrix} +masc, -fem \\ -obl, +obj \end{bmatrix}$ | Geschmack — taste.MASC — $[\ +masc, -fem\ ]$ ← *most features compared:* 4/2

b. durch — by — $[\ -obl, +obj\ ]$ | schlichtes — plain.NEUT — $\begin{bmatrix} -fem \\ \underline{-obl}, \underline{+obj} \end{bmatrix}$ | Design — design.NEUT — $[\ -masc, -fem\ ]$ ← *fewer features compared:* 3/2

c. durch — by — $[\ -obl, +obj\ ]$ | schlichte — plain.FEM — $\begin{bmatrix} \\ \underline{-obl}, \underline{+obj} \end{bmatrix}$ | Struktur — structure.FEM — $[\ -masc, +fem\ ]$ ← *fewest features compared:* 2/2

Conclusions:

- The LAN effect with correct masculine forms is due to the fact that the most features need to be compared in incremental agreement, outweighing the LAN effect with the incorrect forms here.
- This provides a second, albeit indirect, argument for morphological underspecification: Underspecification actually facilitates processing (as it facilitates lexical storage).

VII. Differential Marking and Three-Way Systems as Morphological Allomorphy

Ref.: Aissen (2003), Keine & Müller (2011; 2014), Müller & Thomas (2014)

40. Background

Note:
This is the start of the optimality-theoretic part of the course.

Observation:
Optimality Theory crucially relies on a competition of candidate forms (which are assembled in candidate sets). Furthermore, candidate sets can in principle easily be infinite. This is often taken to raise computational complexity issues.

Reaction:

> This qualm arises from a misapprehension about the kind of thing that grammars are. It is not incumbent upon a grammar to compute, as Chomsky has emphasized repeatedly over the years. A grammar is a function that assigns structural descriptions to sentences; what matters formally is that the function is well-defined. The requirements of explanatory adequacy (on theories of grammar) and descriptive adequacy (on grammars) constrain and evaluate the space of the hypotheses. Grammatical theorists are free to contemplate any kind of formal device in pursuit of these goals; indeed, they *must* allow themselves to range freely if there is to be any hope of discovering decent theories. Concomitantly, one is not free to impose arbitrary additional meta-constraints (e.g. 'computational plausibility') which could conflict with the well-defined basic goals of the enterprise. In practice, computationalists have always proved resourceful. All available complexity results for known theories are stunningly distant from human processing capacities ... yet all manner of grammatical theories have nonetheless been successfully implemented in parsers, to some degree or another, with comparable efficiency. ... There are neither grounds of principle nor grounds of practicality for assuming that computational complexity considerations, applied directly to grammatical formalisms, will be informative."
>
> Prince & Smolensky (1993, 197; 2004, 233)

Note:
Whereas there are alternative approaches to phonology and syntax that do without the concept of competition, this is not actually the case in (inflectional) morphology: Current approaches to inflectional morphology regularly rely on underspecification. Therefore, the concept of competition is present throughout, as is a means for competition resolution. The most important difference between optimality-theoretic and other approaches to morphology will then be the exact mechanism to resolve the competition – optimal constraint profile in one case, highest degree of specificity in the other.

Strategy:
Against the background of the structure of grammar assumed in Distributed Morphology, Optimality Theory could in principle be relevant in three relevant domains:

[1] Syntax

[2] Syntax/Morphology Interface: Post-syntactic morphological operations that precede vocabulary insertion (i.e., that precede genuine morphological exponence)

[3] Morphology: Morphological exponence by vocabulary insertion

[1] is not the topic of this course.
[2] is the more conservative view: Optimality Theory as a theory of interfaces. (See, e.g., Pesetsky (1997; 1998) for this position.)
[3] is the more radical view: Optimality Theory directly covers morphological realization (plus, typically, what is otherwise handled in [2].)

Note:
I will address [2] in the present lecture; the rest of the course then focusses on [3].

Claims:

- Differential argument encoding should be analyzed as a purely morphological phenomenon that is based on selective post-syntactic case feature deletion.
- Three-way case systems should be analyzed as a purely morphological phenomenon that is based on selective post-syntactic case feature deletion.
- Post-syntactic case feature deletion is brought about by optimization procedures rather than by impoverishment rules: The latter would have to refer to unnatural classes.

41. Optimality Theory

Optimality Theory (OT) has been developed since the early nineties, by Alan Prince, Paul Smolensky, John McCarthy and others. At first, the focus was mainly on phonology; but the approach has since been extended to morphology, syntax, semantics, and pragmatics. The most comprehensive (and best) exposition of the theory is still Prince & Smolensky (1993; 2004).

(234) *Basic assumptions of Optimality Theory*:
  a. *Universality*:
     Constraints are universal.
  b. *Violability*:
     Constraints are violable.
  c. *Ranking*:
     Constraints are ranked.
  d. *Competition*:
     The wellformedness of a linguistic expression LE cannot solely be determined on the basis of LE's internal properties. Rather, external factors (more precisely, the competition of LE with other linguistic expressions) determine whether LE is grammatical or not. LEs are *candidates*.

Note:
LE stands for a grammatical unit that is subject to an optimization procedure deciding on its wellformedness. LE is the basic unit of a grammatical domain (phonology, morphology, syntax, semantics).

(235) *Optimality*:
A candidate C_i is optimal with respect to some constraint ranking <$Con_1 \gg Con_2 \gg ... \gg Con_n$> iff there is no other candidate C_j in the same *candidate set* that has a better *constraint profile*.

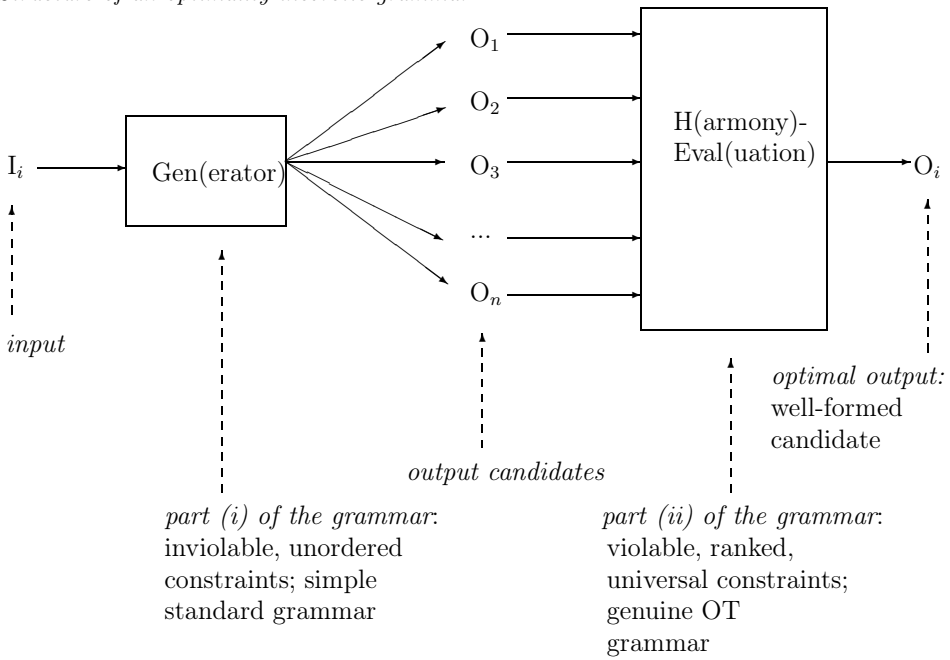
(236) *Constraint profile*:
C_j has a better constraint profile than C_i if there is a constraint Con_k such that (i) and (ii) hold:

a. C_j satisfies C_k better than Con_i.
b. There is no constraint Con_l that is ranked higher than Con_k, and for which C_i and C_j differ.

Note:
C_j satisfies a constraint Con better than C_i if C_j violates Con less often than C_i. (This includes the case where C_j does not violate Con at all, whereas C_i does.)

(237) *Candidate set*:
Two candidates are in the same candidate set iff they go back to the same *input* ('underlying representation').

Structure of an optimality-theoretic grammar



(238) *Types of constraints*:
Standardly, two basic types of H-Eval constraints can be distinguished that often give rise to conflicts:

- *Faithfulness constraints* demand that input and output are identical with respect to some property
  - –Dep: no addition of items in the output.
  - –Max: no deletion of items in the output.
  - –Ident: no change of items in the output:
- *Markedness constraints* impose requirements on outputs that may necessitate a deviation from the input.

Note:
Optimality-theoretic competitions are often illustrated by tables, so-called *tableaux*.

T_1 The basic principle

	A	B	C
☞ O_1			*
O_2			**!
O_3		*!	
O_4	*!		
O_5		*!	*

Generalization:
The optimal output is the candidate that has its first star furthest to the right in a tableau.

(239) *Cross-linguistic variation*:
Assumption: Languages differ with respect to their grammars. Grammatical differences between languages = parametrization. Parametrization in optimality theory: *constraint reranking*.

T_2: Parametrization

	A	C	B
O_1		*!	
O_2		**!	
☞ O_3			*
O_4	*!		
O_5		*!	*

Note:
Optimality theory was developed out of so-called "Harmonic Grammar" approaches → theory of neural networks. (Further reading: Prince & Smolensky (2004, ch. 10), Smolensky & Legendre (2006, part I). I will come back to Harmonic Grammar at the end of the course.) Main innovation: Quality before quantity; no number of violations of a lower-ranked constraint can outweigh a single violation of a higher-ranked constraint. This property is also known as *strict domination*.

T_3: Irrelevance of constraint violation numbers as such

	A	B	C
☞ O_1			****
O_2			*****!**
O_3		*!	
O_4	*!		
O_5		*!	*

Caveat:
OT has introduced a means to undermine the irrelevance of constraint violation quantity as such: *(reflexive) local conjunction* (see Smolensky (1996; 2006); and Legendre et al. (1998), Fischer (2001), Aissen (1999; 2002), Keine (2009), and Keine & Müller (2011; 2014) for some syntactic applications of local conjunction).

(240) *Local Conjunction*:

a. Local conjunction of two constraints Con_1, Con_2 with respect to a local domain D yields a new constraint $Con_1\&_D Con_2$ that is violated iff there are two separate violations of Con_1 and Con_2 in a single domain D.
b. Universal ranking: $Con_1\&_D Con_2 \gg \{Con_1, Con_2\}$
c. If $Con_1 = Con_2$, local conjunction is reflexive.
d. Notation: $B^2 = B\&B$, $B^3 = B^2\&B$, etc.

T_3: A consequence of reflexive local conjunction

	C^4	A	B	C
O_1	*!			****
O_2	*!			*******
☞ O_3			*	
O_4		*!		
O_5			*!	*

42. Differential Marking

42.1. Harmonic Alignment

(241) *Harmonic Alignment* (Prince & Smolensky (2004)):
Suppose given a binary dimension D_1 with a scale X > Y on its elements {X,Y}, and another dimension D_2 with a scale a > b > ... > z on its elements {a,b,...,z}. The *harmonic alignment* of D_1 and D_2 is the pair of Harmony scales H_X, H_Y:

a. H_X: $X/a \succ X/b \succ ... \succ X/z$
b. H_Y: $Y/z \succ ... \succ Y/b \succ Y/a$

The *constraint alignment* is the pair of constraint hierarchies C_X, C_Y:

a. C_X: $*X/z \gg ... \gg *X/b \gg *X/a$
b. C_Y: $*Y/a \gg *Y/b \gg ... \gg *Y/z$

Proposal (Aissen (1999; 2003)):
By combining (i) *harmonic alignment* applied to the scales identified by Hale (1972) and Silverstein (1976) as in (242) and (ii) *local conjunction* with markedness constraints in an OT grammar, alternations between zero and non-zero exponence can be derived (differential subject marking, differential object marking).

(242) *Scales*:

a. *GF scale* (basic):
Subject > Object
("Subject" = "specifier of vP", object = "complement of V": Chomsky (1965; 2001))
b. *θ scale*:
Agent > Patient
c. *Person scale*:
Local Pers. (1,2) > 3. Pers.
d. *Prominence scale*:
X > x (discourse-prominent argument > non-discourse-prominent argument)
e. *Animacy scale*:
Hum(an) > Anim(ate) > Inan(imate)
f. *Definiteness scale*:
Pro(noun) > Name (PN) > Def(inite) > Indefinite Specific (Spec) > NonSpecific (NSpec)

(243) *Markedness constraints*:

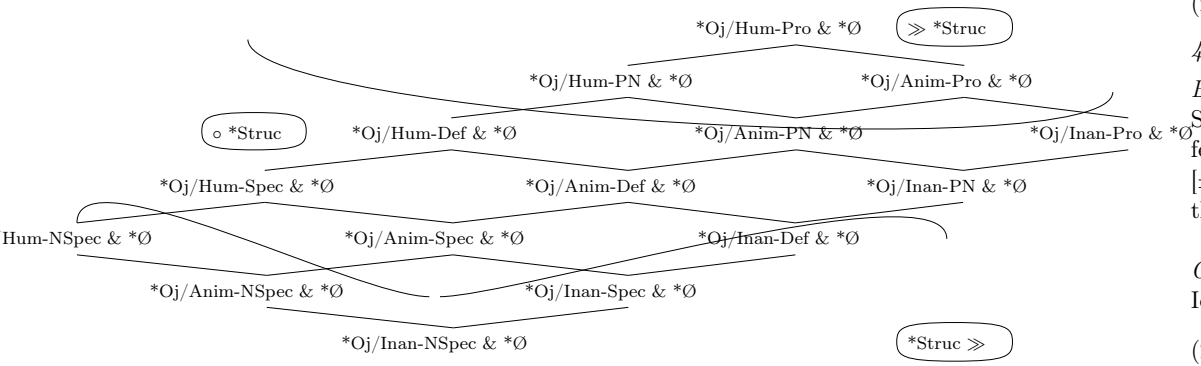
a. $*Ø_C$ (Star-Zero(Case)): (*is conjoined with a hierarchy of constraints*)
"penalizes the absence of a value for the feature CASE"
b. $*\text{STRUC}_C$ (Star-Structure(Case)): (*is <u>not</u> conjoined with a hierarchy of constraints*)
"penalizes a value for the morphological category CASE"

(244) *A consequence for differential object marking*:

	← $*\text{STRUC}_C$	Kalkatungu: no objects case-marked
*Obj/Pro & $*Ø_C \gg$		
	← $*\text{STRUC}_C$	Catalan: only pronominal objects case-marked
*Obj/PN & $*Ø_C \gg$		
	← $*\text{STRUC}_C$	Pitjantjatjara: only pronominal and PN objects case-marked
*Obj/Def & $*Ø_C \gg$		
	← $*\text{STRUC}_C$	Hebrew: only pronominal, PN, and definite objects case-marked
*Obj/Spec & $*Ø_C \gg$		
	← $*\text{STRUC}_C$	Turkish: all objects case-marked except non-specific objects
*Obj/NSpec & $*Ø_C$		
	← $*\text{STRUC}_C$	Written Japanese: all objects case-marked

42.2. Two-Dimensional Differential Object Marking

(245) *DOM in El Cid Spanish*:



42.3. Problem

Problem:
Aissen's approach only permits yes/no decisions concerning morphological marking. This does not take into account the possibility that there might be *degrees* of morphological marking: iconicity.

Proposal:
Differential argument encoding results from harmonic alignment of scales, but it is a purely *morphological* phenomenon, not a *syntactic* phenomenon (as assumed in Aissen (1999; 2003)).

42.4. Impoverishment

Impoverishment Rules
(i) Impoverishment rules are a fundamental concept of Distributed Morphology. They are deletion transformations that remove morpho-syntactic features (which need to be realized by morhological exponents in a post-syntactic morphological component) before marker (= vocabulary item) insertion takes place (see Bonet (1991), Noyer (1998), Halle & Marantz (1993; 1994), Bobaljik (2002b), Frampton (2002)). As a consequence of impoverishment, inflectional morphology applies to reduced feature matrices, and there is a *retreat to the general case*: a less specific marker is inserted than would otherwise be expected.
(ii) Impoverishment can be viewed as insertion of highly specific zero exponents (see Trommer (1999b)).
(iii) Impoverishment can be viewed as being triggered by general filters blocking the co-occurrence of features (Noyer (1992)), or by interacting optimality-theoretic constraints with the same effect (Grimshaw (2001), Kiparsky (2001), Trommer (2001; 2006a), Wunderlich (2004), Lahne (2007b), Opitz (2007)).

Observation:
Aissen's analyses can be reanalyzed in terms of impoverishment:
(i) As before, impoverishment is a post-syntactic operation that deletes morpho-syntactic features.

(ii) Deletion applies so as to satisfy complex faithfulness constraints created by harmonic alignment of scales.
(iii) On this view, impoverishment is essentially functionally motivated.

42.5. Iconicity

Background assumption:
Syncretism is derived by *underspecification* of exponents with respect to morpho-syntactic features (which may be more abstract than is motivated by syntactic considerations – e.g., [±obj], [±obl] as more primitive, decomposed case features whose cross-classification yields the four cases of German, with underspecification capturing natural classes of cases).

Observation (Wiese (1999; 2003; 2004)):
Iconicity holds of inflectional systems.

(246) *Iconicity Meta-Principle*:
Similarity of form implies similarity of function (within a certain domain, and unless there is evidence to the contrary).

Remarks:
(i) Similarity of form: phonological properties (size of exponents, sonority of exponents)
(ii) Similarity of function: *underspecified* features associated with an exponent (and matched against fully specified feature matrices). (Note: This is where Wiese's proposal involves a radical break with the tradition, where iconicity is measured based on fully specified forms (Plank (1979), Wurzel (1984)) – but then, it does not work.)
(iii) There is a feature hierarchy: [+masc] > [+obl] > [+fem] > [+gov]. Rules that involve [+masc] are more specific than rules that don't; etc.

(247) *Wiese (1999) on determiner inflection in German*

a.	(i)	/m/ ↔ [+masc,+obl,+gov]	(Dat.Masc.Sg./Neut.Sg.)
	(ii)	/s/ ↔ [+masc,+obl]	(Gen.Masc.Sg./Neut.Sg.)
	(iii)	/s/ ↔ [+masc,+fem]	(Nom./Acc.Neut.Sg.)
b.	(i)	/n/ ↔ [+masc,+gov]	(Acc.Masc.Sg.)
	(ii)	/r/ ↔ [+masc]	(Nom.Masc.Sg.)
	(iii)	/r/ ↔ [+obl,+fem]	(Dat./Gen.Fem.Sg.)
	(iv)	/n/ ↔ [+obl,+gov]	(Dat.Pl.)
	(v)	/r/ ↔ [+obl]	(Gen.Pl.)
c.	(i)	/e/ ↔ [ ]	(Nom./Acc.Fem.Sg./Pl.)

Conclusion:
This *abstract*, highly theory-dependent concept of iconicity (which only works once underspecification of exponents is postulated) is a recurring feature of inflectional systems (see, e.g., Müller (2004; 2005; 2007b), Georgi (2008), Opitz (2006)).

42.6. Proposal

Suggestion:
(i) Differential marking is not necessarily a categorical yes/no phenomenon; rather, it can be gradient phenomenon.

(ii) Differential marking is brought about by impoverishment. Impoverishment consists of post-syntactic deletion of morpho-syntactic features, triggered by faithfulness constraints derived from harmonic alignment of scales.
(iii) Impoverishment requires insertion of a less specific marker. It may lead to zero exponence winning (/Ø/ is often the elsewhere marker), but it may also lead to a selection of other markers that instantiate a "retreat to the general case", and that are formally closer to zero exponence than the marker that would otherwise be expected (iconicity).

Basic assumptions:
(i) The organization of grammar is as assumed in Distributed Morphology: Syntax precedes inflectional morphology; and syntactic structures can be manipulated before morphological realization ('vocabulary insertion') takes place.
(ii) The only crucial difference is that impoverishment is brought about not by specific rules, but by a system of conflicting constraints (Grimshaw (2001), Kiparsky (2001), Trommer (2001; 2006a), Wunderlich (2004), Lahne (2007b), Opitz (2007)).

(248) *Late vocabulary insertion* (Halle & Marantz (1993)):
- a. Functional morphemes contain fully specified bundles of morpho-syntactic features in syntax; however, they do not yet contain phonological material.
- b. Inflection markers are vocabulary items that pair phonological and (often underspecified) morpho-syntactic features; they are inserted post-syntactically in accordance with the Subset Principle.

(249) *Subset Principle* (Halle (1997)):
A vocabulary item V is inserted into a functional morpheme M iff (i) and (ii) hold:
- (i) The morpho-syntactic features of V are a subset of the morpho-syntactic features of M.
- (ii) V is the most specific vocabulary item that satisfies (i).

(250) *Specificity of vocabulary items* (Lumsden (1992), Noyer (1992), Wiese (1999)):
A vocabulary item V_i is more specific than a vocabulary item V_j iff there is a class of features F such that (i) and (ii) hold.
- (i) V_i bears more features belonging to F than V_j does.
- (ii) There is no higher-ranked class of features F′ such that V_i and V_j have a different number of features in F′.

(251) *Impoverishment* (Grimshaw (2001), Kiparsky (2001), Trommer (2001; 2006a), Wunderlich (2004), Opitz (2007)):
- a. Syntactic structures (inputs) are mapped onto structures that serve as the input to vocabulary insertion (outputs).
- b. This mapping is subject to optimization (Prince & Smolensky (2004)).
- c. Markedness constraints may force feature deletion, in minimal violation of faithfulness (MAX) constraints.
- d. Vocabulary insertion may face an impoverished structure.

42.7. Case Studies

42.7.1. Case Study: Differential Encoding of Objects in Mannheim German

Refs.: Behaghel (1911), Karch (1975), Müller (2003), and literature cited there

42.7.1.1 The Phenomenon Observation:
(i) In all varieties of German, feminine, neuter, and plural NPs are morphologically indistinguishable in nominative and accusative environments.
(ii) In the variety of German spoken in and around Mannheim (and elsewhere in Palatine and Rhine areas), the same holds for non-pronominal masculine NPs: "Rheinischer Akkusativ" (see Behaghel (1911), Karch (1975)).
(iii) The pattern is not extended to personal pronouns.
(iv) Thus, Hale/Silverstein scales seem to be at work.
(v) This suggests a unified approach; but a unified approach is not available if the theory of differential argument encoding can only account for a difference between zero and non-zero encoding (the nominative forms of German determiner inflection are not zero).

(252) *Case marking of non-pronominal objects in Mannheim German*:
- a. Ich wünsch Ihnen [NP ein-Ø schön-er Tag] noch
  I wish you$_{dat}$ a-NOM nice-NOM day PRT
- b. Wir haben [NP pädagogisch-er Planungstag]
  we have pedagocial-NOM planning day
- c. Ich hab auch [NP ein-Ø schön-er Ball], meinst du, bloSS du hast [NP
  I have also a-NOM nice-NOM ball, think you, just you have
  ein-er] ?
  a-NOM
- d. Man müsste mal wieder so richtig [NP einer] drauf machen
  one should PRT again PRT really one-NOM on it make
  'We should really have a night on the town again.'
- e. Hol mir mal [NP der Eimer]
  fetch me PRT the-NOM bucket

(253) *Case marking of pronominal objects in Mannheim German*:
Hol en/*er mir mal her
fetch he-ACC/*he-NOM me-DAT PRT PRT

42.7.1.2 Analysis Recall Wiese's (1999) underspecification analysis of determiner inflection in Standard German (see Bierwisch (1967), Blevins (1995), Wunderlich (1997b), Wiese (1999), Trommer (2005b) for alternative suggestions, most of which could just as well be adopted for present purposes).

(254)

Case		*Gender/Number*	
NOM:	[–obl,–gov]	MASC:	[+masc,–fem]
ACC:	[–obl,+gov]	FEM:	[–masc,+fem]
DAT:	[+obl,+gov]	NEUT:	[+masc,+fem]
GEN:	[+obl,–gov]	PL:	[–masc,–fem]

(255) *Vocabulary items for determiner inflection in German*

a.	(i)	/m/ ↔ [+masc,+obl,+gov]	(Dat.Masc.Sg./Neut.Sg.)
	(ii)	/s/ ↔ [+masc,+obl]	(Gen.Masc.Sg./Neut.Sg.)
	(iii)	/s/ ↔ [+masc,+fem]	(Nom./Acc.Neut.Sg.)
b.	(i)	**/n/ ↔ [+masc,+gov]**	**(Acc.Masc.Sg.)**
	(ii)	**/r/ ↔ [+masc]**	**(Nom.Masc.Sg.)**
	(iii)	/r/ ↔ [+obl,+fem]	(Dat./Gen.Fem.Sg.)
	(iv)	/n/ ↔ [+obl,+gov]	(Dat.Pl.)
	(v)	/r/ ↔ [+obl]	(Gen.Pl.)
c.	(i)	/e/ ↔ [ ]	(Nom./Acc.Fem.Sg./Pl.)

(256) *Scales*

a. *GF scale* (basic):
Subject > object

b. *Definiteness scale*:
Pro(noun) > Name (PN) > Def(inite) > Indefinite Specific (Spec) > NonSpecific (NSpec)

(257) *Constraint alignment*:
*Obj/Pro ≫ *Obj/PN ≫ *Obj/Def ≫ *Obj/Spec ≫ *Obj/NSpec

Note:
(i) *Obj/Pro & Max-C is violated if a case feature of a VP-internal pronoun is deleted post-syntactically (before morphological realization).
(ii) *Obj/PN & Max-C is violated if a case feature of a VP-internal proper name NP is deleted post-syntactically (before morphological realization).

(258) *A conflicting constraint that triggers case feature deletion* (a special version of *STRUC_C):
*[+gov]

(259) *Ranking*:

a. *Obj/Pro & Max-C ≫
b. *[+gov] ≫
c. *Obj/PN & Max-C ≫ *Obj/Def & Max-C ≫ *Obj/Spec & Max-C ≫ *Obj/NSpec & Max-C

Consequences:
(i) [+gov] is maintained with object pronouns. (Personal pronouns follow essentially the same system of inflection as determiners: *e-r–ih-n/e-n* parallels *dies-er-dies-en*; see Wiese (2001a), Fischer (2006).)
(ii) [+gov] is deleted with all other (structurally case marked) objects. Here, /n/ cannot be inserted anymore, and the more general marker /r/ must be chosen.

Question:
Why does this not lead to deletion of [+gov] in dative contexts? (It doesn't because masculine/neuter /m/ is not replaced with less specific /s/ with non-pronominal NPs, and plural /n/ is not replaced with /r/ either: **Ich danke dieses Mann*, **Ich danke dieser Männer*.)

Answer:
"Obj" means Comp(V), but dative arguments show up as Spec(V). The *Spec(V)/X & Max-C constraints are all higher-ranked than *[gov].

42.7.2. Another Case Study: Differential Encoding of Objects in Finnish

Refs.: Kiparsky (1998; 2001), Wunderlich (2000)

42.7.2.1 The Phenomenon Observation:
(i) Finnish objects can be structurally case-marked by *four* different exponents, only one of which is zero: /t/, /n/, /a/, /Ø/.
(ii) The principles that determine choice of the correct exponents are exactly the ones that Aissen (1999; 2003) shows to underlie zero/non-zero alternations in differential argument encoding.
(iii) This strongly suggests a unified approach; but a unified approach is not available if the theory of differential argument encoding can only account for a difference between zero and non-zero encoding.

Conclusion:
Differential case marking of objects in Finnish is best treated as a morphological phenomenon. (Note: To some extent, suggestions along these lines can already be found in Kiparsky (2001) and Wunderlich (2000), and what follows owes a lot to these works. However, the analysis below is much more radical in its treatment of objective case, and also fairly different in several other respects.)

(260) *Case marking of objects in Finnish* (Kiparsky (2001)):

a. Tuo-n häne-t
bring-1.SG he-ACC
'I'll bring him.'
b. Tuo-n karhu-n
bring-1.SG bear-GEN
'I'll bring the/a bear.'
c. Tuo-Ø karhu-∅
bring-IMP bear-NOM
'Bring the/a bear!'
d. Etsi-n karhu-a
seek-1.SG bear-PART
'I'm looking for the/a bear.'

(261) *Structural case markers (singular)* (traditional grammar):

	nouns: 'bear'	pronouns: 'you'
NOM	/Ø/	/Ø/
ACC	/Ø/, /n/	/t/
GEN	/n/	/n/
PART	/a/	/a/

(262) *Structural case markers (singular)* (Kiparsky's (2001) reconstruction):

	nouns: 'bear'	pronouns: 'you'
NOM	/Ø/	/Ø/
ACC	–	/t/
GEN	/n/	/n/
PART	/a/	/a/

Generalizations (Kiparsky (2001)):
(i) Objects of predicates that give rise to an *unbounded* (atelic) interpretation always take the partitive exponent.
(ii) Objects of predicates that give rise to a *bounded* (telic) (resultative, or quasi-resultative) interpretation take the partitive marker if they have a "quantitatively indeterminate denotation.'
(iii) Otherwise, objects of the latter predicates take the accusative marker if they are personal pronouns;
(iv) and they take the genitive marker if they are non-pronominal, and c-commanded by an overt subject.
(v) In all other cases, a structurally case-marked object NP takes the nominative marker.

Conclusion:
(i) Pronouns are marked differently from other NPs.
(ii) Non-specific NPs are marked differently from other NPs.
(iii) This suggests harmonic alignment with the definiteness scale.

42.7.2.2 Analysis Claim:
(i) There is only one kind of object case in (260): accusative.
(ii) Marker variation is a morphological phenomenon resulting from impoverishment.

(263) *Structural cases in Finnish* (see Bierwisch (1967), Levin (1986), Alsina (1996), Wiese (1999) for the primitive case features adopted here):
- a. NOM: [–gov,–obl,+subj]
- b. GEN: [+gov,+obl,±subj]
- c. ACC: [+gov,–obl,–subj]

(264) *Scales*
- a. *GF scale* (basic):
  Subject > object
  (Spec(v) > Comp(V))
- b. *Definiteness scale*:
  Pro(noun) > Name (PN) > Def(inite) > Indefinite Specific (Spec) > NonSpecific (NSpec)
- c. *Boundedness scale*:
  Bounded > unbounded (Bd > NBd)

(265) *Constraint alignments*:
- a. *Obj/Pro ≫ *Obj/PN ≫ *Obj/Def ≫ *Obj/Spec ≫ *Obj/NSpec
- b. *Obj/Bd ≫ *Obj/NBd

Local conjuction of members of the two constraint hierarchies preserves order. It ultimately yields two-dimensional differential argument encoding.

(266) *Local conjunction*:
- a. *Obj/Pro & *Obj/Bd ≫ *Obj/PN & *Obj/Bd ≫ *Obj/Def & *Obj/Bd ≫ *Obj/Spec & *Obj/Bd ≫ *Obj/NSpec & *Obj/Bd

- b. *Obj/Pro & *Obj/NBd ≫ *Obj/PN & *Obj/NBd ≫ *Obj/Def & *Obj/NBd ≫ *Obj/Spec & *Obj/NBd ≫ *Obj/NSpec & *Obj/NBd

(267) *Notational variant (simplification)*:
- a. *Obj/Pro/Bd ≫ *Obj/PN/Bd ≫ *Obj/Def/Bd ≫ *Obj/Spec/Bd ≫ *Obj/NSpec/Bd
- b. *Obj/Pro/NBd ≫ *Obj/PN/NBd ≫ *Obj/Def/NBd ≫ *Obj/Spec/NBd ≫ *Obj/NSpec/NBd

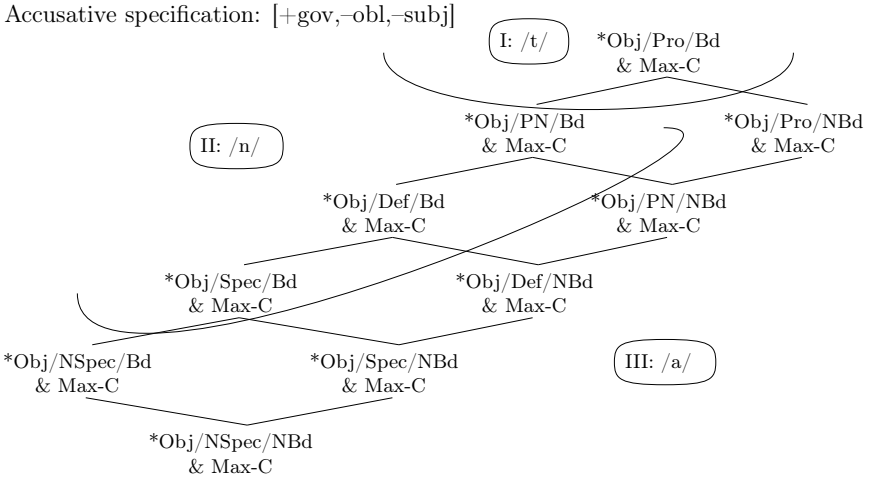
(268) *Order-preserving local conjunction with* MAX-CASE *(formerly *Ø$_C$)*:
- a. *Obj/Pro/Bd & Max-C ≫ *Obj/PN/Bd & Max-C ≫ *Obj/Def/Bd & Max-C ≫ *Obj/Spec/Bd & Max-C ≫ *Obj/NSpec/Bd & Max-C
- b. *Obj/Pro/NBd & Max-C ≫ *Obj/PN/NBd & Max-C ≫ *Obj/Def/NBd & Max-C ≫ *Obj/Spec/NBd & Max-C ≫ *Obj/NSpec/NBd & Max-C

Note:
(i) *Obj/Pro/Bd & Max-C is violated if a case feature of a VP-internal pronoun in a clause with a bounded interpretation of the predicate is deleted post-syntactically (before morphological realization).
(ii) *Obj/NSpec/NBd & Max-C is violated if a case feature of a VP-internal indefinite nonspecific NP in a clause with an unbounded interpretation of the predicate is deleted post-syntactically (before morphological realization).
(iii) Constraints of this type are *gradient* – multiple violations add up.

(269) *Conflicting constraints that trigger case feature deletion* (versions of *STRUC$_C$):
- a. *[–obl]
- b. *[+gov]
- c. *[–subj]

(270) *Ranking*:
- a. I: *Obj/Pro/Bd & Max-C ≫
- b. *[–obl] ≫
- c. II: *Obj/PN/Bd & Max-C ≫ *Obj/Def/Bd & Max-C ≫ Obj/Spec/Bd & Max-C ≫
- d. *[+gov] ≫
- e. III: *Obj/NSpec/Bd & Max-C, { *Obj/Pro/NBd & Max-C ≫ *Obj/PN/NBd & Max-C ≫ *Obj/Def/NBd & Max-C ≫ *Obj/Spec/NBd & Max-C } ≫ *Obj/NSpec/NBd & Max-C
- f. *[–subj]

(271) *The overall picture*:



(272) *Impoverishment effects with object case derived*:

a. [–obl] → Ø/__[¬(Pro,Bd)]
b. [+gov] → Ø/__[Nbd∨(NSpec,Bd)]

Note:
(272) reveals that, in a canonical impoverishment approach (that does not rely on optimization), it would be difficult to characterize the relevant environments as *natural classes* – negation and disjunction are needed (at least this holds as long one does not postulate a more fine-grained feature structure underlying the various categories).

(273) *Vocabulary items*:

a. /t/ ↔ [+gov,–obl,–subj]
b. /n/ ↔ [+gov]
c. /a/ ↔ [–subj]
d. /Ø/ ↔ [ ]

Note:
(i) Assuming that the genitive is defined as [+gov,+obl,+subj], /n/ cannot be characterized by [+gov,–subj] (because then the syncretism cannot be captured).
(ii) Under this assumption, a partial hierarchy of features [+gov] > [–subj] must then be assumed to ensure the correct choice of exponent in II contexts.

(274) *Sample optimizations 1*: /t/

Input: Type I [+gov,–obl,–subj],[Pro],[Bd]	I	*[–obl]	II	*[+gov]	III	*[–subj]
☞ O_1: [+gov,–obl,–subj]		*		*		*
O_2: [+gov,–obl]	*!	*		*		
O_3: [+gov,–subj]	*!			*		*
O_4: [–obl,–subj]	*!	*				*
O_5: [+gov]	*!*			*		
O_6: [–obl]	*!*	*				
O_7: [–subj]	*!*					*
O_8: [ ]	*!**					

Consequence:
Output O_1: [+gov,–obl,–subj] is optimal; there is no impoverishment. Therefore, /t/ is the most specific vocabulary item that fits, and it is inserted.

(275) *Sample optimizations 2*: /n/

Input: Type II [+gov,–obl,–subj],[Def],[Bd]	I	*[–obl]	II	*[+gov]	III	*[–subj]
O_1: [+gov,–obl,–subj]		*!		*		*
O_2: [+gov,–obl]		*!	*	*		
☞ O_3: [+gov,–subj]			*	*		*
O_4: [–obl,–subj]		*!	*			*
O_5: [+gov]			**!	*		
O_6: [–obl]		*!	**			
O_7: [–subj]			**!			*
O_8: [ ]			**!*			

Consequence:
Output O_3: [+gov,–subj] is optimal; there is impoverishment (post-syntactic deletion of [–obl]) Therefore, /t/ cannot be inserted anymore (because of the Subset Principle), and there is a (minimal) retreat to the more general case: The next-specific marker /n/ is inserted.

(276) *Sample optimizations 3*: /a/

Input: Type III [+gov,–obl,–subj],[Nspec],[Nbd]	I	*[–obl]	II	*[+gov]	III	*[–subj]
O_1: [+gov,–obl,–subj]		*!		*		*
O_2: [+gov,–obl]		*!		*	*	
O_3: [+gov,–subj]				*!	*	*
O_4: [–obl,–subj]		*!			*	*
O_5: [+gov]				*!	**	
O_6: [–obl]		*!			**	
☞ O_7: [–subj]					**	*
O_8: [ ]					***!	

Consequence:
Output O_7: [–subj] is optimal; impoverishment deletes [+gov] and [-obl], but no more than

that. Therefore, /a/ is the most specific marker that fits (blocking /Ø/).

Note:
Zero exponence results from massive impoverishment (a deletion of all case features). Simplifying a bit, it shows up when there is no overt subject argument present (e.g., in imperatives). Again, this would seem to suggest a clear functional motivation. There are two analytic possibilites; the first one is adopted here for the sake of simplicity. (Both solutions presuppose that whether a subject argument is overtly present or not can be read off syntactic structures, before post-syntacatic morphology takes place.)
(i) Objects do not participate in harmonic alignment in the first place when they are not accompanied by an overt subject. Hence, sole objects do not obey any of the constraints in I-III, and the *[case] constraints demand full deletion of case features.
(ii) Sole objects participate in harmonic alignment and thus fall under I-III. However, there is an undominated constraint that demands deletion of case features in object positions when no (relevant) subject is present.

(277) *Sample optimizations 4: /Ø/*

Input: Type IV [+gov,–obl,–subj], [no subject]	I	*[–obl]	II	*[+gov]	III	*[–subj]
O_1: [+gov,–obl,–subj]		*!		*		*
O_2: [+gov,–obl]		*!		*		
O_3: [+gov,–subj]				*!		*
O_4: [–obl,–subj]		*!				*
O_5: [+gov]				*!		
O_6: [–obl]		*!				
O_7: [–subj]						*!
☞ O_8: [ ]						

Consequence:
Output O_8: [ ] is optimal; impoverishment deletes all case features. Therefore, /Ø/ is the only remaining marker that fits – a full retreat to the general case.

Final remark:
The system reveals iconicity, as argued by Wiese (1999) for German: /t/ is less sonorous than /n/, which is less sonorous than /a/ (assuming the initial *t* that shows up with *a* in certain morpho-phonologically defined contexts to be truly epenthetic, and irrelevant to the abstract system as such); /Ø/ is least marked. This corresponds to the exponents' degree of specificity.

42.7.3. Yet Another Case Study: Differential Encoding of Objects in Cavineña

Ref.: Guillaume (2008, 569ff., 603f.) (Bolivia, Tacanan family, <1,200 speakers)

42.7.3.1 The Phenomenon Observation:

Two dative/genitive markers can appear: *-kwe* and *-ja*. The choice depends on person and number features of the stem—*-kwe* can only be attached to local persons (i. e., first or second person) in the singular. All other combinations select *-ja*.
This constitutes a case of differential object marking since singular first or second person objects are highly marked. All other combinations are marked less in terms of Hale/Silverstein scales. We argue that it is not a coincidence that for such highly marked objects a phonologically more complex case exponent is chosen. Phonological complexity of markers and hierarchical markedness are again correlated.

(278) *Distribution of markers*:

Person	SG	DL	PL
1	e-Ø-**kwe**	ya-tse-**ja**	e-kwana-**ja**
2	mi-Ø-**kwe**	me-tse-**ja**	mi-kwana-**ja**
3	tu-Ø-**ja**	ta-tse-**ja**	tu-na-**ja**
3PROX	riya-Ø-**ja**	re-tse-**ja**	re-na-**ja**

(279) *Dative/genitive markers in Cavineña*:

a. E-**kwe** ani-kware [maletero ari-da$_{CC}$=ke$_{RC}$]$_S$
1SG-DAT sit-REM.PAST bag big-ASF=LIG
'I had a big bag (lit. a big bag sat to me).' (Guillaume 2008: 567)

b. Sergio=**ja** ani-ya [ata Ramón bakani]$_S$
Sergio=DAT sit-IMPFV relative Ramsón name
'Sergio had a relative called Ramón (lit. a relative called Ramón was sitting to Sergio).' (Guillaume 2008: 603)

c. Tume =tuna-**ja** =tu-ke =Ø$_A$ be-ti-wa budari$_O$
then =3PL-DAT =3SG-FM (=1SG.ERG) bring-GO.TEMP-PERF banana
'I will go and bring bananas for them.' (Guillaume 2008: 575)

(280) a. *Person scale*
Loc(al) (1/2) ≻ N(on)loc(al)
b. *Number scale*
Sg ≻ Non-sg
c. *GF scale*
Subj ≻ Obj

(281) *Ranking*:
a. *Obj/Loc/Sg & Max-C ≫ *Obj/Loc/Non-sg & Max-C
b. *Obj/Nloc/Sg & Max-C ≫*Obj/Nloc/Non-sg & Max-C

Note:
We assume that the dative consists of the subfeature in (282). The relevant markers *-kwe* and *-ja* are analysed as in (283). The phonological markedness of these exponents correlates with their morpho-syntactic markedness; they thus obey iconicity.

(282) DATIVE: [+obl, +obj]

(283) *Marker specification*
a. /-kwe/ ↔ [+obl, +obj]
b. /-ja/ ↔ [+obj]

42.7.3.2 Analysis A markedness constraint penalizing the presence of a case feature [+obl] is then inserted into the ranking (281), triggering case feature deletion for all but highly marked objects (i.e. those high on both the person and the number scale). After this case feature is deleted, insertion of *-kwe* is no longer possible. The system therefore falls back to

a more general marker (*-ja*).

(284) *Markedness constraint*
*[+obl]

(285) *Ranking*:

$$\text{*Obj/Loc/Sg \& Max-C} \gg \text{*[+obl]} \gg \left\{ \begin{array}{l} \text{*Obj/Loc/Non-sg \& Max-C} \\ \text{*Obj/Nloc/Sg \& Max-C} \\ \text{*Obj/Nloc/Non-sg \& Max-C} \end{array} \right\}$$

Note:
As in Finnish, an explicit statement of the context of the impoverishment rule would involve a disjunction: The case feature [+obl] has to be deleted if the object is *either* non-singular *or* non-local. Since these two contexts arguably do not form a natural class, two impoverishment rules are effectively needed in standard approaches. If, however, the context in which impoverishment applies is derived by local conjunction of scales, the case feature is deleted in all environments that are dominated by the markedness constraint *[+obl]. (285) shows that this comprises exactly the context that proved problematic for an approach employing explicit statements of contexts—i. e. if the object is either non-singular or non-local or both. The approach developed here is therefore preferable on conceptual grounds.
The Cavineña data clearly conform to what is expected from the point of view of Hale/Silverstein hierarchies|more marking for unexpected objects. These data are nevertheless surprising if scales can only lead to a total reduction in morphological marking.

42.8. Outlook and Conclusion

Outlook:
The same kind of analyses can be given for various other cases of scale-driven non-zero/non-zero alternations with structural cases:

- differential encoding of subjects and objects in Dyirbal (Carnie (2005), Haspelmath (2007), based on Dixon (1972; 1994))
- differential encoding of subjects and objects in Djapu (Legate (2008), Morphy (1983a))
- differential encoding of subjects in Kambera (Klamer (1998a;b), Georgi (2008))
- direct-inverse Marking (Blake (1994), Macaulay (2005))
- differential encoding of objects in Russian (Comrie (1978))
- differential encoding of objects in Proto-Indo-European (Filimonova (2005))

Consequences for the modelling of interfaces:

- Impoverishment rules are ultimately *functionally motivated* and implemented via harmonic alignment of scales.
- Optimality Theory emerges as a theory of the morphology-syntax interface, much as in Pesetsky (1998); syntax and morphology as such can be assumed to work without violable and ranked constraints.

43. Three-Way Systems

43.1. Background

(286)

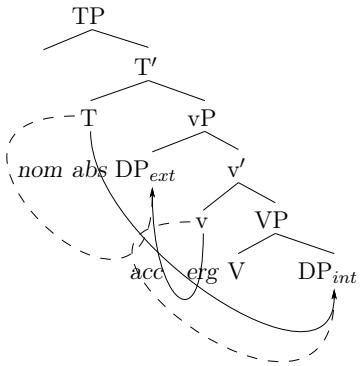
a. *Ergative system*		b. *Accusative system*		c. *Active system*	
DP_{ext}-V_i	DP_{int}-V_i	DP_{ext}-V_i	DP_{int}-V_i	DP_{ext}-V_i	DP_{int}-V_i
DP_{ext}-V_t	DP_{int}-V_t	DP_{ext}-V_t	DP_{int}-V_t	DP_{ext}-V_t	DP_{int}-V_t
erg	abs	nom	acc	erg/nom	abs/acc

A simple approach that will be adopted in what follows:
(i) ergative = accusative = structural case from v
(ii) nominative = absolutive = structural case from T
(Murasugi (1992), Jelinek (1993), Ura (2000; 2006), Müller (2009), Assmann et al. (2012))

An alternative:
(i) ergative = nominative = structural case from T
(ii) accusative = absolutive = structural case from v
(Levin & Massam (1985), Chomsky (1995, ch.3), Bobaljik (1993), Laka (1993), Rezac (2003), Bobaljik & Branigan (2006))

(In what follows, accusative encoding is represented by dashed lines, ergative encoding by full lines.)

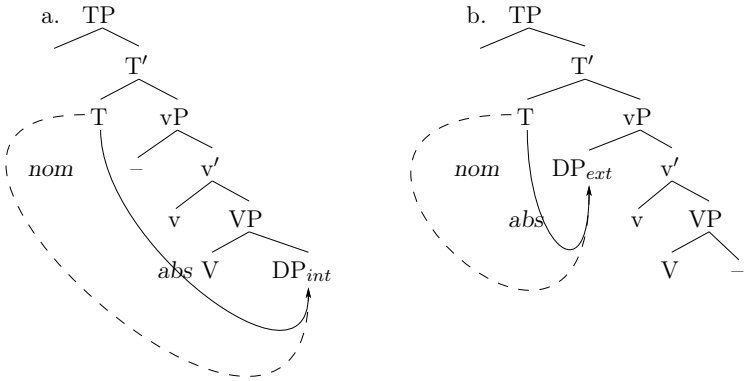
(287) *Transitive context*



Parameter:
The parameter distinguishing ergative and accusative systems exclusively concerns v: Both upward and downward case assignment must be possible in principle, but there is a preference for upward case assignment in ergative systems, and a preference for downward case assignment in accusative systems.

Note:
Ergative and accusative systems work in exactly the same way in intransitive contexts: Only T remains as a case-assigning head here. This corresponds directly to tendencies of morphological marking: The case associated with T is typically morphologically less marked than verbal case assigned by v.

(288) *Intransitive unaccusative and unergative contexts*



Active systems:

- Option (i): v can be the case-assinging head in unergative contexts.
- Option (ii): Unergative structures can be hidden transitives.

(289) *Three-way systems*:

DP$_{ext}$-V$_i$	DP$_{int}$-V$_i$
nom/abs	
DP$_{ext}$-V$_t$	DP$_{int}$-V$_t$
erg	acc

(290) *Three-way encoding in Antekerrepenhe (Central Australia)* (Bittner & Hale (1996a)):

a. Arengke-le aye-nhe ke-ke
dog-ERG me-ACC bite-PST
'The dog bit me.'

b. Apwerte-le athe arengke-nhe we-ke
stones-INS I-ERG dog-ACC pelt-PST
'I pelted the dog with stones.'

c. Arengke nterre-ke
dog-NOM run-PST
'The dog ran.'

Note:
Three-way systems are potentially problematic for the type of analysis sketched above, where two case assigners (T, v) are responsible for two structural cases and each of {erg, acc} is identified with exactly one case of the other system.

Observation:
Three-way systems are cross-linguistically rare. They qualify as *non-canonical* from a typological perspective (Corbett (2005); Corbett & Fedden (2014)).

Note:
This argues against approaches where structural case assignment in transitive contexts is *relational* (Marantz (1991), Bittner & Hale (1996b), Wunderlich (1997a; 2006), Kiparsky

(1999), Stiebels (2002), McFadden (2004), Schäfer (2012), Baker (2015)).

Proposal:
Three-way systems are regular (ergative or accusative) two-way systems in *syntax*; the phenomenon can and should be relocated to *morphology*.

Independent evidence: case as a syntactic category vs. case as a morphological marking

- One and the same morphological case exponent may correspond to two different syntactic cases; see Legate (2008) on zero marking, which may be morphological default marker or a syntactic nominative, depending on the language.
- One and the same syntactic case may correspond to two different morphological case exponents in a given language; see Keine & Müller (2011; 2014) on scale-based differential object marking as a morphological phenomenon (scale-driven allomorphy) .

Observation:
Three-way systems typically also involve scale effects (such that, e.g., only non-prototypical DP$_{int}$ arguments receive what looks like an accusative, or only non-prototypical DP$_{ext}$ arguments bear what looks like an ergative). The situation in Nez Perce: Accusative for DP$_{int}$ of V$_t$, ergative for DP$_{ext}$-3rd-person of V$_t$, and nominative for DP$_{int}$, DP$_{ext}$ of V$_i$, and for DP$_{ext}$-1st/2nd-person of V$_t$.

(291) *Three-way encoding in Nez Perce (Rude (1985), Woolford (1997))*:

a. Kaa wéet'u' núun-e ká'la hinéesqicxne
and not 1PL-ACC just 3NOM.PLDO.take.care.of.PERF
'And he just didn't take care of us.' (Rude (1985, 93))

b. 'Iceyéeye-nm xáxaasna hináaswapci'yawna
coyote-ERG grizzly-ACC 3NOM.PLDO.kill.PERF
'Coyote killed the grizzlies.' (Rude (1985, 88))

c. (i) Núun Ø-papáayna
we 1/2NOM-PL.NOM.arrive.PERF
'We arrived.'

(ii) núun 'epe'wíye
we 1/2TR.shoot.PERF
'We shot him.' (Rude (1985, 85))

Goal:
We extend the morphological approach to differential object marking in terms of scale-driven impoverishment developed in Keine & Müller (2011; 2014) (on the basis of Aissen (1999; 2003)) to three-way systems. Only one important new assumption is required: In addition to the standard prominence scales related to person, animacy, and definiteness (going back to Hale (1972) and Silverstein (1976)), there is also a *transitivity scale* which participates in harmonic alignment processes that eventually bring about post-syntactic impoverishment.

43.2. Theoretical assumptions

Background:
The reconstruction of the optimality-theoretic analysis developed in Aissen (2003) as a post-

syntactic impoverishment operation at the syntax/morphology interface in Keine & Müller (2014).

(292) *Feature decomposition of cases*

a. ergative/accusative: [+gov–obl] (assigned by v)
b. absolutive/nominative: [–gov,–obl] (assigned by T)

(293) *Scales*:

a. *Person scale*:
Local Pers. (1,2) > 3. Pers.
b. *Animacy scale*:
Hum(an) > Anim(ate) > Inan(imate)
c. *Definiteness scale*:
Pro(noun) > Name (PN) > Def(inite) > Indefinite Specific (Spec) > NonSpecific (NSpec)
d. *Transitivity scale:*
$v_{t(rans)} > v_{i(ntrans)}$

Note:
(293-abc) go back to Hale (1972), Silverstein (1976), and Aissen (2003). (293-d) is new. It presupposes that transitive and intransitive v can be distinguished, in both ergative and accusative languages. This is straightforward if v is uniformly the inactive head in intransitive contexts.

(294) *Harmonic Alignment* (Prince & Smolensky (2004)):
Suppose given a binary dimension D_1 with a scale X > Y on its elements {X,Y}, and another dimension D_2 with a scale a > b > ... > z on its elements {a,b,...,z}. The *harmonic alignment* of D_1 and D_2 is the pair of Harmony scales H_X, H_Y:

a. H_X: X/a ≻ X/b ≻ ... ≻ X/z
b. H_Y: Y/z ≻ ... ≻ Y/b ≻ Y/a

The *constraint alignment* is the pair of constraint hierarchies C_X, C_Y:

a. C_X: *X/z ≫ ... ≫ *X/b ≫ *X/a
b. C_Y: *Y/a ≫ *Y/b ≫ ... ≫ *Y/z

(295) *A binary scale: The DP case scale:*
$DP_{[+gov]} > DP_{[-gov]}$

(296) *Consequences of harmonic alignment*:

a. $*DP_{[+gov]}/v_i \gg *DP_{[+gov]}/v_t$
b. $*DP_{[-gov]}/v_t \gg *DP_{[-gov]}/v_i$

(297) *Local conjunction* (Smolensky (1995))
Local conjunction is a mechanism which conjoins two distinct constraints to form a new constraint. The new constraint is violated if both conjoined constraints are violated. Local conjuction of members of the two constraint hierarchies preserves order.

(298) *Further constraints*:

a. MAX(case):
Preserve case features.
b. *[–gov]:
Avoid the feature [–gov].

Note:
MAX(case) can be conjoined with a constraint hierarchy derived from harmonic alignment; *[–gov] cannot be conjoined with a constraint hierarchy. (This is exactly as in Aissen (2003), Keine & Müller (2014).)

(299) *Local conjunction*:
$*DP_{[-gov]}/v_t$ & MAX(case) ≫ $*DP_{[-gov]}/v_i$ & MAX(case)

Input sensitivity: $*DP_{[-gov]}/v_t$ & MAX(case) is violated by a post-syntactic (pre-vocabulary insertion) representation if there is a nominative/absolutive DP in a transitive clause that has its [–gov] feature deleted. Thus, it must be ensured that a case feature like [–gov] that is deleted (thereby violating MAX(case)) can still be accessed so as to determine the violation (i.e., [–gov] is needed to characterize the class of DPs that are subject to the constraint). *Assumption*: Constraints like $*DP_{[-gov]}/v_t$ & MAX(case) are not only output-sensitive, but also input-sensitive (Trommer (2006a)). Thus, [–gov] in "$*DP_{[-gov]}/v_t$" refers to the input (i.e., the syntactic representation where feature deletion is not yet an issue), whereas [–gov] in "MAX(case)" refers to the output (i.e., the post-syntactic representation in which feature deletion may or may not have applied).

(300) *A ranking that gives rise to selective feature deletion and differential marking*:
$*DP_{[-gov]}/v_t$ & MAX(case) ≫ *[–gov] ≫ $*DP_{[-gov]}/v_i$ & MAX(case)

Prediction:
The feature [–gov] will be preserved post-syntactically in transitive contexts but deleted in intransitive contexts. Subsequent vocabulary insertion can then lead to a [–gov]-marked exponent as a case marker for DP in transitive contexts, but given that vocabulary insertion obeys the Subset Principle (Halle & Marantz (1993), Halle (1997)), it will have to resort to an underspecified (typically zero) exponent not bearing [–gov] in intransitive contexts.

(301) *An impoverishment rule as an alternative*?
[–gov] → Ø / DP__[v_i]

No:

- (301) simply *stipulates* the context in which deletion takes place, (300) *derives* this context.
- (300) (again in contrast to (301)) predicts that there can be no language where deletion of [–gov] takes place in transitive but not in intransitive contexts.
- Three-way systems typically also involve (other) scale effects; so it remains to be shown how harmonic alignment and local conjunction with the other scales can be brought into the picture. It will turn out that the optimization approach captures these multi-dimensional scale effects in a fairly straightforward way whereas a standard, rule-based

impoverishment approach will face what look like insurmountable obstacles because the deletion contexts do not form natural classes.

Locality:
In order to evaluate a constraint like *$DP_{[-gov]}/v_t$ & MAX(case) or *$DP_{[-gov]}/v_i$ & MAX(case), both the properties of the DP (either DP_{ext} or DP_{int}) and the properties of v must be taken into account. This suggests that the local domain for constraint evaluation at the interface is the phase (see Chomsky (2001)), with feature deletion and vocabulary insertion applying cyclically.

43.3. Case studies

43.3.1. Kham

43.3.1.1 Data

(302) *Distribution of case markers in Kham (Tibeto-Burman)* (Watters (2002))

	1st	2nd	3rd, definite	3rd, indefinite
DP_{ext}-V_t	-∅	-∅	-e/-ye	-e/-ye
$DP_{ext/int}$-V_i	-∅	-∅	-∅	-∅
DP_{int}-V_t	-lai	-lai	-lai	-∅

Syntax:
Kham exhibits a standard ergative system in the syntax, with *-e/-ye* as the canonical ergative marker and *-lai* as the canonical absolutive marker.

Morphology:
The simple person-based split in ergative contexts, and the more complex transitivity-/definiteness-based split in absolutive contexts, are instances of allomorphic variation reducible to scale-driven optimization.

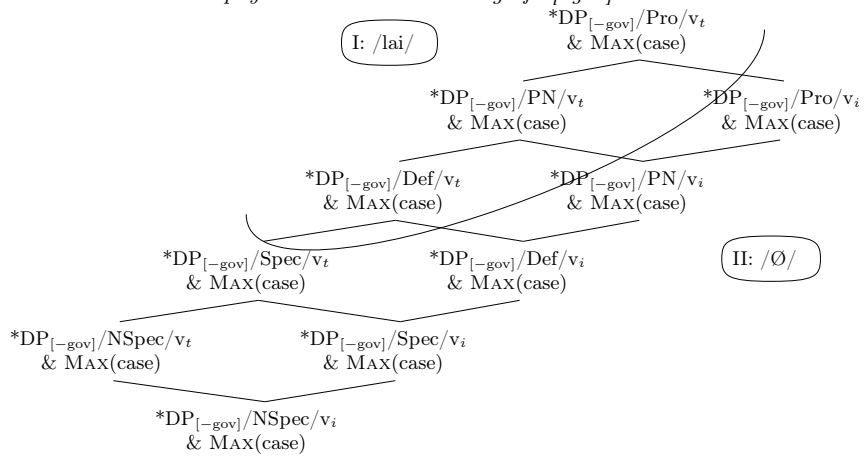
43.3.1.2 Absolutive marking

(303) *Harmonic alignment of case scale with transitivity and definiteness scales*:
a. *$DP_{[-gov]}/v_t$ ≫ *$DP_{[-gov]}/v_i$
b. *$DP_{[-gov]}$/Pro ≫ *$DP_{[-gov]}$/PN ≫ *$DP_{[-gov]}$/Def ≫ *$DP_{[-gov]}$/Spec ≫ *$DP_{[-gov]}$/NSpec

(304) *Two-dimensional local conjunction of both constraint alignments* (simplified notational variant):
a. *$DP_{[-gov]}/Pro/v_t$ ≫ *$DP_{[-gov]}/PN/v_t$ ≫ *$DP_{[-gov]}/Def/v_t$ ≫ *$DP_{[-gov]}/Spec/v_t$ ≫ *$DP_{[-gov]}/NSpec/v_t$
b. *$DP_{[-gov]}/Pro/v_i$ ≫ *$DP_{[-gov]}/PN/v_i$ ≫ *$DP_{[-gov]}/Def/v_i$ ≫ *$DP_{[-gov]}/Spec/v_i$ ≫ *$DP_{[-gov]}/NSpec/v_i$
c. *$DP_{[-gov]}/Pro/v_t$ ≫ *$DP_{[-gov]}/Pro/v_i$
d. *$DP_{[-gov]}/PN/v_t$ ≫ *$DP_{[-gov]}/PN/v_i$
e. *$DP_{[-gov]}/Def/v_t$ ≫ *$DP_{[-gov]}/Def/v_i$
f. *$DP_{[-gov]}/Spec/v_t$ ≫ *$DP_{[-gov]}/Spec/v_i$
g. *$DP_{[-gov]}/NSpec/v_t$ ≫ *$DP_{[-gov]}/NSpec/v_i$

Final step:
Order-preserving local conjunction of the hierarchies in (304) with MAX(case).

(305) *Absolutive allomorphy in Kham: Interleaving of *[–gov]*



Note:
All the constraints in (305) demand case feature preservation. At this point, the ranking of the conflicting constraint demanding case feature deletion becomes relevant: *[–gov] leads to zero-marking for DPs with the feature combinations identified by the constraints that are ranked below it. In Kham, this constraint must be ranked above *$DP_{[-gov]}/Spec/v_t$ & MAX(case) and *$DP_{[-gov]}/Pro/v_i$ & MAX(case), and below *$DP_{[-gov]}/Def/v_t$ & MAX(case) and *$DP_{[-gov]}/Pro/v_t$ & MAX(case), thereby separating the system in (305) into two discrete areas I and II. The absolutive case feature [–gov] is preserved in area I and removed in area II, which leads to the fully specified exponent /lai/ in I configurations and to the elsewhere exponent /∅/ in II configurations.

Scale-driven optimization vs. stipulated impoverishment rules:

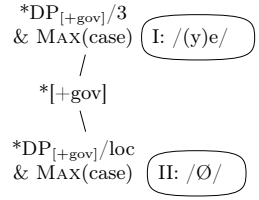
- One would have to postulate *two separate* impoverishment rules, as in (306), since the contexts in which [–gov] deletion takes place (viz., intransitive clause and indefinite interpretation of DP) cannot be referred to as a *natural class*.
- (306) would give rise to redundancies with indefinite (specific or non-specific) DPs in intransitive contexts.

(306) a. [–gov] → ∅ / DP__[v_i]
b. [–gov] → ∅ / $DP_{[indef]}$__

43.3.1.3 Ergative marking

(307) *Harmonic alignment of case scale and person scale plus local conjunction with* MAX*(case)*:
*$DP_{[+gov]}$/3 & MAX(case) ≫ *$DP_{[+gov]}$/loc & MAX(case)

(308) *Ergative allomorphy in Kham: Interleaving of *[+gov]*



43.3.2. Djapu

43.3.2.1 Data

(309) *Distribution of case markers in Djapu (Pama-Nyungan)* (Morphy (1983b))

	Pron	+HU	−HU
DP_{ext}-V_t	-∅	-DHu	-DHu
$DP_{ext/int}$-V_i	-∅	-∅	-∅
DP_{int}-V_t	-NHA	-NHA	-∅

Syntax:
Djapu underlyingly exhibits an ergative system, with *-DHu* as the regular (i.e., most specific) ergative marker and *-NHA* as the regular absolutive marker.

Morphology:
Overt absolutive marking is suspended in intransitive contexts and for non-human objects; overt ergative marking does not show up on pronominal transitive subjects.

43.3.2.2 Absolutive marking The relevant scales determining the distribution of morphological case exponents are the transitivity scale and the animacy scale. Both are harmonically aligned with the basic case scale, yielding (310-a) and (310-b) for absolutive contexts.

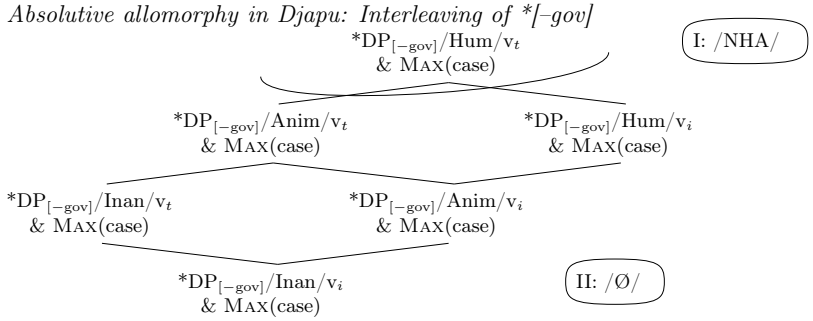
(310) *Harmonic alignment of case scale with transitivity and animacy scales*:
a. $*DP_{[-gov]}/v_t \gg *DP_{[-gov]}/v_i$
b. $*DP_{[-gov]}/Hum \gg *DP_{[-gov]}/Anim \gg *DP_{[-gov]}/Inan$

Local conjunction among the members of these constraint hierarchies with fixed internal order produces the strict rankings in (311).

(311) *Two-dimensional local conjunction of both constraint alignments*:
a. $*DP_{[-gov]}/Hum/v_t \gg *DP_{[-gov]}/Anim/v_t \gg *DP_{[-gov]}/Inan/v_t$
b. $*DP_{[-gov]}/Hum/v_i \gg *DP_{[-gov]}/Anim/v_i \gg *DP_{[-gov]}/Inan/v_i$
c. $*DP_{[-gov]}/Hum/v_t \gg *DP_{[-gov]}/Hum/v_i$
d. $*DP_{[-gov]}/Anim/v_t \gg *DP_{[-gov]}/Anim/v_i$
e. $*DP_{[-gov]}/Inan/v_t \gg *DP_{[-gov]}/Inan/v_i$

Finally, order-preserving local conjunction with MAX(case) gives rise to the two-dimensional system in (312).

(312) *Absolutive allomorphy in Djapu: Interleaving of *[–gov]*



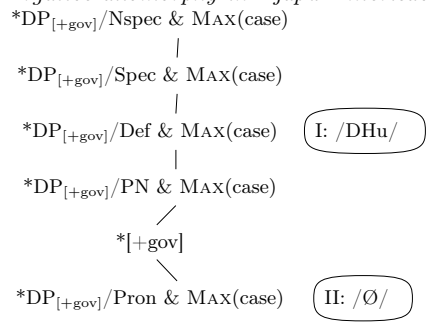
Note:
Again, and impoverishment rule would fail because it cannot refer to the deletion contexts as a natural class.

43.3.2.3 Ergative marking

(313) *Harmonic alignment of case scale and definiteness scale*:
$*DP_{[+gov]}/Nspec \gg *DP_{[+gov]}/Spec \gg *DP_{[+gov]}/Def \gg *DP_{[+gov]}/PN \gg *DP_{[+gov]}/Pron$

Local conjunction with MAX(case) and interleaving of *[+gov] between $*DP_{[+gov]}$/PN & MAX(case) and $*DP_{[+gov]}$/Pron & MAX(case) yields a distribution of the overt ergative exponent /DHu/ that involves all DP_{ext} arguments of transitive contexts except for pronouns.

(314) *Ergative allomorphy in Djapu: Interleaving of *[+gov]*:



43.3.3. Nez Perce

43.3.3.1 Data

(315) *Distribution of case markers in Nez Perce* (Rude (1985))

	1/2 pronouns	3 pronouns	proper names	common nouns
DP_{ext}-V_t	-∅	-(n(i))m	-(n(i))m	-(n(i))m
$DP_{ext/int}$-V_i	-∅	-∅	-∅	-∅
DP_{int}-V_t	-ne	-ne	-ne	-ne

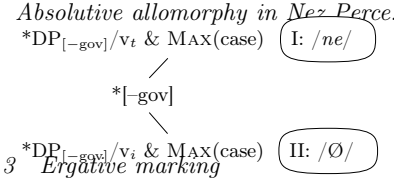
Syntax:
The pattern instantiates a canonical ergative system.

Morphology:
Scale-driven allomorphy affects both ergative and absolutive contexts.

43.3.3.2 Absolutive marking

(316) *Harmonic alignment of case scale and transitivity scale*: *$\text{DP}_{[-\text{gov}]}/\text{v}_t$ & Max(case) ≫ *$\text{DP}_{[-\text{gov}]}/\text{v}_i$ & Max(case)

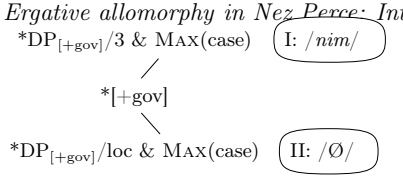
(317) *Absolutive allomorphy in Nez Perce: Interleaving of *[–gov]*:



43.3.3.3 Ergative marking

(318) *Harmonic alignment of case scale and person scale*: *$\text{DP}_{[+\text{gov}]}$/3 & Max(case) ≫ *$\text{DP}_{[+\text{gov}]}$/loc & Max(case)

(319) *Ergative allomorphy in Nez Perce: Interleaving of *[+gov]*:



43.3.4. Dyirbal

43.3.4.1 Data

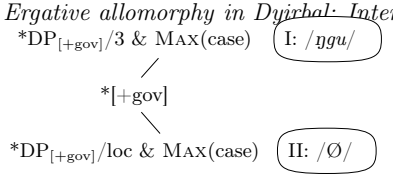
(320) *Distribution of Case markers in Dyirbal* (Dixon (1972; 1994)))

	1st/2nd pronouns	3rd pronouns	proper names	common nouns
DP_{ext}-V_t	-∅	-ŋgu	-ŋgu	ŋgu
$\text{DP}_{ext/int}$-V_i	-∅	-∅	-∅	-∅
DP_{int}-V_t	-na	-∅	-∅	-∅

43.3.4.2 Ergative marking

(321) *Harmonic alignment of case scale and person scale*: *$\text{DP}_{[+\text{gov}]}$/3 & Max(case) ≫ *$\text{DP}_{[+\text{gov}]}$/loc & Max(case)

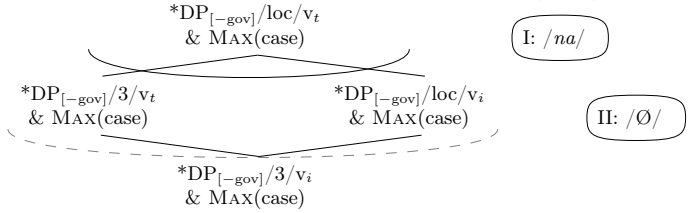
(322) *Ergative allomorphy in Dyirbal: Interleaving of [*gov]*:



Note:
This accusative system is thus completely identical to the system of ergative allomorphy in Nez Perce.

43.3.4.3 Absolutive marking Observation:
The basic case scale is harmonically aligned with both the transitivity scale and the person scale, and subsequently, local conjunction with Max(case) applies to the two constraint hierarchies thus generated, yielding a multidimensional system

(323) *Absolutive allomorphy in Dyirbal: Interleaving of *[–gov]*



Note:
As before, no single impoverishment rule could capture this distribution of zero and non-zero absolutive markers since the contexts in which deletion takes place do not form a natural class.

43.3.5. Interim conclusion

- Three-way case systems can be reanalyzed as standard two-way (ergative or accusative) case systems, with all the marker variation derived by scale-driven optimization operations at the syntax/morphology interface.
- Given that case marker allomorphy based on person, animacy, and definiteness is independently known to occur, and given that these effects also show up in all the languages addressed here, the only additional assumption that is needed to capture all effects in a maximally simple way – viz., the postulation of a transitivity scale on a par with other Hale/Silverstein scales – seems well motivated.
- The crosslinguistic rarity of three-way systems can now be explained under the assumption that non-homogeneous post-syntactic case-feature deletion is inherently marked.
- The fact that putative three-way systems are typically accompanied by Hale/Silverstein scale effects, and that the fact that these effects, though subject to implicational generalizations, are not uniform across languages, together pose an enormous challenge for a syntactic approach recognizing three different cases; ambitious recent attempts notwithstanding (see in particular Deal (2014)) I would like to contend that it is hardly possible to come up with a comprehensive syntactic approach to the phenomenon that qualifies as both simple and elegant, and that covers both an individual language's pattern in detail, and captures cross-linguistic variation as well.

43.4. Syntactic evidence

Prediction:
The present morphology-based approach to three-way systems differs from syntactic approaches in that it reanalyzes what at first sight looks like an accusative DP (in Kham, Djapu, Nez Perce, and Dyirbal) as a non-zero-encoded absolutive DP. There should be independent

evidence for the status of the pertinent DPs as absolutive/nominative (i.e., [–gov,–obl], assigned by T). More generally, we expect to find evidence for a morphological approach in terms of case allomorphy based on identical syntactic behaviour of the non-zero-marked and zero-marked DPs; in the same way, different syntactic behaviour might provide counter-evidence against the proposal. Here I will discuss only one case (there are many more, cf. Müller & Thomas (2014)): topic chaining in Dyirbal.

(324) *Case matching in Dyirbal topic chaining constructions* (Dixon (1972; 1994)):
[$_{CP_1}$ ŋuma yabu-ŋgu bura-n] [$_{CP_2}$ *pro* banaga-n^{y}u]
father-ABS mother-ERG see-NONFUT pro-ABS return-NONFUT

'Mother saw father and he/*she returned.'

Observation ((325-b)):
(i) An absolutive argument in an intransitive second conjunct is coreferent with a *na*-marked object in a transitive first conjunct.
(ii) An absolutive argument in an intransitive second conjunct cannot be coferent with a zero-marked subject in a transitive first conjunct.
(iii) This shows that the *na*-marked object bears absolutive case, and that the zero-marked subject bears ergative case.

(325) *An argument for a standard ergative system* (Morgenroth & Salzmann (2013)):

a. [$_{CP_1}$ ŋana-Ø banaga-n^{y}u] [$_{CP_2}$ n^{y}urra-Ø pro bura-n]
we-ABS return-NONFUT you all-ERG pro-ABS see-NONFUT
'We returned and you all saw us.'

b. [$_{CP_1}$ n^{y}urra-Ø ŋana-na bura-n] [$_{CP_2}$ pro banaga-n^{y}u]
you all-ERG we-ABS see-NONFUT pro-ABS return-NONFUT
'You all saw us and we returned.'

VIII. Optimality Theory 1: Morphematic Approaches

A question:
How can instances of syncretism be derived in optimality theory?

Note:
The approaches presented in this section all rely on underspecification and incorporate the compatibility/specificity requirements of standard underspecification approaches. In addition, however, they envisage the possible interference by other constraints (of diverse provenance), thereby introducing more flexibility.

44. Background: Syncretism by Underspecification

P_{12}: Determiner inflection in German

dies	M.SG	N.SG	F.SG	PL
NOM	er	es	e	e
ACC	en	es	e	e
DAT	em	em	er	en
GEN	es	es	er	er

Syncretism:
There are only five different exponents for 16 (or, in fact, 24) paradigm cells.

Standard approach (Jakobson (1962a;b), Bierwisch (1967)):

1. Morpho-syntactic features are *decomposed* into combinations of more primitive features
2. Common primitive features define *natural classes* of instantiations of grammatical categories (case, number, person, tense, gender, etc.)
3. *Underspecification* of exponents with respect to these features makes reference to natural classes possible and thereby derives instances of syncretism.

Note:
Underspecification of exponents gives rise to competition (more than one exponent fits). Competition can be resolved by something like the *Subset Principle* (aka Specificity Condition, Elsewhere Principle, Blocking Principle, Panini's Principle, Proper Inclusion Principle, etc. (Kiparsky (1973), Di Sciullo & Williams (1987), Fanselow (1991), Anderson (1992), Lumsden (1992), Noyer (1992), Williams (1994), Halle (1997), Williams (1997), Wiese (1999), Stump (2001)). Here, I adopt the Distributed Morphology version.

(326) *Subset Principle*
A vocabulary item *V* is inserted into a functional morpheme *M* iff (i) and (ii) hold:
(i) The morpho-syntactic features of *V* are a subset of the morpho-syntactic features of *M*.
(ii) *V* is the most specific vocabulary item that satisfies (i).

(327) *Specificity of vocabulary items*
A vocabulary item V_i is more specific than a vocabulary item V_j iff there is a class of features $\mathbb{F}$ such that (i) and (ii) hold.
(i) V_i bears more features belonging to $\mathbb{F}$ than V_j does.
(ii) There is no higher-ranked class of features $\mathbb{F}'$ such that V_i and V_j have a different number of features in $\mathbb{F}'$.

Case Study: Determiner Inflection in German
Underspecification analyses (see Bierwisch (1967), Blevins (1995), Wunderlich (1997b), Wiese (1999), Trommer (2005b)). The illustration here follows Wiese (1999).

(328) *Feature Decomposition* (Bierwisch (1967), Wiese (1999)):

Case		*Gender/Number*	
NOM:	[–obl,–gov]	MASC:	[+masc,–fem]
ACC:	[–obl,+gov]	FEM:	[–masc,+fem]
DAT:	[+obl,+gov]	NEUT:	[+masc,+fem]
GEN:	[+obl,–gov]	PL:	[–masc,–fem]

(329) *Underspecified Exponents*:

a.	[+masc,+obl,+gov] ↔ /m/[1]	(dat.masc.sg./neut.sg.)
b.	[+masc,+obl] ↔ /s/[2]	(gen.masc.sg./neut.sg.)
c.	[+masc,+fem] ↔ /s/[3]	(nom./acc.neut.sg.)
d.	[+masc,+gov] ↔ /n/[4]	(acc.masc.sg.)
e.	[+masc] ↔ /r/[5]	(nom.masc.sg.)
f.	[+obl,+fem] ↔ /r/[6]	(dat./gen.fem.sg.)
g.	[+obl,+gov] ↔ /n/[7]	(dat.pl.)
h.	[+obl] ↔ /r/[8]	(gen.pl.)
i.	[ ] ↔ /e/[9]	(nom./acc.fem.sg./pl.)

(330) *Feature Hierarchy*:
[+masc] > [+obl] > [+fem] > [+gov].

P13: Competition of exponents

dies	Masc.Sg.	Neut.Sg.	Fem.Sg.	Pl.
Nom	r[5], e[9]	s[3], r[5], e[9]	e[9]	e[9]
Acc	n[4], r[5], e[9]	s[3], n[4], r[5], e[9]	e[9]	e[9]
Dat	m[1], s[2], n[4], r[5], n[7], r[8], e[9]	m[1], s[2], s[3], n[4], r[5], r[6], n[7], r[8], e[9]	r[6], n[7], r[8], e[9]	n[7], r[8], e[9]
Gen	s[2], r[5], r[8], e[9]	s[2], s[3], r[5], r[6], r[8], e[9]	r[6], r[8], e[9]	r[8], e[9]

- The analysis envisages 9 exponents, which leaves a few unresolved syncretisms (which Wiese then independently derives): 2 exponents /n/, 2 exponents /s/, 3 exponents /r/.
- Without further assumptions, it is difficult to derive more instances of syncretism; 8 exponents is the minimum in standard approaches.

45. A Naive Optimality-Theoretic Translation

(331) a. *Input*:
Fully specified sets of morpho-syntactic features (syntactic structures, paradigm cells, ...)
b. *Output*:
Optimal morphological exponents.

(332) *Gen*:
Gen brings about realization of sets of fully specified features by morphological exponents.

Note:
Compatibility and specificity are both derived by faithfulness constraints.

(333) *Constraints*:
a. IDENT-F:
Morpho-syntactic features of input and output cannot have different values.
b. MAX(MASC):
[masc] of the input is realized on the exponent in the output.
c. MAX(OBL):
[obl] of the input is realized on the exponent in the output.
d. MAX(FEM):
[fem] of the input is realized on the exponent in the output.
e. MAX(GOV):
[gov] of the input is realized on the exponent in the output.

(334) *Ranking*:
IDENT-F ≫ MAX(MASC) ≫ MAX(OBL) ≫ MAX(FEM) ≫ MAX(GOV)

(335) *Dative masculine singular contexts*:

I: [+masc,–fem,+obl,+gov]	ID-F	MAX(MASC)	MAX(OBL)	MAX(FEM)	MAX(GOV)
☞ [+masc,+obl,+gov] ↔ /m/[1]				*	
[+masc,+obl] ↔ /s/[2]				*	*!
[+masc,+fem] ↔ /s/[3]	*!		*		*
[+masc,+gov] ↔ /n/[4]			*!	*	
[+masc] ↔ /r/[5]			*!	*	*
[+obl,+fem] ↔ /r/[6]	*!	*			*
[+obl,+gov] ↔ /n/[7]		*!		*	
[+obl] ↔ /r/[8]		*!		*	*
[ ] ↔ /e/[9]		*!	*	*	*

Note:
An output that violates IDENT-F (i.e., compatibility) can never be optimal as long as there is an elsewhere marker in the system, which cannot violate IDENT-F by definition.

(336) *Nominative feminine singular contexts*:

I: [–masc,+fem,–obl,–gov]	ID-F	MAX(MASC)	MAX(OBL)	MAX(FEM)	MAX(GOV)
[+masc,+obl,+gov] ↔ /m/[1]	*!**			*	
[+masc,+obl] ↔ /s/[2]	*!*			*	*
[+masc,+fem] ↔ /s/[3]	*!		*		*
[+masc,+gov] ↔ /n/[4]	*!*		*	*	
[+masc] ↔ /r/[5]	*!		*	*	*
[+obl,+fem] ↔ /r/[6]	*!	*			*
[+obl,+gov] ↔ /n/[7]	*!*	*		*	
[+obl] ↔ /r/[8]	*!	*		*	*
☞ [ ] ↔ /e/[9]		*	*	*	*

(337) *Accusative neuter singular contexts*:

I: [+masc,+fem,–obl,+gov]	ID-F	MAX(MASC)	MAX(OBL)	MAX(FEM)	MAX(GOV)
[+masc,+obl,+gov] ↔ /m/[1]	*!			*	
[+masc,+obl] ↔ /s/[2]	*!			*	*
☞ [+masc,+fem] ↔ /s/[3]				*	*
[+masc,+gov] ↔ /n/[4]			*!	*	
[+masc] ↔ /r/[5]			*!	*	*
[+obl,+fem] ↔ /r/[6]	*!	*			*
[+obl,+gov] ↔ /n/[7]	*!	*		*	
[+obl] ↔ /r/[8]	*!	*		*	*
[ ] ↔ /e/[9]		*!	*	*	*

46. Optimal Clitics in Grimshaw (2001)

Background assumptions (see Grimshaw (2001)):

- The *input* is a complete morpho-syntactic feature specification.
- The *candidates* are the set of pronouns in a language.
- The optimal *output* is the clitic with the lexical representation that best matches the input specification.
- Candidates can be (and are often) *underspecified*.

P_{14}: Italian Clitics

	1.SG	2.SG	3.SG	1.PL	2.PL	3.PL
ACC	mi	ti	lo/la	ci	vi	li/le
DAT	mi	ti	gli/le	ci	vi	–
ACC-REF	mi	ti	si	ci	vi	si
DAT-REF	mi	ti	si	ci	vi	si

Evidently, there is a lot of syncretism that needs to be accounted for.

(338) *Fully specified and underspecified lexical entries*:

lo	[–R 3 sg masc acc]	him/it
la	[–R 3 sg fem acc]	her/it
li	[–R 3 pl masc acc]	them (masc)
le_1	[–R 3 pl fem acc]	them (fem)
gli	[–R 3 sg masc dat]	to him/it
le_2	[–R 3 sg fem dat]	to her/it
mi	[ℝ 1 sg 𝔾 ℂ]	(to) me(self)
ti	[ℝ 2 sg 𝔾 ℂ]	(to) you(self)
ci	[ℝ 1 pl 𝔾 ℂ]	(to) us(self)
vi	[ℝ 2 pl 𝔾 ℂ]	(to) you(self)
si	[+R ℙ ℕ 𝔾 ℂ]	(to) you(self)

Note:
"𝕏" means "no specification for X".

Competitions

T_4: First and second-person reflexive inputs

I: [+R 2 pl masc acc]	FAITH PERS	FAITH REFL	FAITH NUM	FAITH GEN	FAITH CASE
O_1: si ↔ [+R ℙ ℕ 𝔾 ℂ]	*!		*	*	*
☞ O_2: vi ↔ [ℝ 2 pl 𝔾 ℂ]		*		*	*
O_3: li ↔ [–R 3 pl masc acc]	*!	*			

T_5: Third-person reflexive inputs

I: [+R 3 pl masc acc]	FILL REFL	FAITH PERS	PARSE REFL	FAITH NUM	FAITH GEN	FAITH CASE
☞ O_1: si ↔ [+R ℙ ℕ 𝔾 ℂ]		*		*	*	*
O_2: vi ↔ [ℝ 2 pl 𝔾 ℂ]		*	*		*	*
O_3: li ↔ [–R 3 pl masc acc]	*!					

Note:
FAITHREFL must be split up into two separate constraints; otherwise O_3 would wrongly be predicted to be optimal.
Conclusion

- The approach looks a lot like a typical (e.g., Distributed Morphology) underspecification-based approach to syncretism.
- Input ∼ fully specified context of a functional head in DM.

Outputs ∼ (often) underspecified vocabulary items.

- The main difference: A more flexible way to resolve marker competition (as in Wunderlich (2004)).
- For concretenss, Specificity is decomposed into an ordered set of faithfulness constraints.

Problem:

- It is not clear to me where the underspecified exponents come from if they are not in the input. Does GEN insert them out of nowhere?
- The simplest assumption might be that underspecified exponents are also in the input, together with the complete morpho-syntactic specification.
- Conclusion: There is *underspecification in the input* in this approach.
- (Interestingly, in his concise reconstruction of Grimshaw's analysis, McCarthy (2002, 81) does not invoke underspecification. Here, syncretism is assumed to be derivable from neutralization of input differences in the feature system, but the analysis is not carried out in detail.)

47. An Alternative to Impoverishment: Don & Blom (2006)

Ref.: Don & Blom (2006)

Goal:
Don and Blom develop a more principled alternative to impoverishment rules (i.e., to stipulated underspecification of syntactic contexts before vocabulary insertion).

Assumptions:

- The output of syntax provides the input for morphological exponence, conceived of a realization of morpho-syntactic feature bundles.
- Morphological realization involves optimality-theoretic evaluation of all combinations of stems and affixes, where affixes are inherently associated with morpho-syntactic features, as in Distributed Morphology.
- Affixes that do not match the syntactic feature specifications are typically, but not necessarily filtered out as suboptimal: Their use involves faithfulness violations.
- Features like [past] and [plural] are privative.

(339) *Verb inflection in Dutch* (present tense)

present tense	noem ('call')	loop ('walk')	zijn ('be')
1.sg	noem	loop	ben
2.sg.	noem-t	loop-t	ben-t
3.sg.	noem-t	loop-t	is
1.pl.	noem-en	loop-en	zijn
2.pl.	noem-en	loop-en	zijn
3.pl.	noem-en	loop-en	zijn

(340) *Verb inflection in Dutch* (past tense)

past tense	noem ('call')	loop ('walk')	zijn ('be')
1.sg	noem-de	liep	was
2.sg	noem-de	liep	was
3.sg	noem-de	liep	was
1.pl.	noem-de-en	liep-en	war-en
2.pl.	noem-de-en	liep-en	war-en
3.pl.	noem-de-en	liep-en	war-en

Observation:
Person is neutralized in the plural.

(341) *Constraints*

a. *COMPLEX:
Avoid complex affixes.
b. MAX([PLURAL]):
Realize a [plural] feature in the input by a [plural] exponent in the output.
c. MAX([PAST]):
Realize a [past] feature in the input by a [past] exponent in the output.
d. MAX([αPERSON]): Realize an [αperson] feature in the input by an [αperson] exponent in the output.
e. *AF-TO-AF:
Do not add affixes to affixed stems.

(342) *Morphological exponents*:

a. /en/ ↔ [plur]
b. /t(de)/ ↔ [past]
c. /Ø/ ↔ [1]
d. /t/ ↔ [ ]
e. /st/ ↔ [plur,2] (hypothetical)
f. /ü/ ↔ [2] (hypothetical)

(343) *Ranking* in Dutch:
MAX([PLUR]), MAX([PAST]) ≫ *COMPLEX, *AF-TO-AF ≫ MAX([PERS])

T_6: Person neutralization in the plural (present tense)

I: noem-[plur,2]	MAX([PLUR])	MAX([PAST])	*COMPL	*AF-TO-AF	MAX([PERS])
☞O_1: noem-en					*
O_2: noem-st			*!		
O_3: noem	*!				
O_4: noem-t	*!				
O_5: noem-ü	*!				
O_6: noem-en-ü				*!	

T_7: Person neutralization in the past (singular)

I: noem-[2,past]	MAX([PLUR])	MAX([PAST])	*COMPL	*AF-TO-AF	MAX([PERS])
O_1: noem-en		*!			*
O_2: noem-st		*!	*		
O_3: noem		*!			*
☞O_4: noem-de					*
O_5: noem-ü		*!			
O_6: noem-de-ü		*!		*	

T_8: Person neutralization in the plural (past tense))

I: noem-[plur,2,past]	MAX([PLUR])	MAX([PAST])	*COMPL	*AF-TO-AF	MAX([PERS])
☞O_1: noem-de-en				*	*
O_2: noem-st	*!		*		
O_3: noem	*!	*			*
O_4: noem-de	*!				*
O_5: noem-ü	*!	*			
O_6: noem-de-ü	*!			*	
O_7: noem-de-en-ü				***	

48. Alternatives to Impoverishment and Referral: Wunderlich (2004)

Background:

- Minimalist Morphology (Wunderlich (1996; 1997c)) relies on underspecification and (something like) the Subset Principle (including the Specificity Condition): *Specificity*, *Compatibility*.
- In addition (Wunderlich (2004)), the approach has a technical means that is comparable in its effects to impoverishment (as in Distributed Morphology) and rules of referral (as in Paradigm Functional Morphology; Stump (2001)): The interaction of violable constraints in an optimality-theoretic system may lead to unfaithful output realization of features that are part of the input (MAX, DEP violations).

Case study:
Genitive/accusative syncretism with animate nouns in Russian (see Wunderlich (2004)).

(344) *Russian nouns with animacy split in forms that are used in accusative contexts*

	inanimates				animates		
	class 2	class 3	class 1	class 4	class 2	class 3	class 1
	fem. 'map'	fem. 'door'	masc. 'table'	neut. 'word'	fem. 'squirrel'	fem. 'mother'	masc. 'student'
N.sg.	kárt-a	dver'	stol	slov-o	bélk-a	mat'	studént
A.sg.	kárt-u	dver'	stol	slov-o	bélk-u	mat'	studént-a
G.sg.	kárt-y	dvér-i	stol-á	slov-á	bélk-i	máter-i	studént-a
N.pl.	kárt-y	dvér-i	stol-ý	slov-á	bélk-i	máter-i	studént-y
A.pl.	kárt-y	dvér-i	stol-ý	slov-á	bélok	máter-ej	studént-ov
G.pl.	kart	dver-éj	stol-óv	slov	bélok	máter-ej	studént-ov

Underspecification of Exponents

(345) *Case features*:

a. Nom = ( )
b. Acc = $(+\text{hr})_V$
c. Gen = $(+\text{hr})_N$

(346) *Exponents*

a.	/-y/, +pl	N.pl (class 1,2 & 3)
b.	/-a/, +pl/neuter	N.pl (class 4)
c.	/-u/, $(+\text{hr})_V$ / a]	A.sg (class 2)
d.	/-y/, $(+\text{hr})_N$ / a] ∨ PAL]	G.sg (class 2 & 3)
e.	/-a/, +hr / C] ∨ o]	A/G.sg (class 1 & 4)
f.	C], +pl,+hr / a] ∨ o]	A/G.pl (class 2 & 4)
g.	/-ej/, +pl,+hr / PAL]	A/G.pl (class 3)
h.	/-ov/, +pl,+hr	A/G.pl (class 1)

The System Without Optimality Theory

(347) *Lexical entries for some Russian case affixes*

	inanimates			animates		
	class 2	class 3	class 1	class 2	class 3	class 1
	'map'	'door'	'table'	'squirrel'	'mother'	'student'
N.sg.	a]	PAL]		a]	PAL]	
A.sg.	/-u/, $(+\text{hr})_V$			/-u/, $(+\text{hr})_V$		
G.sg.	/-y/, $(+\text{hr})_N$		/-a/, +hr	/-y/, $(+\text{hr})_N$		/-a/, +hr
N.pl.	/-y/, +pl			/-y/, +pl		
A.pl.						
G.pl.	C], +pl,+hr	/ej/, +pl,+hr	/ov/, +pl,+hr	C], +pl,+hr	/ej/, +pl,+hr	/ov/, +pl,+hr

Observation:
The interaction of the suffixes alone does not yet make the correct predictions in all cases.

Assumption:
In addition, the distribution of suffixes is regulated by a system of violable constraints in an optimality-theoretic approach.

(348) *Constraints*

a. *(+hr)/$_V$ inanim. Do not realize the feature [+hr] in accusative contexts of inanimate nouns.

b. Max(+hr). Realize the feature [+hr].

c. Ranking of the constraints:
*(+hr)/$_V$ inanim ≫ Max(+hr) ≫ *(+hr)/$_V$ anim

(349) *More constraints*

a. Max(+hr)/ –pl, a]

b. Specificity
Choose the affix with the more specific selectional information.

c. Compatibility
Do not insert a form in a context in which the categorial specifications are incompatible.

(350) *Ranking of the constraints*
Spec, Comp, Max(+hr)/–pl, a] ≫ *(+hr)/$_V$ –anim ≫ Max(+hr)

"Realize both accusative and genitive, unless inanimate nouns occur in accusative contexts, excluding class 2 nouns (ending in *-a*, where there exists the accusative morpheme /-u/)."
Competitions 1: Inanimate Nouns

(351) *Selection of optimal forms in an accusative singular context*

a. Inanimate class 2 nouns (a])

	Spec | Comp | Max(+hr)/ –pl, a]	*(+hr)/$_V$ –anim	Max(+hr)
karta	*!		*
kart-y	*!		
☞ kart-u			

b. Inanimate class 1 nouns (masc)

	Spec | Comp | Max(+hr)/ –pl, a]	*(+hr)/$_V$ –anim	Max(+hr)
☞ stol			*
stol-a		*!	
stol-y	*!		

Competitions 2: Animate Nouns

(352) a. Animate class 1 nouns (masc)

	Spec | Comp | Max(+hr)/ –pl, a]	*(+hr)/$_V$ –anim	Max(+hr)
student			*!
☞ student-a			
student-y	*!		

b. Animate class 3 nouns (Pal])

	Spec | Comp | Max(+hr)/ –pl, a]	*(+hr)/$_V$ –anim	Max(+hr)
☞ mat'			*
mater'-i	*!		

The Situation so Far

(353) *A/N and A/G syncretisms in Russian nouns*

A/N syncretism		A/G syncretism	
appears because	is blocked because	appears because	is blocked because
no affix is available (class 3)	an affix is available (class 2)	only underspecified affixes are available (class 1 and plural)	two specific affixes are available (class 2)
a higher-ranked constraint blocks the existing affix (class 1, class 4)	an even higher-ranked constraint forces the existing affix to appear (class 2)		only one specific genitive affix is available (class 3)

Note:
This analysis can be extended to the plural.

(354) *Selection of optimal forms in an accusative plural context*

a. Inanimate class 2 nouns (a])

	Spec | Comp | Max(+hr)/ –pl, a]	*(+hr)/$_V$ –anim	Max(+hr)
☞ kart-y			*
kart-ov	*!	*	
kart		*!	

b. Animate class 2 nouns (a])

	Spec | Comp | Max(+hr)/ –pl, a]	*(+hr)/$_V$ –anim	Max(+hr)
belk-i			*!
belk-ov	*!		
☞ belok			

Conclusion:

- Optimality Theory offers the possibility of a more fine-grained approach to effects that might otherwise be treated via impoverishment.
- Apart from that, Minimalist Morphology analyses of inflectional paradigms work in a way that is similar to non-optimality-theoretic approaches (underspecification, competition resolved by specificity).

49. Distributed Optimality: Trommer (2001; 2003; 2006a)

Distributed Optimality: Basic assumptions (Trommer (2001; 2003; 2006a)):

- Basically, a DM background is adopted: Insertion of vocabulary items into syntactic heads; vocabulary items are often underspecified.
- Insertion (realization) is subject to optimization.
- Inputs: fully specified syntactic structures; competing outputs: underspecified vocabulary items (or rather strings of vocabulary items).
- Faithfulness constraints demand realization of input features on vocabulary items; markedness constraints may block this.
- Markedness constraints can refer to input and output ("two-level markedness")

Conclusion:

- Again, the approach crucially relies on *underspecification*.

A case study: Ainu (Trommer (2003))

(355) *Subject and object agreement in Ainu*:
  a. eci-un-kore
     2-O1p-give
     "You (pl) give us"
  b. e-en-kore
     2sg-O1s-give
     "You (sg.) give me"

(356) *Participant reduction in 1→2 environments*:
  a. *ku-e ("I-you(sg)")
  b. *ku-eci ("I-you(pl)")
  c. *ci-e ("we-you(sg)")
  d. *ci-eci ("we-you(pl)")
  e. eci (for all these contexts)

(357) *Relativized Parse constraints schema*:
If A_1 ... A_n are distinct from B_1 ... B_n, and $A \geq B_i$ on a scale S_i ($1 \leq i \leq n$), then there is a constraints PARSE[Agr]$_{[A_1 \ldots A_n]/[B_1 \ldots B_n]}$.

(358) PARTICIPANT UNIQUENESS (PU):
For two adjacent [–3] agreement heads in the input, number should not be expressed in the output.

Competitions: See next page (or so).

1→2 contexts: participant reduction

I: [+nom+1+pl]$_1$, [+acc,+2+pl]$_2$	PRS(per)$_{[+2]/[+1]}$	L⇐[+nom]	L⇐[+2]	PRS(num)$_{[+1]/[+2]}$	PRS(num)$_{[+2+h]/[+1+l]}$	PU	PRS[F]
O_1: e:[+2−pl]$_2$ ci:[+1+nom+pl]$_1$		*!				**	**
O_2: eci:[+2]$_2$ ci:[+1+nom+pl]$_1$		*!				*	**
O_3: ci:[+1+nom+pl]$_1$ eci:[+2]$_2$			*!			*	**
O_4: ci:[+1+nom+pl]$_1$ e:[+2−pl]$_2$			*!			*	**
O_5: ci:[+1+nom+pl]$_1$	*!					*	**
☞O_6: eci:[+2]$_2$				*			**
O_7: e:[+2−pl]$_2$				*		*!	**

2→1 contexts: no participant reduction

I: [+nom+2−pl]$_1$, [+acc,+1−pl]$_2$	PRS(per)$_{[+2]/[+1]}$	L⇐[+nom]	L⇐[+2]	PRS(num)$_{[+1]/[+2]}$	PRS(num)$_{[+2+h]/[+1+l]}$	PU	PRS[F]
O_1: eci:[+2]$_1$ en:[+1+acc−pl]$_2$					*!	*	**
☞O_2: e:[+2−pl]$_1$ en:[+1+acc−pl]$_2$						**	*
O_3: en:[+1+acc−pl]$_1$ eci:[+2]$_2$			*!		*	*	**
O_4: en:[+1+acc−pl]$_1$ e:[+2−pl]$_2$			*!			**	*
O_5: en:[+1+acc−pl]$_1$	*!				*	*	***
O_6: eci:[+2]$_2$				*!	*		*****
O_7: e:[+2−pl]$_2$				*!		*	****

IX. Optimality Theory 2: A-Morphematic Approaches

50. Introduction

Claim:

1. Inferential theories like those developed in Anderson (1992), Aronoff (1994), Stump (2001), and Corbett & Fraser (1993) or Baerman et al. (2005) differ from lexical theories (like Distributed Morphology (Halle & Marantz (1993; 1994), Harley & Noyer (2003)) or Minimalist Morphology (Wunderlich (1996; 1997c; 2004)) in that inflectional exponents are not assumed to have morpheme status, or to exist as separate objects. Rather, exponents are introduced by rules of exponence. Cf. (Stump (2001)):

   (359) **[D2]** $RR_{D,\{TNS:pres,AGR:\{PER:1,NUM:sg\}\},[CONJ:-T,-C]}(<X,\sigma>) =_{def} <Xm',\sigma>$

2. However, even here inflectional exponents are correlated with morpho-syntactic feature specifications.

3. Therefore, inferential approaches are typically not as radically a-morphematic as is sometimes made out.

4. Accordingly, the gist of an inferential analysis can often be transferred to a lexical analysis without major changes (and vice versa), with most of the important differences being confined to suprasegmental exponents – e.g., umlaut –, or the technical means to override the effects of basic rules of exponence (in inferential approaches) or exponent entries (in lexical approaches) – e.g., rules of referral vs. impoverishment rules (which can produce similar effects, but are not necessarily equivalent).

5. A truly a-morphematic approach to inflectional morphology must give up the assumption that there is any inherent correlation between the form of an exponent and its function.

51. Müller (2002b)

Background:

- Legendre, Smolensky & Wilson (1998): "The functional lexicon is slave to the syntax."

- Aissen (1999; 2002), Müller (2002a): The need for case markers may arise in syntax, under a specific ranking of syntactic constraints. If it does, a case marker is called for; if it does not, the presence of a case marker is blocked (the case marker, by assumption, is not part of the syntactic input).

- Problems for morphematic approaches: What if a language has developed a full paradigm in the morphology that is always blocked in the syntax? What if a language requires case markers for syntactic reasons but the morphological component has simply failed to provide them?

(360) CASE:
The left edge of the minimal residue of an NP requires a case marker.

Assumption:
Case markers cannot be phonologically empty.
Determiner Inflection Again

P_{15}: Determiner inflection

dies	M.SG	N.SG	F.SG	PL
NOM	er	es	e	e
ACC	en	es	e	e
DAT	em	em	er	en
GEN	es	es	er	er

As in morphematic analyses, the approach relies on underspecification and feature decomposition.

(361) *Feature Decomposition*:

Case		*Gender/Number*	
NOM:	[–obl,–gov]	MASC:	[+masc,–fem]
ACC:	[–obl,+gov]	FEM:	[–masc,+fem]
DAT:	[+obl,+gov]	NEUT:	[+masc,+fem]
GEN:	[+obl,–gov]	PL:	[–masc,–fem]

Feature Co-Occurrence Restrictions

(362) *Markedness Constraints*

a. *VCM (Avoid Vocalic Case markers):
¬[–masc,–obl] → ¬Cm:[–consonantal,+sonorant]. (*/e/)

b. *DCCM (Avoid Dorsal Consonantal Case markers):
¬[+fem,–masc] ∧ [+gov] → ¬Cm:[+dorsal,+consonantal]. (*/R/)

c. *CORCM (Avoid Coronal Case markers):
[+masc,+obl,+gov] → ¬Cm:[+coronal] (*/n/, */s/)

d. *SONCM (Avoid Sonorant Case markers):
¬[+masc,–fem,–obl] ∧ ¬[–masc] → ¬Cm:[+sonorant].
(*/m/, */n/, */R/, */e/)

These constraints correlate natural classes of of exponents with natural classes of instantiations of grammatical categories.

- Natural classes of exponents are are captured by phonological features.
- Natural classes of instantiations of grammatical categories are captured by decomposed morpho-syntactic features.

Effects of the Markedness Constraints

P_2: *VCM: */e/*

	M.SG	N.SG	F.SG	PL
NOM	x	x		
ACC	x	x		
DAT	x	x	x	x
GEN	x	x	x	x

P_3: *DCCM: */R/*

	M.SG	N.SG	F.SG	PL
NOM				
ACC	x	x		x
DAT	x	x		x
GEN				

P_4: *CORCM: */n/, */s/*

	M.SG	N.SG	F.SG	PL
NOM				
ACC				
DAT	x	x		
GEN				

P_5: *SONCM: */m/, */n/, */R/, */e/*

	M.SG	N.SG	F.SG	PL
NOM		x		
ACC		x		
DAT	x	x		
GEN	x	x		

Sonority-driven Marker Selection

- The markedness constraints encoding feature co-occurrence restrictions take over the role of rules of *exponence*.
- A low-ranked Sonority Hierarchy replaces the Specificity (Blocking, Elsewhere, Panini) Principle as a means to resolve a *competition* of markers and yields sonority-driven marker selection.
- If the idea is given up that exponents pair phonological form and morpho-syntactic features, with only the form remaining, a selection principle for cases of marker competition can only be sensitive to aspects of *form*, not to aspects of *function*.

(363) *Inventory of declension markers in German*
{/s/, /m/, /n/, /r/, /e/}

(364) SONHIER (Sonority Hierarchy) (Prince & Smolensky (2004)):
*s ≫ *m ≫ *n ≫ *R ≫ *e

Competitions

T_{33}: dies-e

I: /dies/: NOM.F, ACC.F, NOM.PL, ACC.PL	Case	*Cor Cm	*Dc Cm	*V Cm	*Son Cm	SonHier *s	*m	*n	*r	*e
O_1: dies-es						*!				
O_2: dies-em							*!			
O_3: dies-en								*!		
O_4: dies-er			(*!)						*(!)	
☞ O_5: dies-e										*
O_6: dies	*!									

T_{34}: dies-er

I: /dies/: NOM.M, DAT.F, GEN.F, GEN.PL	Case	*Cor Cm	*Dc Cm	*V Cm	*Son Cm	SonHier *s	*m	*n	*r	*e
O_1: dies-es						*!				
O_2: dies-em							*!			
O_3: dies-en								*!		
☞ O_4: dies-er									*	
O_5: dies-e				*!						*
O_6: dies	*!									

T_{35}: dies-en

I: /dies/: ACC.M, DAT.PL	Case	*Cor Cm	*Dc Cm	*V Cm	*Son Cm	SonHier *s	*m	*n	*r	*e
O_1: dies-es						*!				
O_2: dies-em							*!			
☞ O_3: dies-en								*		
O_4: dies-er			*!						*	
O_5: dies-e				*!						*
O_6: dies	*!									

T_{36}: dies-em

I: /dies/: DAT.M, DAT.N	Case	*Cor Cm	*Dc Cm	*V Cm	*Son Cm	SonHier *s	*m	*n	*r	*e
O_1: dies-es		*!				*				
☞ O_2: dies-em					*		*			
O_3: dies-en		*!			*			*		
O_4: dies-er			*!		*				*	
O_5: dies-e				*!	*					*
O_6: dies	*!									

T_{37}: dies-es

I: /dies/: NOM.N, ACC.N, GEN.M, GEN.N	Case	*Cor Cm	*Dc Cm	*V Cm	*Son Cm	SonHier *s	*m	*n	*r	*e
☞ O_1: dies-es						*				
O_2: dies-em					*!		*			
O_3: dies-en					*!			*		
O_4: dies-er			(*!)		*(!)				*	
O_5: dies-e				*!	*					*
O_6: dies	*!									

52. Carstairs-McCarthy (2008)

Background Assumptions of Carstairs-McCarthy (2008)

Empirical domain: weak inflection (of adjectives and nouns) in German

- It is presupposed that the syntax defines contexts where weak inflection is needed. For these contexts, the morphological system generates the correct exponents.
- Wurzel's (1984) "System-Defining Structural Properties" can be encoded as ranked constraints in an optimality-theoretic grammar.
- There are three exponents in German weak declension (of adjectives and nouns):
  1. /Ø/ (the "Grundform")
  2. /e/ (minimal deviation from the Grundform, /e/ → ə)
  3. /en/
- "What morpho-syntactic features do [the exponents] express? My surprising answer is: none at all." "There is a sense in which neither of the suffixes *-e* or *-en* here expresses case or number; neither deserves to be traeted as possessing or realising a particular grammatical function.

Conclusion:
The ranked constraints (SDSPs) predict the distribution of the exponents; the exponents themselves do not have morpho-syntactic specifications associated with them.

Empirical Evidence: Weak Inflection in German

(365) *Paradigms of Weak Inflection of adjectives and nouns*

A			N		
masc	nom sg	/e/	masc	nom sg	/Ø/
	acc sg	/n/		acc sg	/n/
	dat sg	/n/		dat sg	/n/
	gen sg	/n/		gen sg	/n/
fem	nom sg	/e/	fem	nom sg	/Ø/
	acc sg	/e/		acc sg	/Ø/
	dat sg	/n/		dat sg	/Ø/
	gen sg	/n/		gen sg	/Ø/
neut	nom sg	/e/			
	acc sg	/e/			
	dat sg	/n/			
	gen sg	/n/			
pl	nom sg	/n/	pl	nom sg	/n/
	acc sg	/n/		acc sg	/n/
	dat sg	/n/		dat sg	/n/
	gen sg	/n/		gen sg	/n/

Constraints for Weak Inflection

(366) ATTR-ADJ≠GRF:
A weakly inflected attributive adjective does not show up in the Grundform (i.e., it is not /Ø/).

(367) NOUNFEMSG=GRF:
An inflected feminine noun has zero exponence (it shows up in the Grundform).

(368) MASCSGACC≠NOM:
The accusative singular form of a weak masculine noun cannot be identical to the nominative form.

(369) ACC=NOM:
Weak accusative forms are identical to weak nominative forms.

(370) NOMSG=GRF:
Nominative singular forms are Grundforms (i.e., they have zero exponence).

(371) NOUNADJINFL-*en*:
Weak forms of nouns and adjectives have the exponent /-en/.

(372) Ranking:
ATTR-ADJ≠GRF, NOUNFEMSG=GRF, MASCSGACC≠NOM ≫
ACC=NOM, NOMSG=GRF ≫
NOUNADJINFL-*en*

Competitions 1: Masc.Nom

- NOMSG=GRF is a gradient constraint: /e/ is better than /en/.
- A slightly more general version of NOUNADJINFL-*en* might be possible that requires

T_9: der kluge Mensch

I: /klug/: MASC.NOM.SG	ATTR-ADJ ≠GRF	NOUNFEMSG =GRF	MASCSGACC ≠NOM	ACC =NOM	NOMSG =GRF	NOUNADJ INFL-*en*
O_1: klug	*!					*
☞ O_2: klug-e					*	*
O_3: klug-en					**!	

T_{10}: der kluge Mensch

I: /Mensch/: MASC.NOM.SG	ATTR-ADJ ≠GRF	NOUNFEMSG =GRF	MASCSGACC ≠NOM	ACC =NOM	NOMSG =GRF	NOUNADJ INFL-*en*
☞ O_1: Mensch						*
O_2: Mensch-e					*!	*
O_3: Mensch-en					**!	

only consontal marking (with /n/ the sole, or the best, candidate).

- *Mensch-e* is not actually considered by Carstairs-McCarthy (2008). Either this candidate cannot be generated, or there is an undominated constraint that always blocks it. Otherwise, wrong predictions would arise for non-nominative contexts. In what follows, /e/ is ignored with nouns.

Competitions 2: Masc.Acc
T_{11}: den klugen Menschen

I: /klug/: MASC.ACC.SG	ATTR-ADJ ≠GRF	NOUNFEMSG =GRF	MASCSGACC ≠NOM	ACC =NOM	NOMSG =GRF	NOUNADJ INFL-*en*
O_1: klug	*!			*		*
O_2: klug-e			*!			*
☞ O_3: klug-en				*		

T_{12}: den klugen Menschen

I: /Mensch/: MASC.NOM.SG	ATTR-ADJ ≠GRF	NOUNFEMSG =GRF	MASCSGACC ≠NOM	ACC =NOM	NOMSG =GRF	NOUNADJ INFL-*en*
O_1: Mensch			*!			*
☞ O_3: Mensch-en				*		

- Some constraints are *trans-derivational*: To find out whether or not a constraint is violated (and how often), one has to look at other existing (i.e., optimal) forms.
- Thus, in order to find out whether an accusative candidate respects MASCSGACC≠NOM or ACC=NOM, one has to find out what the optimal nominative form is.
- Since nothing like this holds for the nominative, there is no danger of circularity.

- The interaction might perhaps best be implemented within the Optimal Paradigms model (McCarthy (2005)): Optimization affects all forms of a paradigm as a whole.
- On this view, Acc=Nom is an OP faithfulness constraint, and MascSgAcc≠Nom an OP anti-faithfulness constraint.

Competitions 3: Fem.Nom

T_{13}: die kluge Frau

I: /klug/: fem.nom.sg	Attr-Adj ≠Grf	NounFemSg =Grf	MascSgAcc ≠Nom	Acc =Nom	NomSg =Grf	NounAdj Infl-*en*
O_1: klug	*!					*
☞ O_2: klug-e					*	*
O_3: klug-en					**!	

T_{14}: die kluge Frau

I: /Frau/: fem.nom.sg	Attr-Adj ≠Grf	NounFemSg =Grf	MascSgAcc ≠Nom	Acc =Nom	NomSg =Grf	NounAdj Infl-*en*
☞ O_1: Frau						*
O_3: Frau-en		*!			**	

- Except for the additional NounFemSg=Grf violation in tableau T_{14}, which does not affect the outcome, everything is as before.

Competitions 4: Fem.Acc

T_{15}: die kluge Frau

I: /klug/: fem.acc.sg	Attr-Adj ≠Grf	NounFemSg =Grf	MascSgAcc ≠Nom	Acc =Nom	NomSg =Grf	NounAdj Infl-*en*
O_1: klug	*!			*		*
☞ O_2: klug-e						*
O_3: klug-en				*!		

T_{16}: die kluge Frau

I: /Frau/: fem.acc.sg	Attr-Adj ≠Grf	NounFemSg =Grf	MascSgAcc ≠Nom	Acc =Nom	NomSg =Grf	NounAdj Infl-*en*
☞ O_1: Frau						*
O_3: Frau-en		*!		*		

- The analysis also covers plural formation (with minimal extensions).

53. Non-Optimality-Theoretic Reconstruction

- Both a-morphematic analyses can be executed without explicit constraint ranking and constraint violability.
- There is no inherent relation between optimality theory and a-morphematic inflectional morphology.

Reanalysis of Müller's (2002b) Approach: Non-optimality-theoretic reanalysis: Müller (2003).

(373) *Feature Co-Occurrence Restrictions* (inviolable):

a. *VCm (Avoid Vocalic Case markers):
¬[–masc,–obl] → ¬Cm:[–consonantal,+sonorant]. (*/e/)

b. *DcCm (Avoid Dorsal Consonantal Case markers):
¬[+fem,–masc] ∧ [+gov] → ¬Cm:[+dorsal,+consonantal]. (*/ʀ/)

c. *CorCm (Avoid Coronal Case markers):
[+masc,+obl,+gov] → ¬Cm:[+coronal] (*/n/, */s/)

d. *SonCm (Avoid Sonorant Case markers):
¬[+masc,–fem,–obl] ∧ ¬[–masc] → ¬Cm:[+sonorant].
(*/m/, */n/, */ʀ/, */e/)

(374) *Sonority-driven Marker Selection* (SMS):
An exponent α is selected for a fully specified morpho-syntactic context Γ iff (a)-(c) hold:

a. α is part of the inventory that belongs to Γ's domain.
b. α is not blocked in Γ by a FCR.
c. There is no other marker β such that (i)-(iii) hold:
   (i) β satisfies (374-a).
   (ii) β satisfies (374-b).
   (iii) β is more sonorous than α.

Reanalysis of Carstairs-McCarthy's (2008) Approach

Basic assumption:

- SDSPs are reanalyzed as impoverishment rules.
- Impoverishment rules are often explicitly designed to capture system-wide generalizations (Noyer (1992; 1998), Bonet (1991), Halle & Marantz (1994), Frampton (2002), Bobaljik (2002a;b; 2003), Müller (2005), and many others).

(375) *Vocabulary items*:

a. /e/ ↔ number
b. /n/ ↔ case, number

- Given the Specificity condition incorporated into the Subset Principle, /n/ is preferred to /e/ in contexts where it fits (i.e., in a sense it "emerges as the unmarked"), and /e/ is preferred to zero exponence.

- The analysis is thus not fully a-morphematic, but almost (the specifications in (375) are trivial).

(376) *Impoverishment rules*:

a. Feminine nouns in the singular show the Grundform:
[case, number] → Ø/[fem,+N]

b. Masculine nouns in the singular have no overt nominative marker:
[case, number] → Ø/[masc,nom,+N]

c. Singular adjectives have (generally) no consonantal marker in non-oblique contexts:
[case] → Ø/[–obl,–pl,+A] (as long as MascAccCase≠Ø is respected).

(377) *Vocabulary insertion into impoverishment syntactic contexts*

A			N		
masc	~~nom~~ sg	/e/	masc	~~nom sg~~	/Ø/
	acc sg	/n/		acc sg	/n/
	dat sg	/n/		dat sg	/n/
	gen sg	/n/		gen sg	/n/
fem	~~nom~~ sg	/e/	fem	~~nom sg~~	/Ø/
	~~acc~~ sg	/e/		~~acc sg~~	/Ø/
	dat sg	/n/		~~dat sg~~	/Ø/
	gen sg	/n/		~~gen sg~~	/Ø/
neut	~~nom~~ sg	/e/			
	~~acc~~ sg	/e/			
	dat sg	/n/			
	gen sg	/n/			
pl	nom sg	/n/	pl	nom sg	/n/
	acc sg	/n/		acc sg	/n/
	dat sg	/n/		dat sg	/n/
	gen sg	/n/		gen sg	/n/

X. Optimality Theory 3: Leading Forms

General idea:
Some member of a paradigm may act as a "leading form" in the sense that it determines properties of another member of the paradigm.

54. Wurzel on Leading Forms

Ref.: Wurzel (1984; 1987; 1990; 1998)

Wurzels Annahme:
Es gibt in komplexen Flexionsparadigmen sog. *Kennformen* (engl. *leading forms*).

- Kennformen sind gegenüber anderen Wortformen eines Paradigmas privilegiert.
- Kennformen signalisieren (relativ) eindeutig die Zugehörigkeit zu Flexionsklassen.
- Wenn man eine (oder mehrere) Kennformen kennt, kann man dan Rest des Formenbestand des Paradigmas erschließen, mit Hilfe von *Paradigmenstrukturbedingungen*.
- Kennformen sind also im Lexikon gespeichert; alle anderen Formen können durch Regeln abgeleitet werden. Die Endung der Kennform wirkt als *Flexionsklassenmerkmal*.
- Kennformen können, müssen aber *nicht* per se *Nominativformen* (und auch nicht Singularformen) sein.

Vgl. auch Carstairs-McCarthy (1994), Blevins (2004).

(378) *Starke feminine Flexionsklassen im Isländischen*

	Fa *vél* ('Maschine')	Fa′ *drottning* ('Königin')	Fi *mynd* ('Bild')	Fc1 *geit* ('Ziege')	Fc2 *vík* ('Bucht')
nom sg	vél-Ø	drottning-Ø	mynd-Ø	geit-Ø	vík-Ø
acc sg	vél-Ø	drottning-u	mynd-Ø	geit-Ø	vík-Ø
dat sg	vél-Ø	drottning-u	mynd-Ø	geit-Ø	vík-Ø
gen sg	vél-ar	drottning-ar	mynd-ar	geit-ar	vík-ur
nom pl	vél-ar	drottning-ar	mynd-ir	geit-ur	vík-ur
acc pl	vél-ar	drottning-ar	mynd-ir	geit-ur	vík-ur
dat pl	vél-um	drottning-um	mynd-um	geit-um	vík-um
gen pl	vél-a	drottning-a	mynd-a	geit-a	vík-a

Was sind die Kennformen?

Die Kennformen sind (v.a.) Nominativ- und Akkusativ-Plural-Formen, in einem Fall auch Genitiv-Singular-Formen.
Analyse der starken femininen Deklinationen bei Wurzel
Generalisierungen:

- Fi braucht keine lexikalische Spezifikation (kein Flexionsklassenmerkmal).
- Fa braucht /ar/ für Nom./Akk.Pl. als lexikalische Spezifikation.
- Fc1 braucht /ur/ für Nom./Akk.Pl. als lexikalische Spezifikation.
- Fc2 braucht /ur/ für Gen.Sg. als lexikalische Spezifikation (d.h., die Genitiv-Singularform ist die Kennform der Flexionsklasse).

(379) *Paradigmenstrukturbedingungen*

a. (i) [+subst] → [*um*/Dat.Pl.]
(ii) [+subst,-K-V] → [*a*/Gen.Pl.]
(iii) [+subst,+fem,#σ#] → [Ø/Dat./Akk.Sg.]
(i) [*ir*/Nom/Akk.Pl.] → [*ar*/Gen.Sg.]
(ii) [*ar*/Nom/Akk.Pl.] → [*ar*/Gen.Sg.]
(iii) [*ur*/Gen.Sg.] → [*ur*/Nom/Akk.Pl.]

Bemerkung: [-K] = auf Konsonant endend; [-V] = auf schweren Vokal endend; #σ# = Einsilbigkeit

Probleme

(380) *Alle Flexionsklassen*

	1 Ma	2 Na	3 Fa(′)	4 Mi	5 Fi	6 Mu	7 Mc	8 Fc1	9 Fc2	10 Mw	11 Nw	12 Fw
nom sg	ur	Ø	Ø	ur	Ø	ur	ur	Ø	Ø	i	a	a
acc sg	Ø	Ø	Ø (u)	Ø	Ø	Ø	Ø	Ø	Ø	a	a	u
dat sg	i	i	Ø (u)	Ø	Ø	i	i	Ø	Ø	a	a	u
gen sg	s	s	ar	ar	ar	ar	ar	ar	ur	a	a	u
nom pl	ar	Ø	ar	ir	ir	ir	ur	ur	ur	ar	u	ur
acc pl	a	Ø	ar	i	ir	i	ur	ur	ur	a	u	ur
dat pl	um	um	um	um	um	um	um	um	um	um	um	um
gen pl	a	a	a	a	a	a	a	a	a	a	(n)a	(n)a

Gibt es hier zuverlässige Kennformen?

Problem:
More generally, the assumption seems to be untenable that one will always find morphological exponents that are inflection-class specific. (This also argues against the constraints on paradigm economy suggested by Carstairs-McCarthy (1994) (No Blur Principle) and Noyer (2005) (Interclass Syncretism Constraint).)

Question:
Where do the Kennformen come from? How can the learner identify them?

55. McCarthy on Optimal Paradigms

Ref.: McCarthy (2005)

(381) *Paradigm*:
A paradigm is a set of inflected forms based on a common lexeme or stem, e.g., <*lighten, lightens, lightened, lightening*>.

(382) *Candidates*:
Candidates consist of entire paradigms. Every output realization of a lexeme stands in correspondence with every other output realization of that lexeme. (There is an intraparadigmatic correspondence relation R_{OP} on PxP.)

(383) *Optimal paradigm (OP) constraints*:
There are output/output faithfulness constraints for members of a paradigm.

(384) Predictions:

a. *Attraction to the unmarked*
b. *Overapplication only*
c. *Majority rules*

(385) *Constraints*:

a. *$\mu\mu\mu_\sigma$:
No trimoraic syllables
b. App-σ:
Do not link a coda consonant directly to the σ node as an appendix.
c. OP-Id-Wt:
No vowel length alternation in a paradigm.
d. IO-Id-Wt:
Preserve the vowel length of the input.

(386) *Arabic verbs and optimal paradigms: Vowel length*:

/faʕaːl/ + {a, tu, ...}	*$\mu\mu\mu_\sigma$	*App-σ	OP-Id-Wt	IO-Id-Wt
☞O_1: <faʕala, faʕaltu, ...>				**
O_2: <faʕaːla, faʕaːl$_\sigma$tu, ...>		*!		
O_3: <faʕaːla, faʕaːl$_\mu$tu, ...>	*!			
O_4: <faʕaːla, faʕaltu, ...>			*!	*

Note:
Here the leading form (which determines the properties of other forms in the same paradigm) is not stipulated. It is picked by the two high-ranked markedness constraints (which require a short *a* for the *-tu* form: attraction to the unmarked), and the ranking OP-Id-Wt ≫ IO-Id-Wt then ensures that this property spreads to the *-a* form where it is not intrsinsically motivated (overapplication of vowel shortening).

(387) *Arabic verbs and optimal paradigms: Epenthesis*:

/faʕl/ + {a, tu, ...}	*$\mu\mu\mu_\sigma$	*App-σ	OP-Dep-V	IO-Dep-V
☞O_1: <faʕila, faʕiltu, ...>				**
O_2: <faʕla, faʕl$_\sigma$tu, ...>		*!		
O_3: <faʕla, faʕl$_\mu$tu, ...>	*!			
O_4: <faʕla, faʕiltu, ...>			*!	*

"Epenthesis metastasizes throughout the paradigm, even in forms where it is not required for markedness reasons."

(388) *Moroccan Arabic verbs: Majority rules*:

/ʃərb/ + {t, na, ti, tu, u, ət}	*ə$]_\sigma$	*CCC	OP-Max-V	SonCon	IO-Max-V	IO-Dep-V
☞O_1: <ʃrəb, ʃrəbt, ʃrəbna, ʃrəbti, ʃrəbtu, ʃərbu, ʃərbet>			20x*	*	5x*	5x*
O_2: <ʃərb, ʃrəbt, ʃrəbna, ʃrəbti, ʃrəbtu, ʃərbu, ʃərbet>			24x*!		4x*	4x*
O_3: <ʃrəb, ʃrəbt, ʃrəbna, ʃrəbti, ʃrəbtu, ʃrəbu, ʃrəbet>	*!*			*	7x*	7x*
O_4: <ʃərb, ʃərbt, ʃərbna, ʃərbti, ʃərbtu, ʃərbu, ʃərbet>		*!***				

Note:
Completely uniform candidates (O_3, O_4) fatally violate high-ranked markedness constraints. These constraints are satisfied by O_1, O_2, which only differ with respect to *3.masc.sg.* forms (the first member of the paradigm). O_1 wins because "the CCəC pattern is better represented in the reset of the paradigm" than the CəCC pattern. (Note: Low ranking of IO-faithfulness implies that the input could also have been different. Also note: 20 = 5x2x2, 24 = 4x3x2: All stems are equally important for this constraint, i.e., OP-Max-V is violated for *ər* stems by *rə* stems, and for *rə* stems by *ər* stems).

Also note:
Majority rules can only become relevant here because of a low ranking for the markedness constraint SonCon. Otherwise, there would be attraction to the unmarked.

56. Albright on Leading Forms

Ref.: Albright (2002; 2008), Albright & Hayes (2002)

Case study (Albright (2008)): Nominal paradigms in Yiddish.

(389) a. Middle High German (MHG):
/bund/, /bundə/ → [bunt], [bundə]
b. Yiddish (NEY):
/bund/, /bundə/ → [bund], [bundə]

Problem for Optimal Paradigms model:
The Yiddish change is unexpected since the model relies on overapplication only (of devoicing, in the case at hand).

(390) *Optimal Paradigms: Overapplication only*

a. *No OP effect*

/bund/, /bund-ə/	FinDevoi	IO-Id(voi)	OP-Id(voi)
☞O_1: [bunt], [bundə]		*	*
O_2: [bunt], [buntə]		*!*	
O_3: [bund], [bundə]	*!		

b. *OP effect*

/bund/, /bund-ə/	OP-Id(voi)	FinDevoi	IO-Id(voi)
O_1: [bunt], [bundə]	*!		*
☞O_2: [bunt], [buntə]			**
O_3: [bund], [bundə]		*!	

(391) *Final devoicing in MHG*:

a. Voiced obstruents

Stem	NomSg	GenSg	NomPl	gloss
lob-	lop	lobes	lobe	'praise'
rad-	rat	rades	reder	'wheel'
wëg	wëc	wëges	wëge	'way'

b. Voiceless obstruents

Stem	NomSg	GenSg	NomPl	gloss
blat-	blat	blates	bleter	'leaf'
roc-	roc	rockes	röcke	'overcoat'
schif-	schif	schifes	schiffe	'ship'

(392) *Analogical leveling in Modern Northeast Yiddish (NEY)*:

Stem	Sg	Pl	gloss	MHG Sg
loyb-	loyb	loybən	'praise'	lop
rɔd-	rɔd	reder	'wheel'	rat
veg-	veg	vegən	'way'	wëc
hoyz-	hoyz	hayzər	'house'	huːs

(393) *Persistence of devoicing outside the paradigm in NEY*:

Sg.	Pl.	derivationally related word
veg	vegən	a-vek ('away')
faynd	faynd	faynt hɔbən ('come to hate')

(394) *Persistence of devoicing in word-final obstruent clusters*:

1sg	lib	1pl	libən
2sg	lipst	2pl	lipt
3sg	lipt	3pl	libən

Note:
This implies that the absence of devoicing in (392) in NEY is a paradigmatic (morphophonological) effect, not a genuine phonological effect, and that it does not go hand in hand with a change in inputs.

(395) *Constraints*:

a. Faithfulness constraints:
   (i) IDENT(VOI):
   Preserve underlying voicing value.
   (ii) $\text{IDENT}_{\text{Onset}}$(VOI):
   Preserve voicing in onset position.
   (iii) $\text{IDENT}_{\text{LexCat}}$(VOI):
   Preserve voicing within roots of lexical categories.

b. Markedness constraints:
   (i) $\text{FINDEVOI}_{\text{O}}$:
   No faithfully voiced obstruents in coda position.
   (ii) $\text{FINDEVOI}_{\text{N}}$:
   No derived (new) voiced obstruents in coda position.
   (iii) *DD#:
   No word-final sequences of voiced obstruents.
   (iv) AGREE:
   Consecutive obstruents may not have conflicting [voice] specifications.
   (v) AGREE/__#:
   Consecutive obstruents may not have conflicting [voice] specifications at the ends of words.

(396) *Ranking* (in stochastic OT):
AGREE/__# ≫ $\text{IDENT}_{\text{Onset}}$(VOI), *DD# ≫ $\text{FINDEVOI}_{\text{N}}$, AGREE, $\text{IDENT}_{\text{LexCat}}$(VOI) ≫ $\text{FINDEVOI}_{\text{O}}$ ≫ IDENT(VOI)

Note:
In (396), "≫" stands for no (or hardly any) overlapping domains of constraints, "," stands for overlapping domains, with the relative (non-categorical) ranking corresponding to the order presentation.

(397) *Crucial partial ranking for MHG and NEY*:

a. MHG:
$\text{FINDEVOI}_{\text{O}}$ ≫ $\text{IDENT}_{\text{LexCat}}$(VOI), IDENT(VOI)

b. NEY:
$\text{IDENT}_{\text{LexCat}}$(VOI) ≫ $\text{FINDEVOI}_{\text{O}}$ ≫ IDENT(VOI)

(398) *Absence of final devoicing in Yiddish: Conspiracy of regular constraints*

/bund/, /bund-ə/	$\text{IDENT}_{\text{LexCat}}$(VOI)	$\text{FINDEVOI}_{\text{O}}$	IDENT(VOI)
O_1: [bunt], [bundə]	*!		*
O_2: [bunt], [buntə]	*!*		**
☞O_3: [bund], [bundə]		*	

Note:
This simple analysis seems to work well for Yiddish; by taking into account all the other constraints, all other data where one can or must have devoicing after all can be accomodated.

(399) *Blocking of final voiced+voiced sequences in Yiddish*:

/lib-t/	*DD#	AGREE	$\text{IDENT}_{\text{LexCat}}$(VOI)	$\text{FINDEVOI}_{\text{O}}$	IDENT(VOI)
O_1: [libt]		*!		*	
O_2: [libd]	*!			**	*
☞O_3: [lipt]			*		*

Another case: (Variation in) regressive devoicing.

(400) a. *Regressive devoicing in /abta/*

/abta/	$\text{IDENT}_{\text{Onset}}$(VOI)	$\text{FINDEVOI}_{\text{N}}$	AGREE	$\text{IDENT}_{\text{LexCat}}$(VOI)	$\text{FINDEVOI}_{\text{O}}$	IDENT(VOI)
O_1: [abta]			*!		*	
O_2: [abda]	*!			*	*	*
☞O_3: [apta]				*		*

b. *No regressive voicing in /apta/*

/apda/	$\text{IDENT}_{\text{Onset}}$(VOI)	$\text{FINDEVOI}_{\text{N}}$	AGREE	$\text{IDENT}_{\text{LexCat}}$(VOI)	$\text{FINDEVOI}_{\text{O}}$	IDENT(VOI)
☞O_1: [apda]			*			
O_2: [abda]		*!		*		*
O_3: [apta]	*!			*		*

Situation so far:
The analysis works technically. However: At no point does the concept of a *leading form* (a "base", in Albright's terminology) play a role in the analysis. This changes in the last five pages of the paper, where an alternative (?) analysis is presented that is based on the model developed in Albright (2002). The new approach replaces $\text{IDENT}_{\text{LexCat}}$(VOI) with $\text{BASEIDENT}_{\text{pl}}$ which requires faithfulness to a *preselected plural base form*.

(401) *Absence of final devoicing in Yiddish: Paradigmatic leveling*

a. Plural form without devoicing:

/bund-ə/	$\text{BASEIDENT}_{\text{pl}}$	$\text{FINDEVOI}_{\text{O}}$	IDENT(VOI)
☞O_1: [bundə]			
O_2: [buntə]			*!

b. Singular form without devoicing (so as to match the plural form):

/bund/	$\text{BASEIDENT}_{\text{pl}}$	$\text{FINDEVOI}_{\text{O}}$	IDENT(VOI)
☞O_1: [bund]		*	
O_2: [bunt]	*!		*

Question:
How is the plural form selected as the base form (leading form)?

Answer:
The plural form is the most informative part of the paradigm. It is "the form that most clearly exhibits lexical contrasts and extending the plural variant does the least violence to recoverability" (p. 300). "See Albright (2002) for details and algorithmic implementation." (Crucial concepts: reliability score of rules (hits divided by scope), adjustment by confidence scores, etc.)

Hunch:
It might in principle be possible (though perhaps less plausible) to carry out leading form determination in inflectional morphology in OT *within* OT (rather than by invoking some

algorithm like the Minimal Generalization Learner of Albright (2002)). As a matter of fact, there is already such a proposal: Sympathy theory (McCarthy (1999)).

57. McCarthy on Sympathy Theory

Ref.: McCarthy (1999)

Problem:
Instances of opaque rule application in derivational phonology (counter-bleeding, counter-feeding) cannot straightforwardly be accounted for in representational optimality-theoretic phonology ("harmonic parallelism").

(402) *Counter-bleeding in Tiberian Hebrew*:

a. Epenthesis into final clusters:
/melk/ → melex "king"

b. ʔ-Deletion outside onsets:
/qaraʔ/ → qārā_ "he called"

c. Interaction – Epenthesis → ʔ-Deletion:
/dešʔ/ → dešeʔ → deše_ "tender grass"

Note:
Standard (parallel) optimality theoretic can only produce the result of transparent rule application: **deš*.

McCarthy's (1999) idea:
The intermediate stage of the derivation in (402-c), viz., *dešeʔ*, corresponds to a candidate that competes with (and loses against) the optimal form *deše_*, but that is more faithful to the input /dešʔ/ in one respect – it maintains the ʔ. *deše_* blocks *deš* because it is more faithful to the candidate that corresponds to the intermediate step in a derivational approach. This latter instance of faithfulness is called sympathy.

(403) *Basic tenets of sympathy theory*:

a. Certain (input/output faithfulness) constraints F_i divide the candidate set C into two non-overlapping subsets: C_{+Fi} is the class of candidates that respect F_i, and C_{-Fi} is the class of candidates that violate F_i. F_i is called a "selector".

b. The optimal member of C_{+Fi} is called $\bullet_{Fi}$. This is the ☸-candidate selected by F_i. $\bullet_{Fi}$ does not have to be optimal in C.

c. There are ☸-faithfulness constraints that demand faithfulness (sympathy) to $\bullet_{Fi}$ candidates, rather than to the input itself. If high-ranked, these ☸-faithfulness constraints can render non-transparent candidates optimal and thereby account for opacity effects like counter-bleeding.

Note:
Sympathy theory identifies leading forms and ensures that properties of these leading forms (☸ candidates) can be transported to other forms in the same candidate set. Normally the selector is a faithfulness constraint, but perhaps this does not have to be the case (see, e.g., Müller (2002a) on sympathy in syntax). In principle, it might be possible to extend this to

T_{17}: Counter-bleeding and sympathy in Tiberian Hebrew in McCarthy (1999)

Input: /dešʔ/	☸Max-V$_{Max-C}$	*Complex	Anchor	CodaCond	Max-C	Dep-V
☞O_1: dešeʔ					*	*
☛O_2: deš	*!				*	
O_3: dešʔe			*!			*
☸O_4: dešeʔ				*!		*
O_5: dešʔ	*!	*		*		

paradigmatic leveling; the only technical issue would be that if paradigms (rather than word forms) are subject to optimization, it looks as though the ☸ optimization would have to take place within the paradigm first (cyclically, or in a separate stratum).

Yet another alternative?
Harmonic serialism: Leading forms as outputs of prior optimizations can somehow be the *inputs* for subsequent optimization, so that regular faithfulness constraints derive analogical leveling. (In the case of Yiddish, singular forms must be derived from plural forms.)

XI. Optimality Theory 4: Syncretism without Underspecification

58. Basic Assumptions and Data

The Approach to Syncretism in Müller (2011)

1. There is *no underspecification* of exponents.
2. Not all members of a paradigm (exponents) are present in the input; only *leadings forms* are (see Wurzel (1984), Blevins (2004), Finkel & Stump (2007; 2009), Albright (2008), and Baerman (2009) on somewhat related concepts).
3. A mismatch of paradigm cells and leadings forms gives rise to syncretism: Initial gaps are filled by using "wrong", i.e., *unfaithful exponents* (Weisser (2007)).
4. Mismatches between the exponent's specification and the target specification are minimized; this is not accomplished by a single *Minimality* condition (cf. the *Nearest Neighbour Principle* in Weisser (2007, 26), or the *Minimality* principle in Lahne (2007a, 11)), but by a set of *ranked faithfulness constraints* for the features involved (as in Grimshaw (2001), Trommer (2001; 2006a), Wunderlich (2004), etc.; however, these authors all crucially rely on underspecification – cf. handout Morphology I).
5. *Feature decomposition* yielding natural classes is needed exactly as before.
6. The resulting approach can be viewed as a way to provide a principled, highly restrictive optimality-theoretic concept of a *rule of referral* (Zwicky (1985), Stump (2001), and Baerman, Brown & Corbett (2005)).

(404) *Determiner inflection in German*

dies 'this'	MASC.SG	NEUTER.SG	FEMININE.SG	PLURAL
NOMINATIVE	*r*	s	*e*	e
ACCUSATIVE	*n*	*s*	e	e
DATIVE	*m*	m	r	*n*
GENITIVE	*s*	s	*r*	*r*

59. Analysis

(405) *Nine leading forms*:
/r/$_1$ ↔ [+masc,–fem,–gov,–obl]
/n/$_2$ ↔ [+masc,–fem,+gov,–obl]
/m/$_3$ ↔ [+masc,–fem,+gov,+obl]
/s/$_4$ ↔ [+masc,–fem,–gov,+obl]
/s/$_5$ ↔ [+masc,+fem,+gov,–obl]
/e/$_6$ ↔ [–masc,+fem,–gov,–obl]
/n/$_7$ ↔ [–masc,–fem,+gov,+obl]
/r/$_8$ ↔ [–masc,+fem,–gov,+obl]
/r/$_9$ ↔ [–masc,–fem,–gov,+obl]

Tableau T_{18}: Nom.Neut.Sg. contexts

Input: dies ↔ [+masc,+fem,–gov,–obl], EXP	MATCH	IDENT MASC	IDENT OBL	IDENT FEM	IDENT GOV
O_1: dies-r$_1$ ↔ [+masc,*–fem*,–gov,–obl]				*!	
O_2: dies-n$_2$ ↔ [+masc,*–fem,+gov*,–obl]				*!	*
O_3: dies-m$_3$ ↔ [+masc,*–fem,+gov,+obl*]			*!	*	*
O_4: dies-s$_4$ ↔ [+masc,*–fem*,–gov,*+obl*]			*!	*	
☞ O_5: dies-s$_5$ ↔ [+masc,+fem,*+gov*,–obl]					*
O_6: dies-e$_6$ ↔ [*–masc*,+fem,–gov,–obl]		*!			
O_7: dies-n$_7$ ↔ [*–masc,–fem,+gov,+obl*]		*!	*	*	*
O_8: dies-r$_8$ ↔ [*–masc*,+fem,–gov,*+obl*]		*!	*		
O_9: dies-r$_9$ ↔ [*–masc,–fem*,–gov,*+obl*]		*!	*	*	
O_{10}: dies-r$_1$ ↔ [+masc,–fem,–gov,–obl]	*!				

Optimality-Theoretic Constraints

(406) MATCH (undominated, possibly part of GEN):
The morpho-syntactic features of stem and exponent are identical in the output.

(407) *Faithfulness constraints for features on exponents*
a. IDENTMASC:
[±masc] of the input must not be changed in the output on an exponent.
b. IDENTOBL:
[±obl] of the input must not be changed in the output on an exponent.
c. IDENTFEM:
[±fem] of the input must not be changed in the output on an exponent.
d. IDENTGOV:
[±gov] of the input must not be changed in the output on an exponent.

(408) *Ranking*:
IDENTMASC ≫ IDENTOBL ≫ IDENTFEM ≫ IDENTGOV

Incomplete Paradigms

(409) *Incomplete paradigm with leading forms only*

dies 'this'	MASC.SG	NEUTER.SG	FEMININE.SG	PLURAL
[–gov,–obl]	/r/$_1$		/e/$_6$	
[+gov,–obl]	/n/$_2$	/s/$_5$		
[+gov,+obl]	/m/$_3$			/n/$_7$
[–gov,+obl]	/s/$_4$		/r/$_8$	/r/$_9$

Note:
In what follows, EXP is an abstract case exponent that stands for the set of possible (fully specified) exponents of the inventory (see RED in McCarthy & Prince (1994)).

Tableau T_{19}: Acc.Pl. contexts

Input: dies ↔ [–masc,–fem,+gov,–obl], Exp	Match	Ident Masc	Ident Obl	Ident Fem	Ident Gov
O_1: dies-r_1 ↔ [+*masc*,–fem,–*gov*,–obl]		*!			*
O_2: dies-n_2 ↔ [+*masc*,–fem,+gov,–obl]		*!			
O_3: dies-m_3 ↔ [+*masc*,–fem,+gov,+*obl*]		*!	*		
O_4: dies-s_4 ↔ [+*masc*,–fem,–*gov*,+*obl*]		*!	*		*
O_5: dies-s_5 ↔ [+*masc*,+*fem*,+gov,–obl]		*!		*	
☞ O_6: dies-e_6 ↔ [–masc,+*fem*,–*gov*,–obl]				*	*
O_7: dies-n_7 ↔ [–masc,–fem,+gov,+*obl*]			*!		
O_8: dies-r_8 ↔ [–masc,+*fem*,–*gov*,+*obl*]			*!	*	*
O_9: dies-r_9 ↔ [–masc,–fem,–*gov*,+*obl*]			*!		*
O_{10}: dies-r_1 ↔ [+masc,–fem,–gov,+obl]	*!				

Tableau T_{20}: Dat.Fem.Sg. contexts

Input: dies ↔ [–masc,+fem,+gov,+obl], Exp	Match	Ident Masc	Ident Obl	Ident Fem	Ident Gov
O_1: dies-r_1 ↔ [+*masc*,–*fem*,–*gov*,–*obl*]		*!	*	*	*
O_2: dies-n_2 ↔ [+*masc*,–*fem*,+gov,–*obl*]		*!	*	*	
O_3: dies-m_3 ↔ [+*masc*,–*fem*,+gov,+obl]		*!		*	
O_4: dies-s_4 ↔ [+*masc*,–*fem*,–*gov*,+obl]		*!		*	*
O_5: dies-s_5 ↔ [+*masc*,+fem,+gov,–*obl*]		*!	*		
O_6: dies-e_6 ↔ [–masc,+fem,–*gov*,–*obl*]			*!		*
O_7: dies-n_7 ↔ [–masc,–*fem*,+gov,+obl]				*!	
☞ O_8: dies-r_8 ↔ [–masc,+fem,–*gov*,+obl]					*
O_9: dies-r_9 ↔ [–masc,–*fem*,–*gov*,+obl]				*!	*
O_{10}: dies-r_1 ↔ [+masc,–fem,–gov,+obl]	*!				

Tableau T_{21}: A wrong prediction for Gen.Pl. contexts if /r/$_9$ is not present

Input: dies ↔ [–masc,–fem,–gov,+obl], Exp	Match	Ident Masc	Ident Obl	Ident Fem	Ident Gov
☛ O_7: dies-n_7 ↔ [–masc,–fem,+*gov*,+obl]					*
O_8: dies-r_8 ↔ [–masc,+*fem*,–gov,+obl]				*!	

(410) *Complete paradigm with spreading of leading forms*

dies 'this'	masc.sg [+masc,–fem]	neuter.sg [+masc,+fem]	feminine.sg [–masc,+fem]	plural [–masc,–fem]
[–gov,–obl]	/r/$_1$	↑	/e/$_6$	→
[+gov,–obl]	/n/$_2$	/s/$_5$	↓	↘
[+gov,+obl]	/m/$_3$	→	↑	/n/$_7$
[–gov,+obl]	/s/$_4$	→	/r/$_8$	/r/$_9$

Note:
To some extent, the decisions on which occurrence of an exponent's distribution is to count as primary (i.e., qualify as the leading form), and which occurrences of the distribution are secondary (involving a violation of faithfulness) have been *arbitrary* from a purely synchronic, grammar-internal point of view.

However:
Evidence for occurrence asymmetries of inflectional exponents comes from other domains (i.e., outside grammatical theory) which can be addressed by research in areas like *diachronic linguistics*, *corpus linguistics*, and *psycholinguistics*.

60. Restrictiveness of the Approach: No Elsewhere

As it stands, the approach does not derive *elsewhere distributions*.

(411) a. *Leading forms*

x	
	y

b. *Intended spreading*

x	→
↓	y

Bidirectional spreading:
It seems that in order to derive something like (411-b), *contextual faithfulness* (cf. Beckmann (1998) on positional faithfulness in phonology and Woolford (2007) for syntax) is needed in the absence of *radically underspecified elsewhere markers*.

(412) *Incomplete paradigm of German determiner inflection: a wrong prediction*

dies 'this'	feminine.sg [–masc,+fem]	plural [–masc,–fem]
[+gov,+obl]		/n/$_7$
[–gov,+obl]	/r/$_8$	

Tableau T_{22}: A wrong prediction for Dat.Fem.Sg. contexts under reranking

Input: dies ↔ [–masc,+fem,+gov,+obl], Exp	Match	Ident Masc	Ident Obl	Ident Gov	Ident Fem
☛ O_7: dies-n_7 ↔ [–masc,*–fem*,+gov,+obl]					*
O_8: dies-r_8 ↔ [–masc,+fem,*–gov*,+obl]				*!	

Tableau T_{23}: Correct prediction for Gen.Pl. contexts without /r/$_9$: contextual faithfulness

Input: dies ↔ [–masc,–fem,–gov,+obl], Exp	Match	Ident Masc	Ident Obl	Ident Gov([–fem])	Ident Fem	Ident Gov
O_7: dies-n_7 ↔ [–masc,–fem,*+gov*,+obl]				*!		*
☞ O_8: dies-r_8 ↔ [–masc,*+fem*,–gov,+obl]					*	

Note:
A *learning algorithm* for elsewhere distributions of syncretism is necessarily much more complex than a learning algorithm for systems where all instances of syncretism can be derived by reference to natural classes, without reference to elsewhere or default exponents (see Pertsova (2007) on the "No-Homonymy Learner" and the "Elsewhere Learner").

(413) An Obvious Challenge: Verb Inflection in English

	Singular	Plural
1	am	*are*
2	*are*	*are*
3	is	*are*

(414) Underspecification approach (Subset Principle; standard):

a. /am/ ↔ [–2,–pl]
b. /is/ ↔ [–1,–2,–pl]
c. /are/ ↔ [ ]

(415) Overspecification approach (Superset Principle; Starke (2006), Caha (2007; 2008)):

a. /am/ ↔ [pres,part]
b. /is/ ↔ [pres]
c. /are/ ↔ [pres,part,addr,group]

Even more interesting: /s/ vs. Ø with regular verbs.

Solution for "to be" via contextual faithfulness:
Add a constraint IdentPers([–pl]); /are/ ↔ [–1,+2,+pl].

61. Czech Verb Inflection by Leading Forms, without Underspecification

Ref.: Englisch (2015)

(416) *Present tense of the Czech verb* prosit *'ask/beg'*

	sg	pl
1	pros-ím	pros-íme
2	pros-íš	pros-íte
3	pros-*í*	pros-*í*

Table 24: OT tableau for *pros-ím* 'beg-1sg'

I:	pros ↔ [+1 −2 −pl]	Match	Id1	Id2	IdPl
a. ☞	pros-ím ↔ [+1 −2 −pl]				
b.	pros-íme ↔ [+1 −2 −**pl**]				∗!
c.	pros-íš ↔ [+**1** −**2** −pl]		∗(!)	∗(!)	
d.	pros-íte ↔ [+**1** −**2** −**pl**]		∗(!)	∗(!)	∗
e.	pros-í ↔ [+**1** −2 −pl]		∗(!)		
f.	pros-í ↔ [−1 −2 −pl]	∗!			

Table 25: OT tableau for *pros-í* 'beg-3pl'

I:	pros ↔ [−1 −2 +pl]	Match	Id1	Id2	IdPl
a.	pros-ím ↔ [−**1** −2 +**pl**]		∗(!)		∗
b.	pros-íme ↔ [−**1** −2 +pl]		∗(!)		
c.	pros-íš ↔ [−1 −**2** +**pl**]			∗(!)	∗
d.	pros-íte ↔ [−1 −**2** +pl]			∗(!)	
e. ☞	pros-í ↔ [−1 −2 +**pl**]				∗
f.	pros-í ↔ [−1 −2 −pl]	∗!			

(417) First person: [+1 −2] Singular: [−pl] Past tense: [+pst]
Second person: [−1 +2] Plural: [+pl] Non-past: [−pst]
Third Person: [−1 −2]

(418) a. -ím ↔ [+1 −2 −pl]
b. -íme ↔ [+1 −2 +pl]
c. -íš ↔ [−1 +2 −pl]
d. -íte ↔ [−1 +2 +pl]
e. -í ↔ [−1 −2 −pl]

(419) Match
The morpho-syntactic features of stem and exponent are identical in the output.

(420) *Faithfulness constraints*

a. Id1
[±1] of the input must not be changed in the output of an exponent.
b. Id2
[±2] of the input must not be changed in the output of an exponent.
c. IdPl
[±pl] of the input must not be changed in the output of an exponent.

(421) Match ≫ { Id1, Id2 } ≫ IdPl

Problem (as before):
This kind of approach does not easily accomodate elsewhere distributions.

XII. Optimality Theory 5: Deponency

62. Introduction

62.1. Deponency

(422) *A Definition* (Baerman (2007)):
Deponency is a mismatch between form and function (1). Given that there is a formal morphological opposition (2) between active and passive (3) that is the normal realization of the corresponding functional opposition (4), deponents are a lexically-specified set (5) of verbs whose passive forms function as actives. The normal function is no longer available (6).

Note:
Baerman suggests to treat (1) as the central, defining characteristic of deponency; all the other properties are subject to parametrization. Thus, an extended concept of deponency emerges that is not confined to deponent verbs in Latin (Greek, Sankskrit).

62.2. Deponent Verbs in Latin

(423) Regular and deponent verbs

	regere ('rule')		hortāri ('urge')	
	ACT	PASS	ACT	PASS
PRES IND	regit	regitur	hortātur	—
PRES INF	regere	regi	hortāri	—
PRF IND	rēxit	rēctus est	hortātus est	—
PTCP PERF	—	rēctus	hortātus	—
SUPINE	rēctum	—	hortātum	—
PART PRES	regēns	—	hortāns	—

- Even with deponent verbs, some forms are taken from the active marker set (and have an active interpretation): In addition to the supine and the present participle, this holds for the future participle (*hortaturus*) and the gerund (*hortandi*).
- In contrast, the gerundive has maintained its passive meaning: *hortandus* 'someone who must be urged'.

62.3. Preterite Present Verbs in German

Generalization:
Preterite present verbs in German are mainly modal verbs, but also, e.g., *wissen* ('know'). They give rise to *heteroclisis*: Two inflectional patterns are mixed in one paradigm.

(424) Preterite present verbs
sollen ('shall')

	PRES	PAST
1.sg.	soll-Ø	soll-te
2.sg.	soll-st	soll-te-st
3.sg.	soll-Ø	soll-te
1.pl.	soll-en	soll-te-n
2.pl.	soll-t	soll-te-t
3.pl.	soll-en	soll-te-n

(425) Regular weak verbs
wählen ('choose')

	PRES	PAST
1.sg.	*wähl-Ø	wähl-te
2.sg.	wähl-st	wähl-te-st
3.sg.	*wähl-Ø	wähl-te
1.pl.	wähl-en	wähl-te-n
2.pl.	wähl-t	wähl-te-t
3.pl.	wähl-en	wähl-te-n

Note:
Preterite present verbs take their present tense exponents from the past tense marker inventory of *strong* verbs. There is no defectivity. "The present tense forms of modal verbs arose via reinterpretation [...] A past tense form was reinterpreted as a present tense form. Given this reinterpretation, the past paradigm was vacant and had to be newly generated. This generation took place "regularly", i.e., with *weak* forms" (Eisenberg (2000, 185)).

62.4. Infinitivus pro Participio (Ersatz infinitive) in German

(426) *Infinitivus pro participio* (IPP):
a. *dass sie das Lied singen *gewollt* hat
that she the song sing-INF want-PART has
b. dass sie das Lied hat singen *wollen*
that she the song has sing-INF want-INF

(427) *Absence of IPP*:
a. dass sie das *gewollt* hat
that she that want-PART has
b. *dass sie das hat *wollen*
that she that has want-INF

Generalization:
If a modal verb like *wollen* ('want') is embedded by a perfect auxiliary and embeds an infinitive itself, it shows up as an infinitive, not as a past participle (which one would normally expect). In addition, the VP headed by the modal verb is extraposed. In contrast to other cases of deponency, the IPP effect is *syntactically* conditioned.

63. Deponency: Some Theories

63.1. A Taxonomy of Analyses

(428) a. *Form deponency*
(i) There is a featural mismatch between a morphological exponent and morpho-syntactic property set (= paradigm cell, syntactic context, ...) that it realizes.
(ii) Refs.: Stump (2006), Weisser (2014)
b. *Property deponency*
(i) There is no mismatch between the morphological exponent and the morpho-syntactic property set; but there is a mismatch between the morpho-

syntactic property set and its interpretation.
(ii) Refs.: Stump (2007), Embick (2000), Kiparsky (2005)

c. *Spurious morpho-syntactic deponency*
(i) There is no mismatch. The morphological exponent faithfully realizes the morpho-syntactic property set, but the features involved are more abstract than one might initially have thought.
(ii) Refs.: Bobaljik (2007), Keine (2010), Grestenberger (2014)

d. *Spurious morphomic deponency*
(i) There is no mismatch. The morphological exponent faithfully realizes a purely morphological ('morphomic', Aronoff (1994)) property set; there is a relation between syntactic features and morphomic features, but it is indirect.
(ii) Refs.: Sadler & Spencer (2001), Kiparsky (2005), Brown (2006), Hippisley (2007), Schulz (2010)

e. *Spurious semantic deponency*
(i) There is no mismatch. The morphological exponent faithfully realizes a certain abstract semantic property; i.e., e.g., deponent verbs in Indo-European languages can form a semantically defined natural class with other, more obvious instances of non-active morphology after all.
(ii) Refs: Xu, Aronoff & Anshen (2007), Kallulli (2013), Zombolou & Alexiadou (2014), Alexiadou (2013) on Indo-European verbs (in languages like Latin, Albanian, and Greek); and Grestenberger (2014) for arguments against such an approach.

63.2. Form Deponency

63.2.1. Stump (2006) on Paradigm Linkage

Form deponency would a priori seem to be the most straightforward approach, but there seem to be very few analyses of this type: Stump (2006) is one. Stump (2006, 286-289)) introduces rules of *paradigm linkage* which can be viewed as generalizations of rules of referral.

Stump (2006) shows that the inflectional properties of deponent verbs can be accounted for by means of a generalization of rules of referral, which were originally introduced in order to account for syncretism (Zwicky (1985), Corbett & Fraser (1993), Stump (2001)). Such rules state that the exponent for a given morpho-syntactic context (or paradigm cell) must be identical to the exponent independently chosen for some other morpho-syntactic context. The otherwise expected morphological rule of exponence underapplies in this context.

Against this background, Stump (2006) introduces rules of *paradigm linkage* which can be viewed as generalizations of rules of referral, such that the referral does not merely affect individual paradigm cells, but entire paradigmatic areas (i.e., what Corbett (2007) calls 'slabs'), as required for deponency. Normally, the form chosen for a given morpho-syntactic context σ is the most specific form where the morphological exponent realizes a subset of σ's features; this is guaranteed by a *universal default rule of paradigm linkage*. However, with deponent verbs, a more specific *Latin rule of paradigm linkage* ensures that the form chosen for a morpho-syntactic context σ that contains the specification [active] is the one chosen for a context that is just like σ, except that [active] is replaced with [passive].

Two general properties of the analysis can be noted. First, there is a true *mismatch* between exponent and syntactic context with deponent verbs; the morpho-syntactic features associated

with the morphological exponent (e.g., [passive]) and the features of the morpho-syntactic context (e.g., [active]) are of the same type. And second, the resolution of this mismatch implies *underapplication* of a standard rule of exponence (which would predict active markers in active contexts), and *blocking* by a more specific rule.

(429) Universal default rule of paradigm linkage:
If <L,σ> is a content-cell and stem r is stipulated as the root of lexeme L, then <L,σ> has <r,σ> as its form-correspondent (i.e. the realization of the content-cell <L,σ> is that of the form-cell <r,σ>).

(430) (More specific) Latin rule of paradigm linkage:
Where L is a deponent verbal lexeme having r as its root, the content-cell <L,σ> has <r,$f_2(\sigma)$> as its form-correspondent.

(431) Definition of the Latin property mapping f_2:
If σ = {active X}, then $f_2(\sigma)$ = {passive X}; otherwise $f_2(\sigma) = \sigma$.

(432) a. <FATĒRĪ ('confess'), {1st singular present nonperfect active indicative}>
b. <fat, {1st singular present nonperfect passive indicative}> (realization: fateor)

Crucial observation:
The features of the exponent and the features of the morpho-syntactic property set are of the same type: <L,σ>, <r,$f_2(\sigma)$>.

63.2.2. Weisser (2014) on Mismatch Verbs

Another form deponency approach is developed in Weisser (2014), based on minimalist syntax and Distributed Morphology. Here the main claim is that deponent verbs and unaccusative verbs emerge as two sides of the same coin, with reversed values for the feature [±active]. Again, a mismatch between the features associated with the exponent and the features of the syntactic context is acknowledged. Normally, active/passive syntax and morphological realization by active/passive exponents are determined uniformly by a single voice feature [±active] on the functional predicate head v (which selects VP; Chomsky (2001)). However, in the case of deponent (or, for that matter, unaccusative) verbs, V itself is inherently specified for voice. The mismatch that invariably results when a deponent V (specified as [–active]) undergoes head movement to v if the latter is specified as [+active] is resolved by a general principle according to which special lexical specifications overwrite functional specifications for the purpose of morphological realization ([+active] on v has ensured active syntax by then). (If both heads are [–active], an OCP-like constraint demanding distinctness of adjacent features is violated; this accounts for defectivity.)

63.2.3. Conclusion

The two analyses, although fundamentally incompatible concerning basic assumptions about the organization of grammar, are similar in their treatment of deponency: There is a mismatch between form and function whose resolution implies underapplication of the expected rule of exponence.

63.3. Property Deponency

63.3.1. Stump (2007) on Sanskrit Middles

Ātmanepadin verbs (Ā-verbs) may take on middle forms in the presence of active (non-middle) interpretation. The middle interpretation – with an *affected subject* – is also possible with these forms, i.e., the deponency does not lead to defectivity, and there is no loss of the original function.

Two arguments for property deponency:

1. Even in cases of active interpretation, the information "middle" must be syntactically (and not just morphologically) available because it participates in *agreement rules*: An auxiliary verb that co-occurs with the Ā-verb in the periphrastic perfect also must have formal middle marking.

2. There is a *system-wide syncretism* pattern according to which the passive forms of a verb have to be syncretic with the middle forms in a number of contexts, and the deponent Ā-verbs are no exception; thus, the information "middle" must be accessible at the point where this generalization is expressed, which can not be the individual morphological exponent.

Proposal:
Ā-verbs are morphologically and syntactically marked [middle], but can, by stipulation, escape a standard [middle] interpretation (viz., an interpretation of the object as affected).

63.3.2. Embick (2000) on Latin Deponents

Background:
Distributed Morphology (Halle & Marantz (1993)): Inflectional items are post-syntactic realizations of functional heads.

Two approaches, each with two possible sources of [pass]:

1. [pass] may be present in syntax, triggering passive morphology and interpretation, or may be inserted after syntax, where it still triggers passive morphology (by late insertion of morphological exponents) but comes too late to trigger passive syntax (or interpretation → *counter-feeding*). (Problem: deponency realization feeds head movement, but there is no post-syntactic movement. Solution:)

2. [pass] may show up in two *different positions*: With regular passivization, it is part of a functional head (triggering passive syntax and intepretation). With deponents, it shows up on a root, where subcatgorization information and interpretation are not affected. Morphological realization of [pass] proceeds uniformly.

Note:
In both cases, [pass] of the morpho-syntactic property set is matched with [pass] of a morphological exponent, and standard [pass] interpretation is not possible with deponents. However, in contrast to Stump (2007), agreement for [pass] may also be unexpected (in the first proposal, and unless agreement is post-syntactic).

63.4. Spurious Morpho-Syntactic Deponency

63.4.1. Bobaljik (2007) on Chukchi Antipassive

(433) *Antipassive in Chukchi*:

a. ʔaaček-a kimitʔ-ən ne-nɬʔetet-ən
youth-ERG load-ABS 3.SUBJ(TRANS)-carry-3.SG.OBJ
'(The) young men carried away the load.'

b. ʔaaček-ət Ø-*ine*-nɬʔetet-ɣʔet kimitʔ-e
youth-PL(ABS) 3.SUBJ(INTR)-AP-carry-3.PL.SUBJ(INTR) load-INSTR
'(The) young men carried away the load.'

(434) *Spurious Antipassive in Chukchi*:
ə-nan ɣəm Ø-*ine*-ɬʔu-ɣʔi
he-ERG I(ABS) 3.SG.SUBJ(INTR)-AP-see-3.SG.SUBJ(INTR)

'He saw me.'

Observation:
In certain marked combinations of external and internal argument (3.sg>1.sg, 2>1.sg, 2>1.pl), antipassive morphology is required even though the the clause stays transitive (and the external argument bears ergative case).

Bobaljik's (2007) Analysis:

- Distributed Morphology
- Object movement in transitive clauses, blocked in marked contexts.
- Regular antipassive: object also stays in situ.
- The two relevant contexts (spurious antipassive, antipassive) – share a property that sets them apart from standard transitive contexts.
- Morphological realization of v proceeds differently depending on whether object movement has applied or not: A marker like *ine* is inserted in v/__Obj contexts, whereas a zero marker Ø is inserted in bare v contexts after object movement.
- Thus, *ine* is *not an antipassive marker*; it realizes v v as it shows up in antipassive contexts as well as in certain well-defined transitive contexts; and the only thing that the two contexts have in common is that there is no object movement.
- There is no "spurious antipassive" because the morphological exponent does not mark antipassive in the first place; it marks v/__Obj.

63.4.2. Keine (2010) on IPP in German

(435) *Infinitivus pro participio* (IPP):

a. *dass sie das Lied singen *gewollt* hat
that she the song sing-INF want-PART has

b. dass sie das Lied hat singen *wollen*
that she the song has sing-INF want-INF

(436) *Absence of IPP*:

a. dass sie das *gewollt* hat
that she that want-PART has

b. *dass sie das hat *wollen*
that she that has want-INF

Note:
The analysis also relies on post-syntactic insertion of exponents into functional heads:

- The infinitive marker is the default exponent.
- The past participle exponent is used if a verb is c-commanded by a perfect auxiliary (v_{perf}).
- If verb movement has applied to a position outside of the c-command domain of v_{perf}, the context for participle morphology is not present anymore, and the default infinitive exponent is inserted.
- The movement of the embedded verb is normally blocked; however, it is forced by a special filter with certain kinds of embedding verbs.

63.4.3. Grestenberger (2014) on Deponent Verbs in Hittite, Vedic Sanskrit, Latin, and Ancient Greek

Claim:
Deponent verbs in the older Indo-European languages are agentive transitive predicates. However, passive morphology is not per se incompatible with such a specification. Passive (or middle) morphology shows up whenever v does not introduce an agent DP.

(437) *Post-syntactic rules of morphological exponence*:

a. v triggers non-active morphology if it does not have an agentive DP as its specifier.
b. v triggers active morphology if it has an agentive DP as its specifier.

Crucial assumption:
Deponent verbs, as a lexical property, project their agentive DP *within VP* already. Hence, there is an agent, the clause is transitive, but the context for morphological realization of active exponence is not present.

Conclusion:
Grestenberger's approach belongs to the class of spurious morpho-syntactic deponency analyses because non-active morphological realization is tied to the abstract morpho-syntactic property of v without DP specifier. (And it is this abstract property that characterizes regular passive/middle verbs and deponent active verbs as a natural class.)

63.5. Spurious Morphomic Deponency

Assumption:
"Active" inflection, "passive" inflection, etc. in Latin are pure *form classes*, without any syntactic interpretation as such; the relevant features governing morphological exponence are *morphomic*.

Other instances of morphomic analysis:

- inflection class features (Aronoff (1994))
- decomposed inflection class features (Alexiadou & Müller (2008), Trommer (2008), Müller (2007b))
- decomposition of morpho-syntactic features for syncretism (Jakobson (1962b), Bierwisch (1967))
- transcategorial decomposition of morphological features for syncretism (Wiese (1999), Trommer (2005b))
- purely morphomic features for syncretism (Bonami & Boyé (2010))

A predecessor: Kiparsky (2005)
"These data [showing that verbs of any semantic type can be deponents in Latin, and showing that there are semi-deponents] suggest that passive inflection in Latin is a *conjugational* feature – we'll call it [±Passive] – which can be lexically specified, for verb stems as well as for inflectional endings, or left unspecified" (p. 121).
However: "[+Passive] inflections trigger one or more of the operations on the verb's argument structure [...] forming passives, as well as possibly reflexives, reciprocals, and inchoatives, depending on further, partly idiosyncratic, properties of the verb" (p. 122).

An *explicitly morphomic* approach: Schulz (2010)

An *implicitly morphomic* approach: Brown (2006), Hippisley (2007)

(438) Hippisley's (2007) analysis of Latin deponent verbs:

a. VERB
(i) <syn> == "<mor>"
(ii) <mor active> == ACT_FORMS:<>
(iii) <mor passive> == PASS_FORMS:<>

b. DEPONENT
(i) <> == VERB
(ii) <mor active> == PASS_FORMS:<> (deponency)
(iii) <mor active imperfective future infinitive> == VERB
(iv) <mor passive> == *undefined*. (defectivity)

ACT_FORMS, PASS_FORMS are morphomic; they define form classes and play no role in syntax. The system works in exactly the same way if one replaces ACT_FORMS, PASS_FORMS with FORM-CLASS 1, FORM-CLASS 2; or, indeed, with PASS_FORMS, ACT_FORMS, respectively.

63.6. Conclusion

1. There are some *spurious morpho-syntactic deponency* approaches. It is not clear whether a different syntactic context can plausibly be assumed in all attested cases of deponency.
2. There are surprisingly many *spurious morphomic deponency* approaches. These approaches work, but they complicate the syntax/morphology interface because the two

levels do not talk about the same kinds of features even though there is a tight interaction; this interaction must then be derived by stipulation in each case. Also, it is not quite clear where to stop (there must be features that are shared by morphology and syntax).

3. There are some *property deponency* approaches. In those cases where Stump argues that they are needed, they make radical assumptions necessary; e.g., a feature like [passive] cannot be mentioned by syntactic rules if passive deponency is derived in this way.

4. There are few *form deponency* approaches.

5. Deponency and *syncretism* are very similar. There is an *optimality-theoretic* approach to syncretism that relies on the use of "wrong" (i.e., unfaithful) morphological exponents. This approach can be generalized so as to cover deponency.

Strategy:

- Wrong forms are not a marginal phenomenon of grammar; they are everywhere.
- The ubiquity of grammatical wrong forms requires a model of grammar that envisages rule/constraint violability.
- Optimality Theory is such a model of grammar.

63.7. Deponency and Syncretism

(439) *Typology of morphological mismatches* (Spencer (2007)):

a. Syncretism (canonical):
Domain: within, Paradigm coverage: cell, Generality: class, Defectivity: no

b. Deponency (canonical):
Domain: within, Paradgim coverage: slab, Generality: exception/subclass, Defectivity: yes

However:
"No logical possibility [with respect to the combination of variables] can be ruled out."

A mixed pattern (Corbett (2007)):
The noun *xexbi* ('child(ren)') in Tsez is deponent because it has plural inflection in the singular, but it shares properties with both (canonical) syncretism and (canonical) deponency:

- no defectivity of the paradigm (syncretism)
- no loss of the original function (syncretism)
- slabs as relevant domains (deponency)
- generalizes across cells, not lexemes (deponency)

(440) Coding of *xexbi* in Spencer (2007):
Domain: within, Paradgim coverage: slab, Generality: exception, Defectivity: no

64. An Optimality-Theoretic Approach to Syncretism

64.1. Determiner Inflection in German

(441) *Determiner inflection in German*

dies 'this'	MASC.SG	NEUTER.SG	FEMININE.SG	PLURAL
NOMINATIVE	er	es	e	e
ACCUSATIVE	en	es	e	e
DATIVE	em	em	er	en
GENITIVE	es	es	er	er

Standard analysis:
Syncretism is derived via (a) feature decomposition yielding natural classes of instantiations of grammatical categories; and (b) underspecification of morphological exponents with respect to these features. Among the (underspecified) exponents that realize a subset of the fully specified features characterizing the paradigm cell, the most specific one is chosen.

Refs.: Bierwisch (1967), Blevins (1995), Sauerland (1996), Wunderlich (1997b), Wiese (1999), Gallmann (2004), Trommer (2005b), Sternefeld (2006)

64.2. A Standard Underspefication-Based Approach

(442) *Feature Decomposition* (Bierwisch (1967), Wiese (1999)):

a. *Case*

NOM:	[–obl,–gov]
ACC:	[–obl,+gov]
DAT:	[+obl,+gov]
GEN:	[+obl,–gov]

b. *Gender/Number*

MASC:	[+masc,–fem]
FEM:	[–masc,+fem]
NEUT:	[+masc,+fem]
PL:	[–masc,–fem]

(443)

a.	[+masc,+obl,+gov] ↔ /m/[1]	(dat.masc.sg./neut.sg.)
b.	[+masc,+obl] ↔ /s/[2]	(gen.masc.sg./neut.sg.)
c.	[+masc,+fem] ↔ /s/[3]	(nom./acc.neut.sg.)
d.	[+masc,+gov] ↔ /n/[4]	(acc.masc.sg.)
e.	[+masc] ↔ /r/[5]	(nom.masc.sg.)
f.	[+obl,+fem] ↔ /r/[6]	(dat./gen.fem.sg.)
g.	[+obl,+gov] ↔ /n/[7]	(dat.pl.)
h.	[+obl] ↔ /r/[8]	(gen.pl.)
i.	[ ] ↔ /e/[9]	(nom./acc.fem.sg./pl.)

(444) Feature hierarchy for specificity:
[+masc] > [+obl] > [+fem] > [+gov].

64.3. The Approach to Syncretism in Müller (2011)

1. There is *no underspecification* of exponents.

2. Not all members of a paradigm (exponents) are present in the input; only *leadings forms* are (see Wurzel (1984), Blevins (2004), Finkel & Stump (2007; 2009), Albright (2008), and Baerman (2009) on somewhat related concepts).

3. A mismatch of paradigm cells and leadings forms gives rise to syncretism: Initial gaps are filled by using "wrong", i.e., *unfaithful exponents* (Weisser (2007)).

4. Mismatches between the exponent's specification and the target specification are minimized; this is not accomplished by a single *Minimality* condition (cf. the *Nearest Neighbour Principle* in Weisser (2007, 26), or the *Minimality* principle in Lahne (2007a, 11)), but by a set of *ranked faithfulness constraints* for the features involved (as in Grimshaw (2001), Trommer (2001; 2006a), Wunderlich (2004); however, these authors all crucially rely on underspecification).

5. *Feature decomposition* yielding natural classes is needed exactly as before.

6. The resulting approach can be viewed as a way to provide a principled, highly restrictive optimality-theoretic concept of a *rule of referral* (Zwicky (1985), Stump (2001), and Baerman, Brown & Corbett (2005)).

64.4. Leading Forms

(445) *Determiner inflection in German*

dies 'this'	MASC.SG	NEUTER.SG	FEMININE.SG	PLURAL
NOMINATIVE	*r*	s	*e*	e
ACCUSATIVE	*n*	*s*	e	e
DATIVE	*m*	m	r	*n*
GENITIVE	*s*	s	*r*	*r*

(446) *Nine leading forms*:
/r/$_1$ ↔ [+masc,–fem,–gov,–obl]
/n/$_2$ ↔ [+masc,–fem,+gov,–obl]
/m/$_3$ ↔ [+masc,–fem,+gov,+obl]
/s/$_4$ ↔ [+masc,–fem,–gov,+obl]
/s/$_5$ ↔ [+masc,+fem,+gov,–obl]
/e/$_6$ ↔ [–masc,+fem,–gov,–obl]
/n/$_7$ ↔ [–masc,–fem,+gov,+obl]
/r/$_8$ ↔ [–masc,+fem,–gov,+obl]
/r/$_9$ ↔ [–masc,–fem,–gov,+obl]

64.5. Optimality-Theoretic Constraints

(447) MATCH (undominated, possibly part of GEN):
The morpho-syntactic features of stem and exponent are identical in the output.

(448) *Faithfulness constraints for features on exponents*

a. IDENTMASC:
[±masc] of the input must not be changed in the output on an exponent.
b. IDENTOBL:
[±obl] of the input must not be changed in the output on an exponent.
c. IDENTFEM:
[±fem] of the input must not be changed in the output on an exponent.

d. IDENTGOV:
[±gov] of the input must not be changed in the output on an exponent.

(449) *Ranking*:
IDENTMASC ≫ IDENTOBL ≫ IDENTFEM ≫ IDENTGOV

64.6. Incomplete Paradigms

(450) *Incomplete paradigm with leading forms only*

dies 'this'	MASC.SG	NEUTER.SG	FEMININE.SG	PLURAL
[–gov,–obl]	/r/$_1$		/e/$_6$	
[+gov,–obl]	/n/$_2$	/s/$_5$		
[+gov,+obl]	/m/$_3$			/n/$_7$
[–gov,+obl]	/s/$_4$		/r/$_8$	/r/$_9$

64.7. Sample Paradigms

Tableau T_{26}: Nom.Neut.Sg. contexts

Input: dies ↔ [+masc,+fem,–gov,–obl], EXP	MATCH	IDENT MASC	IDENT OBL	IDENT FEM	IDENT GOV
O_1: dies-r$_1$ ↔ [+masc,*–fem*,–gov,–obl]				*!	
O_2: dies-n$_2$ ↔ [+masc,*–fem*,*+gov*,–obl]				*!	*
O_3: dies-m$_3$ ↔ [+masc,*–fem*,*+gov*,*+obl*]			*!	*	*
O_4: dies-s$_4$ ↔ [+masc,*–fem*,–gov,*+obl*]			*!	*	
☞ O_5: dies-s$_5$ ↔ [+masc,+fem,*+gov*,–obl]					*
O_6: dies-e$_6$ ↔ [*–masc*,+fem,–gov,–obl]		*!			
O_7: dies-n$_7$ ↔ [*–masc*,*–fem*,*+gov*,*+obl*]		*!	*	*	*
O_8: dies-r$_8$ ↔ [*–masc*,+fem,–gov,*+obl*]		*!	*		
O_9: dies-r$_9$ ↔ [*–masc*,*–fem*,–gov,*+obl*]		*!	*	*	
O_{10}: dies-r$_1$ ↔ [+masc,–fem,–gov,–obl]	*!				

Note:
EXP is an abstract case exponent that stands for the set of possible (fully specified) exponents of the inventory (see RED in McCarthy & Prince (1994)).

64.8. Spreading

(451) *Complete paradigm with spreading of leading forms*

dies 'this'	MASC.SG [+masc,–fem]	NEUTER.SG [+masc,+fem]	FEMININE.SG [–masc,+fem]	PLURAL [–masc,–fem]
[–gov,–obl]	/r/$_1$	↑	/e/$_6$	→
[+gov,–obl]	/n/$_2$	/s/$_5$	↓	↘
[+gov,+obl]	/m/$_3$	→	↑	/n/$_7$
[–gov,+obl]	/s/$_4$	→	/r/$_8$	/r/$_9$

Tableau T_{27}: Acc.Pl. contexts

Input: dies ↔ [–masc,–fem,+gov,–obl], Exp	Match	Ident Masc	Ident Obl	Ident Fem	Ident Gov
O_1: dies-r_1 ↔ [+*masc*,–fem,–*gov*,–obl]		*!			*
O_2: dies-n_2 ↔ [+*masc*,–fem,+gov,–obl]		*!			
O_3: dies-m_3 ↔ [+*masc*,–fem,+gov,+*obl*]		*!	*		
O_4: dies-s_4 ↔ [+*masc*,–fem,–*gov*,+*obl*]		*!	*		*
O_5: dies-s_5 ↔ [+*masc*,+*fem*,+gov,–obl]		*!		*	
☞ O_6: dies-e_6 ↔ [–masc,+*fem*,–*gov*,–obl]				*	*
O_7: dies-n_7 ↔ [–masc,–fem,+gov,+*obl*]			*!		
O_8: dies-r_8 ↔ [–masc,+*fem*,–*gov*,+*obl*]			*!	*	*
O_9: dies-r_9 ↔ [–masc,–fem,–*gov*,+*obl*]			*!		*
O_{10}: dies-r_1 ↔ [+masc,–fem,–gov,+obl]	*!				

Tableau T_{28}: Dat.Fem.Sg. contexts

Input: dies ↔ [–masc,+fem,+gov,+obl], Exp	Match	Ident Masc	Ident Obl	Ident Fem	Ident Gov
O_1: dies-r_1 ↔ [+*masc*,–*fem*,–*gov*,–*obl*]		*!	*	*	*
O_2: dies-n_2 ↔ [+*masc*,–*fem*,+gov,–*obl*]		*!	*	*	
O_3: dies-m_3 ↔ [+*masc*,–*fem*,+gov,+obl]		*!		*	
O_4: dies-s_4 ↔ [+*masc*,–*fem*,–*gov*,+obl]		*!		*	*
O_5: dies-s_5 ↔ [+*masc*,+fem,+gov,–*obl*]		*!	*		
O_6: dies-e_6 ↔ [–masc,+fem,–*gov*,–*obl*]			*!		*
O_7: dies-n_7 ↔ [–masc,–*fem*,+gov,+obl]				*!	
☞ O_8: dies-r_8 ↔ [–masc,+fem,–*gov*,+obl]					*
O_9: dies-r_9 ↔ [–masc,–*fem*,–*gov*,+obl]				*!	*
O_{10}: dies-r_1 ↔ [+masc,–fem,–gov,+obl]	*!				

Note:
To some extent, the decisions on which occurrence of an exponent's distribution is to count as primary (i.e., qualify as the leading form), and which occurrences of the distribution are secondary (involving a violation of faithfulness) have been *arbitrary* from a purely synchronic, grammar-internal point of view.

However:
Evidence for occurrence asymmetries of inflectional exponents comes from other domains (i.e., outside grammatical theory) which can be addressed by research in areas like *diachronic linguistics*, *corpus linguistics*, and *psycholinguistics*.

64.9. Restrictiveness of the Approach

As it stands, the approach does not derive *elsewhere distributions*.

(452) a. *Leading forms*

x	
	y

b. *Intended spreading*

x	→
↓	y

Multidirectional spreading:
It seems that in order to derive something like (452-b), *contextual faithfulness* is needed in the absence of *radically underspecified elsewhere markers*.

Note:
A *learning algorithm* for elsewhere distributions of syncretism is necessarily much more complex than a learning algorithm for systems where all instances of syncretism can be derived by reference to natural classes, without reference to elsewhere or default exponents (see Pertsova (2007) on the "No-Homonymy Learner" and the "Elsewhere Learner").

65. An Optimality-Theoretic Approach to Deponency

65.1. General Features of the OT Approach to Deponency

1. As with the optimality-theoretic approach to syncretism sketched above, an *unfaithful (leading) exponent* emerges as optimal.

2. However, the trigger is not an initial paradigmatic gap (absence of a leading form) but a *lexical specification* on the stem (a feature co-occurrence restriction (FCR), see Gazdar et al. (1985)) that expresses an incompatibility with the regular exponent's morpho-syntactic features.

3. The *fewer features* the FCR excludes, the *more cells* will be affected by the deponency.

4. The *more stems* the FCR applies to, the *more general* the deponency pattern will be.

5. As with many other approaches to deponency (e.g., Embick (2000), Kiparsky (2005), Bobaljik (2007), Hippisley (2007), Schulz (2010)), *defectivity* does not automatically follow as a general property of deponency. It is logically independent and where it holds, it must be derived by some additional means.

6. The analysis predicts that unfaithful exponents chosen in cases of deponency are *not arbitrary* (as is the case, e.g., with the Network Morphology analyses developed in Hippisley (2007) for Latin deponent verbs and Archi deponent nouns, and in Brown (2006) for spurious antipassive in Chukchi, verbal case on nouns in Kayardild, and polarity effects with telic and atelic verb stems in Tülatulabal; or with the Paradigm Function Morphology analyses in Sadler & Spencer (2001), Stump (2006)). Rather, the unfaithful exponents must differ *minimally* from the regularly expected exponent.

65.2. Deponent Nouns in Archi

Refs.: Kibrik (1991; 2003), Mel'čuk (1999), Corbett (2007), Hippisley (2007), Keine & Hein (2010)

(453) Partial paradigm of some regular nouns in Archi

	aInš ('apple')		*qIin* ('bridge')		*áʕrum* ('sickle')	
	SG	PL	SG	PL	SG	PL
ABS	aInš-Ø	aInš-um	qIin-Ø	qionn-or	áʕrum-Ø	áʕrum-mul
ERG	aInš-li	aInš-um-čaj	qIin-i	qionn-or-čaj	áʕrum-li	áʕrum-mul-čaj
GEN	aInš-li-n	aInš-um-če-n	qIin-i-n	qionn-or-če-n	áʕrum-li-n	áʕrum-mul-če-n
DAT	aInš-li-s	aInš-um-če-s	qIin-i-s	qionn-or-če-s	áʕrum-li-s	áʕrum-mul-če-s
COMIT	aInš-li-ɬ:u	aInš-um-če-ɬ:u	qIin-i-ɬ:u	qionn-or-če-ɬ:u	áʕrum-li-ɬ:u	áʕrum-mul-če-ɬ:u
...						

Note:
The system involves (i) *parasitic (Priscianic) formation*, where oblique case forms are derived from the ERG form; and (ii) *extended exponence*: /li/ is an ergative singular exponent; /čaj/ is an ergative plural exponent; and /um/, /or/, /mul/ are plural exponents sensitive to noun class.

(454) Partial paradigm of deponent nouns with plural markers in singular contexts

	haʕtəra ('river')		*c′aj* ('female goat')	
	SG	PL	SG	PL
ABS	haʕtəra-Ø	haʕtər-mul	c′aj-Ø	c′ohor-Ø
ERG	haʕtər-*čaj*	haʕtər-mul-čaj	c′ej-*taj*	c′ohor-čaj
...				

Note:
Choice of *t̄aj* vs. *čaj* is determined by consonant-final vs. vowel-final roots.

(455) *Partial paradigm of the deponent (and suppletive) noun 'xʕon' with singular markers in plural contexts*

	xʕon ('cow')	
	SG	PL
ABS	xʕon-Ø	buc:′i
ERG	xʕin-i	buc:′i-*li*
...		

65.2.1. Optimality-Theoretic Analysis of Deponent Nouns in Archi

(456) *Case and number features*:

a. *Case*

ABS:	[–obl]
ERG:	[+obl]
DAT:	[+obl,+gov]
...	

b. *Number*

SG:	[–pl]
PL:	[+pl]

(457) MATCH (undominated, possibly part of GEN):
The morpho-syntactic features of stem and exponent are identical in the output.

(458) LEX (undominated, possibly part of GEN):
A stem with FCR *[α] cannot be combined with an exponent bearing [α] in the input (where α is a – possibly singleton – set of morpho-syntactic features).

Reference to inputs:
LEX refers to the input properties of an exponent, *not* to its output properties (which may have been changed, triggered by MATCH). See Trommer (2006a), Stoppel (2010) for this kind of reference to inputs in optimality-theoretic constraints. One way to implement this would be to assume that LEX applies to structure-building directly (in which case candidates violating it would not be part of the competition).

(459) *Faithfulness constraints for features on exponents*

a. IDENTOBL(IQUE):
[±obl] of the input must not be changed in the output on an exponent.

b. IDENTNUM(BER):
[±pl] of the input must not be changed in the output on an exponent.

65.2.2. Sample Optimizations

Tableau T_{29}: Erg.Pl., faithful winner

Input: haʕtər-mul- ↔ [+obl,+pl], EXP **[+obl,–pl]*	LEX	MATCH	IDENT OBL	IDENT NUM
O_1: haʕtər-mul-li ↔ I: [+obl,–*pl*] O: [+obl,+pl]	*!			*
O_2: haʕtər-mul-Ø ↔ I: [–*obl*,–*pl*] O: [+obl,+pl]			*!	*
☞ O_3: haʕtər-mul-čaj ↔ I: [+obl,+pl] O: [+obl,+pl]				

Note:
Strictly speaking, there are two EXP morphemes associated with the stem in the plural; but class-dependent optimization of the first EXP (yielding plural marker *mul*) is orthogonal to the deponency issue, and hence omitted here. (Similarly for further oblique case markers.)

Tableau T_{30}: Erg.Sg., unfaithful winner

Input: haʕtər- ↔ [+obl,–pl], EXP **[+obl,–pl]*	LEX	MATCH	IDENT OBL	IDENT NUM
O_1: haʕtər-li ↔ I: [+obl,–pl] O: [+obl,–pl]	*!			
O_2: haʕtəra-Ø ↔ I: [–*obl*,–pl] O: [+obl,–pl]			*!	
☞ O_3: haʕtər-čaj ↔ I: [+obl,+*pl*] O: [+obl,–pl]				*

Note:
No attempt is made here to account for stem selection/suppletion. As with multiple EXP optimization, this issue is orthogonal to the deponency issue.

Tableau T_{31}: Erg.Sg., faithful winner

Input: xʕon- ↔ [+obl,–pl], Exp **[+obl,+pl]*	Lex	Match	Ident Obl	Ident Num
☞ O_1: xʕon-i ↔ I: [+obl,–pl] O: [+obl,–pl]				
O_2: xʕon-Ø ↔ I: [*–obl*,–pl] O: [+obl,–pl]			*!	
O_3: xʕon-čaj ↔ I: [+obl,*+pl*] O: [+obl,–pl]	*!			*

Tableau T_{32}: Erg.Pl., unfaithful winner

Input: buc:′i- ↔ [+obl,+pl], Exp **[+obl,+pl]*	Lex	Match	Ident Obl	Ident Num
☞ O_1: buc:′i-li ↔ I: [+obl,*–pl*] O: [+obl,+pl]				*
O_2: buc:′i-Ø ↔ I: [*–obl*,*–pl*] O: [+obl,+pl]			*!	*
O_3: buc:′i-čaj ↔ I: [+obl,+pl] O: [+obl,–pl]	*!			

65.3. Deponent Nouns in Tsez

Refs.: Corbett (2007), Spencer (2007)

(460) Partial paradigm of regular noun *besuro* ('fish')

	SG	PL
ABS	besuro-Ø	besuro-bi
GEN 1	besuro-Ø-s	besuro-za-s
INES/ERG	besur-Ø-ā	besuro-z-ā
...		

(461) Partial paradigm of deponent noun *xexbi* ('child(ren)')

	SG	PL
ABS	xex-bi	xex-bi
GEN 1	xex-za-s	xex-za-s
INES/ERG	xex-z-ā	xex-z-ā
...		

Assumption:
/bi/ is a plural exponent, /Ø/ is a singular exponent, /za/ is an oblique plural exponent, /s/ and /ā/ are pure oblique case exponents.
An interesting consequence:
Even in simple absolutive singular noun forms like *besuro-Ø*, ('fish'), there must be a number position (Exp) that needs to be filled by some marker (which then must regularly be Ø) under present assumptions. Otherwise, there would be no motivation for the system to provide an unfaithful plural marker in singular contexts.

Tableau T_{33}: Abs.Sg., unfaithful winner

Input: xex- ↔ [–obl,–pl], Exp **[–pl]*	Lex	Match	Ident Obl	Ident Num
O_1: xex-Ø ↔ I: [+obl,–pl] O: [+obl,–pl]	*!			
☞ O_2: xex-bi ↔ I: [+obl,*+pl*] O: [+obl,–pl]				*

Tableau T_{34}: Gen1.Sg., unfaithful winner

Input: xex- ↔ [+obl,–pl], Exp, -s **[–pl]*	Lex	Match	Ident Obl	Ident Num
O_1: xex-Ø-s ↔ I: [+obl,–pl] O: [+obl,–pl]	*!			
☞ O_2: xex-za-s ↔ I: [+obl,*+pl*] O: [+obl,–pl]				*

Note:
The genitive 1 marker /-s/ would strictly speaking have to enter the optimal output form by (trivial) optimization; as before, the issue is irrelevant for questions of deponency.

65.4. Deponent Stems in Tübatulabal

Refs.: Baerman (2007), Brown (2006), and references cited there.
Observation:
Tübatulabal (Uto-Aztecan) exhibits a *polarity* effect in deponency. There is stem alternation via reduplication with telic vs. atelic verbs. Normally, the telic stem is generated by reduplication on the basis of the atelic stem; however, there are some thirty verbs where the telic stem is in fact the basis, and the atelic stem is formed by reduplication.

(462) *Regular verbs*:

atelic	telic	
ela-	eʔela-	'jump'
tɨk-	ɨtɨk	'eat'
tana-	andana-	'get down'

(463) *Polar verbs*:

atelic	telic	
anaŋ-	naŋ-	'cry'
andaŋ-	taŋ-	'kick'
ʊnʊŋ-	nʊŋ-	'pound'

Assumption:
There are two exponents; /Ø/ ↔ [–telic]; /RED/ ↔ [+telic].

Problem:
telic
on deponent V will produce a reduplicated stem for atelic contexts, but not yet a simple stem for telic contexts; similarly, *[+telic] on deponent V will produce a simple stem for telic contexts, but not yet a reduplicated stem for atelic contexts.

Assumption:
There are variables over feature values (α notation, Chomsky & Halle (1968)): A [+telic] stem cannot combine with an exponent that is [–telic] in the input; a [–telic] stem cannot combine with an exponent that is [+telic].

(464) *Lexical entries for regular and deponent verbs*:

a. ela- ↔ [αtelic]
b. naŋ- ↔ [αtelic]
[*αtelic]

Note:
α is realized as + or – as soon as the verb is taken out of the lexicon and enters grammar.

Tableau T_{35}: deponent verb, atelic; unfaithful winner

Input: Exp, naŋ- ↔ [–telic] *[–telic]	Lex	Match	Ident Tel
O_1: Ø-naŋ- ↔ I: [–telic] O: [–telic]	*!		
☞ O_2: red-naŋ- ↔ I: [*+telic*] O: [–telic]			*

Tableau T_{36}: deponent verb, telic; unfaithful winner

Input: Exp, naŋ- ↔ [+telic] *[+telic]	Lex	Match	Ident Tel
☞ O_1: Ø-naŋ- ↔ I: [*–telic*] O: [+telic]			*
O_2: red-naŋ- ↔ I: [+telic] O: [+telic]	*!		

Tableau T_{37}: regular verb, telic; faithful winner

Input: Exp, ela- ↔ [+telic]	Lex	Match	Ident Tel
O_1: Ø-naŋ- ↔ I: [*–telic*] O: [+telic]			*!
☞ O_2: red-naŋ- ↔ I: [+telic] O: [+telic]			

In the same way, the Ø-prefixed stem wins in atelic contexts with regular verbs.

65.5. Spurious Antipassive in Chukchi

(465) *Spurious Antipassive in Chukchi*:
ə-nan ɣəm Ø-*ine*-ɬʔu-ɣʔi
he-erg I(abs) 3.sg.subj(intr)-ap-see-3.sg.subj(intr)

'He saw me.'

Observation:
In certain marked combinations of external and internal argument (3.sg>1.sg, 2>1.sg, 2>1.pl), antipassive morphology is required even though the the clause stays transitive (and the external argument bears ergative case).

(466) Sketch of an analysis:

a. /Ø/ ↔ [–apass]
b. /ine/ ↔ [+apass]
c. /α/[+V]:
[3.sg.>1.sg,–apass]
[2>1.sg,–apass]
[2>1.pl,–apass]

Violated faithfulness constraint in optimal deponent outputs: IdentApass

65.6. Deponent Verbs in Latin

Deponent Verbs in Latin

(467) Deponent verbs:
/α/[+V,+dep]:
[–pass]

(468) Semi-deponent verbs:
/α/[+V,+dep]:
[–pass,+perf]

Violated faithfulness constraint in optimal deponent outputs: IdentPass.

Note:
This does not yet derive defectivity. This can be handled by *output/output constraints*.

66. Background

- *Harmonic serialism in phonology*:
  McCarthy (2008; 2010), McCarthy et al. (2012), Kimper (2012), Pater (2012), ...
  (also see Prince & Smolensky (1993; 2004) for the general option, and McCarthy (2000) for an early negative assessment)
- *Harmonic serialism in syntax*:
  Heck & Müller (2007; 2013a;b), Assmann, Georgi, Heck, Müller & Weisser (2015)
  (predecessors: Ackema & Neeleman (1998), Heck (1998; 2001), Heck & Müller (2000; 2003))
- *Harmonic serialism in morphology*:
  □

Claim:
Extended exponence provides an empirical domain in which an approach in terms of harmonic serialism suggests itself.

67. Extended Exponence

Origin (Matthews (1972b, 82), Matthews (1974, 149)):
Extended (multiple) exponence in Greek verb inflection, English verb inflection, etc.

Extended exponence:
Cases of morphological realization where a single morpho-syntactic property seems to be expressed by more than one exponent (i.e., inflection marker, in the cases to be considered here).

Empirical domain:
Interaction of argument encoding and number/person marking in:

- German (case-marking on nouns, number marking)
- Archi (case-marking on nouns, number marking)
- Timucua (agreement morphology on verbs, person marking)
- Sierra Popoluca (agreement morphology on verbs, person marking)
- Swahili (negation and verb inflection)

67.1. German

Observation:
Plural can be marked twice on nouns in dative (DAT) contexts in German (Eisenberg (2000), Wiese (2000)). Note: *n* must be a DAT plural marker rather than a simple DAT marker because it does not show up in the singular.

(469) *Extended exponence in German nouns*:

a.	Kind-er-n	b.	*Kind-n	(German)
	child-PL-DAT.PL		child.SG-DAT.PL	
c.	Tisch-e-n	d.	*Tisch-n	
	table-PL-DAT.PL		table.SG-DAT.PL	

67.2. Archi

Observation:
The same phenomenon exists in the Daghestanian language Archi (Kibrik (1991; 2003), Mel'čuk (1999), Plank (1999)). Archi exhibits an ergative-absolutive (ERG-ABS) pattern of argument encoding. For a stem like *gel* ('cup'), the ERG plural is created by adding the plural marker *um* and the ERG plural marker *čaj* (in that order); for a stem like *qIin* ('bridge'), the ERG plural is derived by adding the plural marker *or* and, again, the ERG plural marker *čaj*; see (470-ac). As before, it is clear that *čaj* must be a marker of both case (ERG) and number (plural): This marker cannot be used in the singular, where the case markers *li*, *i* are used for marking ERG instead.

(470) *Extended exponence in Archi nouns*:

a.	gel-um-čaj	b.	gel-li	(Archi)
	cup-PL-ERG.PL		cup.SG-ERG	
c.	qIinn-or-čaj	d.	qIonn-i	
	bridge-PL-ERG.PL		bridge.SG-ERG	

67.3. Timucua

Observation:
A similar phenomenon can be found in the domain of verb inflection in Timucua, an extinct language isolate from Florida (Mithun (1999, 520); the discussion here is based on Granberry (1990)). Arguments are encoded by head-marking, i.e., case-sensitive agreement morphology on the verb; the pattern is a nominative-accusative one (NOM-ACC). (Assumption: case-assignment depends on Agree operations involving matching features (in the sense of Chomsky (2001)), so structural case (like NOM) is present both on the case-marked DP and the case-marking head; see, e.g., Bobaljik & Wurmbrand (2003)).)

(471) *Prefix markers*:

a. The internal argument of a transitive verb is encoded by an "object", i.e., ACC prefix.
b. Other primary arguments, including the external argument of a transitive verb, are encoded by a "subject", i.e., NOM prefix.
c. A NOM prefix precedes a ACC prefix in transitive contexts; the two markers occupy positions no. 1 and 2 in the template identified by Granberry.
d. These prefixes encode person (but not number) in addition to case:
   (i) two 1.NOM markers *ho-* and *ni-* (which "occur with approximately equal frequency"; Granberry (1990, 86))
   (ii) a 2.NOM marker *ci-*
   (iii) a zero 3.NOM marker Ø-.

(472) *Suffix markers*:

a. Many more types of affixes show up on the inflected Timucua verb, but they are all suffixes.
b. Among these: number markers indicating plural (in 7th position in Granberry's

template):

c. Crucially, these plural markers also involve case (NOM) and person (local vs. 3) information and thus qualify as combined PERS.NUMBER.NOM markers (not too unlike typical subject agreement markers in Indo-European languages like German or Icelandic).

d. The markers are *-bo* (for 1./2.PL.NOM arguments) and *-ma* (for 3.PL.NOM arguments).

(473) *Extended exponence in Timucua verbs*:

a. ho-ini-ta-la
1.NOM-be-ASP-LOC
'I am.'

b. ni-huba-so-si-bo-te-la (Timucua)
1.NOM-love-TR-REC-1/2.NOM.PL-ASP-LOC
'We love each other.'

c. ci-huba-so-te-le
2.NOM-love-TR-ASP-LOC
'You$_{sg}$ love (someone).'

d. ci-huba-so-bo-te-le
2.NOM-love-TR-1/2.NOM.PL-ASP-LOC
'You$_{pl}$ love (someone).'

e. ano Ø-hewa-na-no
man 3.NOM-speak-ASP-LOC
'The man is speaking.'

f. Ø-ini-ma-bi-la
3.NOM-be-3.NOM.PL-ASP-LOC
'They are just now.'

Note:

- (473-ace) involve singular subjects (1., 2., 3. person), with a prefix encoding person and case.
- (473-bdf) are corresponding examples with plural subjects (1., 2., 3. person) that exhibit extended exponence of case and person marking in Timucua.

(Other markers, irrelevant here: ASP (aspect, here: durative or bounded action), LOC (or TENSE: proximate vs. distant time), TR (transitivity), and REC (reciprocity); also note that *te/ta*, *le/la* are variants.)

67.4. Sierra Popoluca

Observation:
Sierra Popoluca (Mixe-Zoque, Mexico) employs a head-marking system of argument encoding that follows an ergative-absolutive pattern (ERG-ABS) (Elson (1960a, 29-30), Elson (1960b, 207-208)). As in Timucua, person can be marked twice on the verb.

(474) *Extended exponence in Sierra Popoluca verbs, intransitive contexts*:

a. A-nɨk-pa (Sierra Popoluca)
1.ABS-go-INC
'I am going.' (Marlett (1986, 364))

b. A-pɨːšiñ
1.ABS-man
'I am a man.'

c. Ta-hoːy-pa
1.INCL.ABS-take.a.walk-INC
'You and I take a walk.' (Elson (1960b, 208))

(475) *Extended exponence in Sierra Popoluca verbs, transitive contexts*:

a. A-Ø-koʔc-pa (Sierra Popoluca)
1.ABS-3.ERG-hit-INC
'He hits me.'

b. Ø-Aŋ-koʔc-pa
3.ABS-1.ERG-hit-INC
'I hit him.'

c. Ø-Taŋ-koʔc-pa
3.ABS-1.INCL.ERG-hit-INC
'You and I hit him.' (Elson (1960b, 208))

(476) *Order of verbal affixes in Sierra Popoluca*:
PERS.ABS – PERS.ERG – V – NUM – PASS – ASP

Note:
Number, passive, and aspect markers are ignored here.

(477) *Apparent fusional case/person markers in Sierra Popoluca*:

	ABS	ERG
1.	a	an
1.INCL	ta	tan
2.	mi	iñ
3.	Ø	i

	ABS ← ERG
1 → 2	man
2 → 1	an

Note:
This time, the evidence is not quite as direct, but it is there under an analysis that provides internal structure for the markers in (477), via subanalysis based on a decomposition of person features as in (478). The simplest analysis (that accounts for all instances of syncretism) will have to postulate that *a* is [+1], and that *t* is then marked [+1,+2] (Müller (2006b)). If so, there is extended exponence of [+1] in Sierra Popoluca.

(478) *Decomposition of person features* (Frampton (2002)):

a. [+1,–2] = 1. pers.
b. [–1,+2] = 2. pers.
c. [–1,–2] = 3. pers.
d. [+1,+2] = 1. pers. incl.

67.5. Swahili

Observation (Stump (2001, 162-163)):
Noyer's concept of secondary exponence [see below] is empirically problematic since there are cases where one and the same inflection marker must act as a primary exponent of a morpho-syntactic property in one context, and as a secondary exponent of the same morpho-syntactic property in another context.

(479) *Past tense and negation in Swahili 1. plural contexts*:

a. tu-li-taka (positive)
1.PL-PAST-want
'We wanted'

b. ha-tu-ku-taka (negative)
NEG-1.PL-NEG.PAST-want
'We did not want'

(480) *Future tense and negation in Swahili 1. plural contexts*:

a. tu-ta-taka (positive)
1.PL-FUT-want
'We will want'

b. ha-tu-ta-taka (negative)
NEG-1.PL-FUT-want
'We will not want'

67.6. Interim Conclusion

Conclusion so far:
Extended exponence exists in the argument encoding systems of German, Archi, Timucua, and Sierra Popoluca, and with negative verb inflection in Swahili.

Note:
That said, there are several cases where extended exponence has been argued to show up that may not be fully convincing upon closer inspection. For instance, Matthews (1974) argues for extended exponence on the basis of German plural formation per se, based on the fact that plural may be realized by a combination of segmental plural marker (like *er*) and Umlaut of the stem vowel, as in *Buch* ('book') vs. *Büch-er* ('books'). However, this evidence for extended exponence loses its force if we assume that Umlaut is encoded on plural markers as an abstract ('floating') feature; cf., e.g., Wiese (1996). Similar conclusions may be drawn in the case of deverbal noun formation in Kujamaat Jóola discussed in Aronoff & Fudeman (2005, 154), where a class marker change is accompanied by vowel tensing.

Question:
How do current theories of morphology deal with extended exponence?

State of the art:

1. *Lexical-incremental approaches* (e.g., Wunderlich (1996)):
Extended exponence is prima facie unexpected.
Possible solution (Stiebels (2015)): A second exponent of a given feature must primarily contribute *another feature*; in addition, reference to secondary *contextual features* is needed.

2. *Inferential-realizational approaches* (e.g., Matthews (1972b), Anderson (1992), Aronoff (1994), Stump (2001)):
Extended exponence is expected.

3. *Lexical-realizational approaches* (e.g., Halle & Marantz (1993), Noyer (1992), but also most of the morphematic optimality-theoretic approaches discussed in handout 8 on morphematic optimality-theoretic approaches: Grimshaw (2001), Don & Blom (2006), Trommer (2001; 2003; 2006a)):

- An exponent realizes one syntactic position (standard assumption, disjunctive ordering).
Extended exponence is prima facie unexpected. → Reference to secondary *contextual features* is needed.
- An exponent discharges a feature that it realizes (Noyer (1992), Trommer (1999b)):
Extended exponence is prima facie unexpected → References to secondary *discharged features* is needed.
- Müller (2007a): Reference to secondary (contextual, discharged) features can be dispensed with if post-syntactic *enrichment rules* are postulated that copy features before realization, and that act as the counterpart of *impoverishment rules*.

Observation:
The enrichment approach in Müller (2007a) is compatible with the existence of multiple exponents with an *identical* feature specification. Abstracting away from cases of *form replication* (i.e., multiple occurrence of the same exponents), this does not seem to occur. Caballero & Harris (2012) give a single example from Nahuatl that is supposed to exhibit "fully superfluous multiple exponence" but this may well be misanalyzed. (It is claimed that there can be two causative suffixes in some cases, *l* and *tia*, that correspond to only one instance of causativization; however, there no evidence for the independent availability of *l* as a causative marker, and synchronically the *l*-version might simply be an optional part of the causative exponent *tia*.)

Generalization:
Extended exponence is possible only when the morpho-syntactic features of two exponents are not identical (Stiebels (2015)); they can then (a) be in a subset relation ("partially superfluous multiple exponence", in the terminology of Caballero & Harris (2012), as in all the examples discussed here), or (b) not be in a subset relation ("overlapping multiple exponence", Caballero & Harris (2012)).

Problem:
It is not a priori clear how can this generalization be derived in a (morphematic) optimality-theoretic approach (of the type discussed in lecture 8 (Optimality Theory I: Morphematic Approaches)), given that an exponent whose morpho-syntactic features are a subset of the morpho-syntactic features of another exponent should be blocked as redundant.
(In contrast, overlapping exponence is unproblematic from an OT perspective.)

Claim:
This only holds for classical, parallel optimality theory, not for serial optimality theory.

68. Enrichment

Ref.: Müller (2007a)

(481) *Extended exponence in Archi nouns*:

a. gel-um-čaj
cup-PL-ERG.PL

b. gel-li (Archi)
cup.SG-ERG

c. qIinn-or-čaj
bridge-PL-ERG.PL

d. qIonn-i
bridge.SG-ERG

(482) *An enrichment rule that applies to (N-)F in Archi*:
Ø → [+pl]/[+pl],[+erg]__

(483) *Vocabulary items*:
a. /-um/ ↔ [+pl],[I]
b. /-or/ ↔ [+pl],[II]
c. /-čaj/ ↔ [+pl],[+erg]

Note:
Oblique case forms are generated on the basis of the ergative form: parasitc (Priscianic) formations (Matthews (1972b); Mel'čuk (1999, 8)). These forms are unproblematic if case features are also decomposed (see Bierwisch (1967), Franks (1995), Wiese (1999); and Kibrik (2003, 60-61) for an approach along these lines).

(484) *Paradigms of cases for 'gel' ('cup'), 'qIin' ('bridge')*:

	SG	PL
absolutive	gel	gel-um
ergative	gel-li	gel-um-čaj
genitive	gel-li-n	gel-um-če-n
dative	gel-li-s	gel-um-če-s
comparative	gel-li-Xur	gel-um-če-Xur
comitative	gel-li-łu	gel-um-če-łu
permutative	gel-li-L'ana	gel-um-če-L'ana

...

qIin ('Brücke')	sg	pl
absolutive	qIin-Ø	qIonn-or
ergative	qIinn-i	qIonn-or-čaj
genitive	qIinn-i-n	qIonn-or-če-n
dative	qIinn-i-s	qIonn-or-če-s

...

69. Extended Exponence in Harmonic Serialism

69.1. Assumptions

(485) *Harmonic serialism* (McCarthy (2010), Heck & Müller (2007)):
a. Given some input I_i, the candidate set $CS_i = \{O_{i1}, O_{i2}, ... O_{in}\}$ is generated by applying at most *one operation* to I_i.
b. The output O_{ij} with the best constraint profile is selected as optimal.
c. O_{ij} forms the input I_{ij} for the next generation step producing a new candidate set $CS_j = \{O_{ij1}, O_{ij2}, ... O_{ijn}\}$.
d. The output O_{ijk} with the best constraint profile is selected as optimal.
e. Candidate set generation stops (i.e., the derivation converges) when the output of an optimization procedure is identical to the input (i.e., when the constraint profile cannot be improved anymore).

(486) *Assumptions about morphology* (simplified):
a. The initial input is a stem plus a fully specified set of morpho-syntactic features that are realized by exponents which themselves can be underspecified.
b. The optimal exponent for some feature(s) is determined by a ranked set of faithfulness constraints (deriving compatibility and specificity requirements) and other (e.g., markedness) constraints (Grimshaw (2001), Don & Blom (2006), Trommer (2001; 2003; 2006a), Wunderlich (2004), Stiebels (2006)).

c. An exponent realizing the morpho-syntactic feature of a stem by attaching to it *discharges* the corresponding feature of the stem (Noyer (1992), Trommer (1999b)); a discharged feature remains visible and can be realized again, but cannot be discharged again: [F] → ~~[F]~~.

69.2. Case study: Archi

(487) *Extended exponence in Archi nouns*:
a. gel-um-čaj
cup-PL-ERG.PL

b. gel-li
cup.SG-ERG

(Archi)

c. qIinn-or-čaj
bridge-PL-ERG.PL

d. qIonn-i
bridge.SG-ERG

(488) *Exponents*:
a. /um/ ↔ [+pl,I]
b. /or/ ↔ [+pl,II]
c. /i/ ↔ [–pl,+erg]
d. /čaj/ ↔ [+pl,+erg]

Note:
I, II are inflection class features; these features are *morphomic* (Aronoff (1994)) rather than *morpho-syntactic*; they play no role whatsoever in syntax. Consequently, the cases of extended exponence in (487) involve subset relations (i.e., "partially superfluous" exponence).

(489) *Faithfulness constraints*:
a. IdentNum:
A number feature [F] on a stem is realized by an exponent with an identical feature.
b. IdentCase:
A case feature [F] on a stem is realized by an exponent with an identical feature.

(490) *Other constraints*:
a. MinDis ('Minimize Discharge'):
An operation does not discharge more than one feature.
b. UniqReal ('Uniqueness of Realization'):
A morpho-syntactic feature associated with a stem cannot be realized by more than one exponent.
c. ¬Con ('No Contradiction'):
Stem and exponent must not bear contradictory features.

Remarks:
(i) (490-a) basically demands agglutination and blocks portmanteau morphemes. (Also cf. Don & Blom (2006) on *Complex, discussed in lecture 8.)
(ii) (490-b) prohibits extended exponence.
(iii) (490-c) primarily ensures that stem and exponent do not bear contradictory inflection class features. This should not be formulated as an Ident constraint because it would otherwise be violated in all those cases where inflection class does not play any role (e.g., in the singular in Archi) – morphomic inflection class features inherent to a stem are never

discharged. In addition, ¬Con ensures that O_{114} in T_2 below does not accidentally block O_{115} (Fabian Heck (p.c.)). (¬Con is similar to Match as discussed in lectures 11 & 12, but Match requires identity of all the features of stem and exponent, whereas ¬Con only requires compatibility.)

69.3. A Harmonic Serialism Analysis

(491) *Ranking in Archi*:
¬Con ≫ IdentNum ≫ MinDis ≫ IdentCase ≫ UniqReal

T_{38}: Deriving gel-um-čaj, Step 1: Plural marking

I_1: /*gel*$_I$ [+pl,+erg]/	¬Con	IdNum	MinDis	IdCase	UReal
☞O_{11}: gel$_I$[~~+pl~~,+erg]-um[+pl,I]				*	
O_{12}: gel$_I$[~~+pl~~,+erg]-or[+pl,II]	*!			*	
O_{13}: gel$_I$[+pl,+erg]		*!		*	
O_{14}: gel$_I$[+pl,+erg]-i[–pl,+erg]	*!	*			
O_{15}: gel$_I$[~~+pl~~,~~+erg~~]-čaj[+pl,+erg]			*!		

T_{39}: Deriving gel-um-čaj, Step 2: Extended exponence

I_{11}: /*gel*$_I$ [~~+pl~~,+erg]-um[+pl,I]/	¬Con	IdNum	MinDis	IdCase	UReal
O_{111}: gel$_I$[~~+pl~~,+erg]-um[+pl,I]-um[+pl,I]				*!	*
O_{112}: gel$_I$[~~+pl~~,+erg]-um[+pl,I]-or[+pl,II]	*!			*	*
O_{113}: gel$_I$[~~+pl~~,+erg]-um[+pl,I]				*!	
O_{114}: gel$_I$[~~+pl~~,~~+erg~~]-um[+pl,I]-i[–pl,+erg]	*!				
☞O_{115}: gel$_I$[~~+pl~~,~~+erg~~]-um[+pl,I]-čaj[+pl,+erg]					*

T_{40}: Deriving gel-um-čaj, Step 3: Convergence

I_{115}: /*gel*$_I$ [~~+pl~~,+erg]-um[+pl,I]-čaj[+pl,+erg]/	¬Con	IdNum	MinDis	IdCase	UReal
O_{1151}: gel$_I$[~~+pl~~,~~+erg~~]-um[+pl,I]-čaj[+pl,+erg]-um[+pl,I]					**!
O_{1152}: gel$_I$[~~+pl~~,~~+erg~~]-um[+pl,I]-čaj[+pl,+erg]-or[+pl,II]	*!				**
☞O_{1153}: gel$_I$[~~+pl~~,~~+erg~~]-um[+pl,I]-čaj[+pl,+erg]					*
O_{1154}: gel$_I$[~~+pl~~,~~+erg~~]-um[+pl,I]-čaj[+pl,+erg]-i[–pl,+erg]	*!				**
O_{1155}: gel$_I$[~~+pl~~,~~+erg~~]-um[+pl,I]-čaj[+pl,+erg]-čaj[+pl,+erg]					**!*

Note:

- T_2 illustrates how extended exponence can become optimal: The second realization of [+pl] by /*čaj*/ does not violate MinDis because [+pl] already has been discharged in the prior optimization step.
- The way in which the competition is resolved in T_3 accounts for the absence of fully superfluous multiple exponence in the world's languages.
- Outputs with exponents bearing the wrong inflection class information are harmonically bounded.

(492) *Further rankings*:
a. ¬Con ≫ IdentNum ≫ IdentCase ≫ MinDis ≫ UniqReal:
☞*gel-čaj* → no extended exponence
b. ¬Con ≫ IdentNum ≫ MinDis ≫ UniqReal ≫ IdentCase :
☞*gel-um* → no extended exponence

69.4. Global Optimization

Note:
Ceteris paribus, global, parallel optimization as it is standardly assumed will always be incompatible with extended exponence, under any ranking. (In MinDis, "operation" stands for "input-output mapping".)

T_{41}: Global optimization: wrong winner

I_1: /*gel*$_I$ [+pl,+erg]/	¬Con	IdNum	MinDis	IdCase	UReal
☛O_{11}: gel$_I$[~~+pl~~,+erg]-um[+pl,I]				*	
O_{12}: gel$_I$[~~+pl~~,+erg]-or[+pl,II]	*!			*	
O_{13}: gel$_I$[+pl,+erg]		*!		*	
O_{14}: gel$_I$[+pl,~~+erg~~]-i[–pl,+erg]	*!	*			
O_{15}: gel$_I$[~~+pl~~,~~+erg~~]-čaj[+pl,+erg]			*!		
O_{16}: gel$_I$[~~+pl~~,~~+erg~~]-um[+pl,I]-čaj[+pl,+erg]			*!		*
O_{17}: gel$_I$[~~+pl~~,~~+erg~~]-čaj[+pl,+erg]-um[+pl,I]			*!		*

Note:
The problem is a high-ranked MinDis. However, alternative rankings like the ones in (492) will not produce extended exponence either under global optimization.

T_{42}: Global optimization, second attempt: wrong winner

I_1: /*gel*$_I$ [+pl,+erg]/	¬Con	IdNum	IdCase	MinDis	UReal
O_{11}: gel$_I$[~~+pl~~,+erg]-um[+pl,I]			*!		
O_{12}: gel$_I$[~~+pl~~,+erg]-or[+pl,II]	*!		*		
O_{13}: gel$_I$[+pl,+erg]		*!	*		
O_{14}: gel$_I$[+pl,~~+erg~~]-i[–pl,+erg]	*!	*			
☛O_{15}: gel$_I$[~~+pl~~,~~+erg~~]-čaj[+pl,+erg]				*	
O_{16}: gel$_I$[~~+pl~~,~~+erg~~]-um[+pl,I]-čaj[+pl,+erg]				*	*!
O_{17}: gel$_I$[~~+pl~~,~~+erg~~]-čaj[+pl,+erg]-um[+pl,I]				*	*!

Conclusion:
More generally, under global optimization, the candidate that has extended exponence will always be harmonically bounded by a candidate that leaves out one of the two markers. If MinDis is simply abandoned, the optimal candidate will always be one where the exponent realizing a subset of the other exponent's features is blocked.

Qualification:
This only holds for scenarios with a subset relation ("partially superfluous multiple exponence"), not for those where there is no subset relation ("overlapping multiple exponence"): In these latter cases, extended exponence can be brought about both in a harmonic serialism approach and in a harmonic parallelism approach (by a high ranking of two faithfulness constraints demanding realization of $[F_1]$ and $[F_2]$, which are present on two exponents α and β, respectively, that also share some feature $[F_3]$).

Observation:
Extended exponence in the other languages discussed above works in exactly the same way.

Predecessor:
Caballero & Inkelas (2013) introduce a *stratal OT* approach that can also cover extended exponence, and has the same fatal consequence for standard parallel optimization. Crucially, in the case of Archi, it is assumed that there are two strata (root to stem and stem to word), and *um*, by stipulation, belongs to the first stratum, and *čaj* to the second.

Differences between the stratal and the harmonic serialism approaches:

- What needs to be stipulated in the stratal approach (viz., why *um* comes first) is derived in the harmonic serialism approach (via MinDis).
- Depending on a number of further assumptions, the stratal approach could be compatible with fully superfluous extended exponence; deriving this is impossible under the harmonic serialism analysis.
- Whereas the case may or be not be dubious in Archi, for some of the above cases (e.g., dative plurals in German and agreement marking in Sierra Popoluca) it seems unlikely that the two markers participating in extended exponence can be argued to belong to two different strata.
- The order of the two exponents in negative marking in Swahili poses a potential problem for both approaches; both approaches must assume that the general negation marker becomes optimal before the negation/past marker is introduced in cases like (479-b) (*ha-tu-ku-taka*). However, it is hard to see how a stratal analysis that *defines* strata on the basis of roots can accomplish that.
- More generally, if "root → stem" defines the first stratum in Caballero & Inkelas (2013), then a partially superfluous exponent can never be non-adjacent to the root. This is certainly not the case for absolutive markers on verbs in Sierra Popoluca.

XIV. Optimality Theory 7: Harmonic Grammar

70. Background: Syncretism by Leading Forms, without Underspecification

70.1. Basic Assumptions and Data

The Approach to Syncretism in Müller (2011)

1. There is *no underspecification* of exponents.
2. Not all members of a paradigm (exponents) are present in the input; only *leadings forms* are (see Wurzel (1984), Blevins (2004), Finkel & Stump (2007; 2009), Albright (2008), and Baerman (2009) on somewhat related concepts).
3. A mismatch of paradigm cells and leadings forms gives rise to syncretism: Initial gaps are filled by using "wrong", i.e., *unfaithful exponents* (Weisser (2007)).
4. Mismatches between the exponent's specification and the target specification are minimized; this is not accomplished by a single *Minimality* condition (cf. the *Nearest Neighbour Principle* in Weisser (2007, 26), or the *Minimality* principle in Lahne (2007a, 11)), but by a set of *ranked faithfulness constraints* for the features involved (as in Grimshaw (2001), Trommer (2001; 2006a), Wunderlich (2004), etc.; however, these authors all crucially rely on underspecification – cf. handout Morphology I).
5. *Feature decomposition* yielding natural classes is needed exactly as before.
6. The resulting approach can be viewed as a way to provide a principled, highly restrictive optimality-theoretic concept of a *rule of referral* (Zwicky (1985), Stump (2001), and Baerman, Brown & Corbett (2005)).

(493) *Determiner inflection in German*

dies 'this'	MASC.SG	NEUTER.SG	FEMININE.SG	PLURAL
NOMINATIVE	*r*	s	*e*	e
ACCUSATIVE	*n*	*s*	e	e
DATIVE	*m*	m	r	*n*
GENITIVE	*s*	s	*r*	*r*

70.2. Analysis

(494) *Nine leading forms*:
/r/$_1$ ↔ [+masc,–fem,–gov,–obl]
/n/$_2$ ↔ [+masc,–fem,+gov,–obl]
/m/$_3$ ↔ [+masc,–fem,+gov,+obl]
/s/$_4$ ↔ [+masc,–fem,–gov,+obl]
/s/$_5$ ↔ [+masc,+fem,+gov,–obl]
/e/$_6$ ↔ [–masc,+fem,–gov,–obl]
/n/$_7$ ↔ [–masc,–fem,+gov,+obl]
/r/$_8$ ↔ [–masc,+fem,–gov,+obl]
/r/$_9$ ↔ [–masc,–fem,–gov,+obl]

Optimality-Theoretic Constraints

(495) MATCH (undominated, possibly part of GEN):
The morpho-syntactic features of stem and exponent are identical in the output.

(496) *Faithfulness constraints for features on exponents*
a. IDENTMASC:
[±masc] of the input must not be changed in the output on an exponent.
b. IDENTOBL:
[±obl] of the input must not be changed in the output on an exponent.
c. IDENTFEM:
[±fem] of the input must not be changed in the output on an exponent.
d. IDENTGOV:
[±gov] of the input must not be changed in the output on an exponent.

(497) *Ranking*:
IDENTMASC ≫ IDENTOBL ≫ IDENTFEM ≫ IDENTGOV

Incomplete Paradigms

(498) *Incomplete paradigm with leading forms only*

dies 'this'	MASC.SG	NEUTER.SG	FEMININE.SG	PLURAL
[–gov,–obl]	/r/$_1$		/e/$_6$	
[+gov,–obl]	/n/$_2$	/s/$_5$		
[+gov,+obl]	/m/$_3$			/n/$_7$
[–gov,+obl]	/s/$_4$		/r/$_8$	/r/$_9$

Note:
In what follows, EXP is an abstract case exponent that stands for the set of possible (fully specified) exponents of the inventory (see RED in McCarthy & Prince (1994)).

Tableau T_{43}: Nom.Neut.Sg. contexts

Input: dies ↔ [+masc,+fem,–gov,–obl], EXP	MATCH	IDENT MASC	IDENT OBL	IDENT FEM	IDENT GOV
O_1: dies-r$_1$ ↔ [+masc,*–fem*,–gov,–obl]				*!	
O_2: dies-n$_2$ ↔ [+masc,*–fem*,*+gov*,–obl]				*!	*
O_3: dies-m$_3$ ↔ [+masc,*–fem*,*+gov*,*+obl*]			*!	*	*
O_4: dies-s$_4$ ↔ [+masc,*–fem*,–gov,*+obl*]			*!	*	
☞ O_5: dies-s$_5$ ↔ [+masc,+fem,*+gov*,–obl]					*
O_6: dies-e$_6$ ↔ [*–masc*,+fem,–gov,–obl]		*!			
O_7: dies-n$_7$ ↔ [*–masc*,*–fem*,*+gov*,*+obl*]		*!	*	*	*
O_8: dies-r$_8$ ↔ [*–masc*,+fem,–gov,*+obl*]		*!	*		
O_9: dies-r$_9$ ↔ [*–masc*,*–fem*,–gov,*+obl*]		*!	*	*	
O_{10}: dies-r$_1$ ↔ [+masc,–fem,–gov,–obl]	*!				

Tableau T_{44}: Acc.Pl. contexts

Input: dies ↔ [–masc,–fem,+gov,–obl], EXP	MATCH	IDENT MASC	IDENT OBL	IDENT FEM	IDENT GOV
O_1: dies-r$_1$ ↔ [*+masc*,–fem,*–gov*,–obl]		*!			*
O_2: dies-n$_2$ ↔ [*+masc*,–fem,+gov,–obl]		*!			
O_3: dies-m$_3$ ↔ [*+masc*,–fem,+gov,*+obl*]		*!	*		
O_4: dies-s$_4$ ↔ [*+masc*,–fem,*–gov*,*+obl*]		*!	*		*
O_5: dies-s$_5$ ↔ [*+masc*,*+fem*,+gov,–obl]		*!		*	
☞ O_6: dies-e$_6$ ↔ [–masc,*+fem*,*–gov*,–obl]				*	*
O_7: dies-n$_7$ ↔ [–masc,–fem,+gov,*+obl*]			*!		
O_8: dies-r$_8$ ↔ [–masc,*+fem*,*–gov*,*+obl*]			*!	*	*
O_9: dies-r$_9$ ↔ [–masc,–fem,*–gov*,*+obl*]			*!		*
O_{10}: dies-r$_1$ ↔ [+masc,–fem,–gov,+obl]	*!				

Tableau T_{45}: Dat.Fem.Sg. contexts

Input: dies ↔ [–masc,+fem,+gov,+obl], EXP	MATCH	IDENT MASC	IDENT OBL	IDENT FEM	IDENT GOV
O_1: dies-r$_1$ ↔ [*+masc*,*–fem*,*–gov*,*–obl*]		*!	*	*	*
O_2: dies-n$_2$ ↔ [*+masc*,*–fem*,+gov,*–obl*]		*!	*	*	
O_3: dies-m$_3$ ↔ [*+masc*,*–fem*,+gov,+obl]		*!		*	
O_4: dies-s$_4$ ↔ [*+masc*,*–fem*,*–gov*,+obl]		*!		*	*
O_5: dies-s$_5$ ↔ [*+masc*,+fem,+gov,*–obl*]		*!	*		
O_6: dies-e$_6$ ↔ [–masc,+fem,*–gov*,*–obl*]			*!		*
O_7: dies-n$_7$ ↔ [–masc,*–fem*,+gov,+obl]				*!	
☞ O_8: dies-r$_8$ ↔ [–masc,+fem,*–gov*,+obl]					*
O_9: dies-r$_9$ ↔ [–masc,*–fem*,*–gov*,+obl]				*!	*
O_{10}: dies-r$_1$ ↔ [+masc,–fem,–gov,+obl]	*!				

Tableau T_{46}: A wrong prediction for Gen.Pl. contexts if /r/$_9$ is not present

Input: dies ↔ [–masc,–fem,–gov,+obl], Exp	Match	Ident Masc	Ident Obl	Ident Fem	Ident Gov
☛ O_7: dies-n$_7$ ↔ [–masc,–fem,+*gov*,+obl]					*
O_8: dies-r$_8$ ↔ [–masc,+*fem*,–gov,+obl]				*!	

(499) *Complete paradigm with spreading of leading forms*

dies 'this'	masc.sg [+masc,–fem]	neuter.sg [+masc,+fem]	feminine.sg [–masc,+fem]	plural [–masc,–fem]
[–gov,–obl]	/r/$_1$	↑	/e/$_6$	→
[+gov,–obl]	/n/$_2$	/s/$_5$	↓	↘
[+gov,+obl]	/m/$_3$	→	↑	/n/$_7$
[–gov,+obl]	/s/$_4$	→	/r/$_8$	/r/$_9$

Note:
To some extent, the decisions on which occurrence of an exponent's distribution is to count as primary (i.e., qualify as the leading form), and which occurrences of the distribution are secondary (involving a violation of faithfulness) have been *arbitrary* from a purely synchronic, grammar-internal point of view.

However:
Evidence for occurrence asymmetries of inflectional exponents comes from other domains (i.e., outside grammatical theory) which can be addressed by research in areas like *diachronic linguistics*, *corpus linguistics*, and *psycholinguistics*.

70.3. Restrictiveness of the Approach: No Elsewhere

As it stands, the approach does not derive *elsewhere distributions*.

(500) a. *Leading forms*

x	
	y

b. *Intended spreading*

x	→
↓	y

Bidirectional spreading:
It seems that in order to derive something like (500-b), *contextual faithfulness* (cf. Beckmann (1998) on positional faithfulness in phonology and Woolford (2007) for syntax) is needed in the absence of *radically underspecified elsewhere markers*.

(501) *Incomplete paradigm of German determiner inflection: a wrong prediction*

dies 'this'	feminine.sg [–masc,+fem]	plural [–masc,–fem]
[+gov,+obl]		/n/$_7$
[–gov,+obl]	/r/$_8$	

Note:
A *learning algorithm* for elsewhere distributions of syncretism is necessarily much more com-

Tableau T_{47}: A wrong prediction for Dat.Fem.Sg. contexts under reranking

Input: dies ↔ [–masc,+fem,+gov,+obl], Exp	Match	Ident Masc	Ident Obl	Ident Gov	Ident Fem
☛ O_7: dies-n$_7$ ↔ [–masc,–*fem*,+gov,+obl]					*
O_8: dies-r$_8$ ↔ [–masc,+fem,–*gov*,+obl]				*!	

Tableau T_{48}: Correct prediction for Gen.Pl. contexts without /r/$_9$: contextual faithfulness

Input: dies ↔ [–masc,–fem,–gov,+obl], Exp	Match	Ident Masc	Ident Obl	Ident Gov([–fem])	Ident Fem	Ident Gov
O_7: dies-n$_7$ ↔ [–masc,–fem,+*gov*,+obl]				*!		*
☞ O_8: dies-r$_8$ ↔ [–masc,+*fem*,–gov,+obl]					*	

plex than a learning algorithm for systems where all instances of syncretism can be derived by reference to natural classes, without reference to elsewhere or default exponents (see Pertsova (2007) on the "No-Homonymy Learner" and the "Elsewhere Learner").

(502) An Obvious Challenge: Verb Inflection in English

	Singular	Plural
1	am	*are*
2	*are*	*are*
3	is	*are*

(503) Underspecification approach (Subset Principle; standard):

a. /am/ ↔ [–2,–pl]
b. /is/ ↔ [–1,–2,–pl]
c. /are/ ↔ [ ]

(504) Overspecification approach (Superset Principle; Starke (2006), Caha (2007; 2008)):

a. /am/ ↔ [pres,part]
b. /is/ ↔ [pres]
c. /are/ ↔ [pres,part,addr,group]

Even more interesting: /s/ vs. Ø with regular verbs.

Solution for "to be" via contextual faithfulness:
Add a constraint IdentPers([–pl]); /are/ ↔ [–1,+2,+pl].

71. Czech Verb Inflection by Leading Forms, without Underspecification

Ref.: Englisch (2015)

(505) *Present tense of the Czech verb* prosit *'ask/beg'*

	sg	pl
1	pros-ím	pros-íme
2	pros-íš	pros-íte
3	pros-*í*	pros-*í*

Table 49: OT tableau for *pros-ím* 'beg-1SG'

I: pros ↔ [+1 −2 −pl]	MATCH	ID1	ID2	IDPL
a. ☞ pros-ím ↔ [+1 −2 −pl]				
b. pros-íme ↔ [+1 −2 **−pl**]				∗!
c. pros-íš ↔ [**+1** **−2** −pl]		∗(!)	∗(!)	
d. pros-íte ↔ [**+1** **−2** **−pl**]		∗(!)	∗(!)	∗
e. pros-í ↔ [**+1** −2 −pl]		∗(!)		
f. pros-í ↔ [−1 −2 −pl]	∗!			

Table 50: OT tableau for *pros-í* 'beg-3PL'

I: pros ↔ [−1 −2 +pl]	MATCH	ID1	ID2	IDPL
a. pros-ím ↔ [**−1** −2 **+pl**]		∗(!)		∗
b. pros-íme ↔ [**−1** −2 +pl]		∗(!)		
c. pros-íš ↔ [−1 **−2** **+pl**]			∗(!)	∗
d. pros-íte ↔ [−1 **−2** +pl]			∗(!)	
e. ☞ pros-í ↔ [−1 −2 **+pl**]				∗
f. pros-í ↔ [−1 −2 −pl]	∗!			

(506) First person: [+1 −2] Singular: [−pl] Past tense: [+pst]
Second person: [−1 +2] Plural: [+pl] Non-past: [−pst]
Third Person: [−1 −2]

(507) a. -ím ↔ [+1 −2 −pl]
b. -íme ↔ [+1 −2 +pl]
c. -íš ↔ [−1 +2 −pl]
d. -íte ↔ [−1 +2 +pl]
e. -í ↔ [−1 −2 −pl]

(508) MATCH
The morpho-syntactic features of stem and exponent are identical in the output.

(509) *Faithfulness constraints*

a. ID1
[±1] of the input must not be changed in the output of an exponent.

b. ID2
[±2] of the input must not be changed in the output of an exponent.

c. IDPL
[±pl] of the input must not be changed in the output of an exponent.

(510) MATCH ≫ { ID1, ID2 } ≫ IDPL

Problem (as before):
This kind of approach does not easily accomodate elsewhere distributions.

72. A Harmonic Grammar Approach to Syncretism

Ref.: Englisch (2015).

Table 51: HG tableau for *pros-ím* 'beg-1SG'

I: [+1 −2 −pl]	*H*	MATCH 6	ID1 2	ID2 2	IDPL 1
a. ☞ -ím ↔ [+1 −2 −pl]	0	0	0	0	0
b. -íme ↔ [+1 −2 **−pl**]	−1	0	0	0	−1
c. -íš ↔ [**+1** **−2** −pl]	−4	0	−1	−1	0
d. -íte ↔ [**+1** **−2** **−pl**]	−5	0	−1	−1	−1
e. -í ↔ [**+1** −2 −pl]	−2	0	−1	0	0
f. -í ↔ [−1 −2 −pl]	−6	−1	0	0	0

72.1. Reconstruction of the Analysis of Czech Verb Inflection

(511) *Harmony* (Pater; 2009: 1006)

$$H = \sum_{k=1}^{K} s_k w_k$$

(s = satisfaction score, w = weight)

(512) *Illustration of the gang effect in Harmonic Grammar*

I: [+α +β +γ]	*H*	IDα 3	IDβ 2	IDγ 2
a. ☞ [−α +β +γ]	−3	−1	0	0
b. [+α −β −β]	−4	0	−1	−1

Goal:
Reanalysis of the approach to Czech verb inflection in Harmonic Grammar.

(513) MATCH
For each feature in each marker, add −1 to the satisfaction score iff. the feature value differs from the value of the feature in the corresponding feature structure in the input.

(514) IDα
For each marker in the output, add −1 to the satisfaction score iff. its value for the feature [±α] differs from the value of [±α] in the corresponding leading form.

(515) *Constraints and their weights for Czech verbal inflection*

constraint	MATCH	ID1	ID2	IDPL
weight	6	2	2	1

72.2. Elsewhere Effects

(516) a. am ↔ [+1 −2 −pl −pst]
b. are ↔ [−1 +2 +pl −pst]
c. is ↔ [−1 −2 −pl −pst]
d. was ↔ [+1 −2 −pl +pst]
e. were ↔ [−1 +2 +pl +pst]

(517) *[−pl]
For each instance of the feature [−pl] in the output, add −1 to the satisfaction score.

Table 52: HG tableau for *pros-í* 'beg-3PL'

I: [−1 −2 +pl]	*H*	MATCH 6	ID1 2	ID2 2	IDPL 1
a. -ím ↔ [−**1** −2 +**pl**]	−3	0	−1	0	−1
b. -íme ↔ [−**1** −2 +pl]	−2	0	−1	0	0
c. -íš ↔ [−1 −**2** +**pl**]	−3	0	0	−1	−1
d. -íte ↔ [−1 −**2** +pl]	−2	0	0	−1	0
e. ☞ -í ↔ [−1 −2 +**pl**]	−1	0	0	0	−1
f. -í ↔ [−1 −2 −pl]	−6	−1	0	0	0

[Present tense]

	SG	PL
1	am	*are*
2	*are*	*are*
3	is	*are*

[Past tense]

	SG	PL
1	was	*were*
2	*were*	*were*
3	was	*were*

Table 53: Paradigm of the English verb *be*

(518) *Constraints and their weights for English*:

constraint	IDPST	IDPL	MATCH	*[−pl]	ID1	ID2
weight	19	19	3	2	2	2

(519) *HG tableau for the* 1PL *form of the English copula* be

I: [+1 −2 +pl]	*H*	IDPST 19	IDPL 19	MATCH 3	*[−pl] 2	ID1 2	ID2 2
a. am ↔ [+1 −2 −pl]	−5	0	0	−1	−1	0	0
b. ☞ are ↔ [+**1** −**2** +pl]	−4	0	0	0	0	−1	−1
c. is ↔ [+**1** −2 −pl]	−7	0	0	−1	−1	−1	0

(520) *HG tableau for the* 2SG *form of the English copula* be

I: [−1 +2 −pl]	*H*	IDPST 19	IDPL 19	MATCH 3	*[−pl] 2	ID1 2	ID2 2
a. am ↔ [−**1** +**2** −pl]	−6	0	0	0	−1	−1	−1
a.′ am ↔ [+1 −2 −pl]	−8	0	0	−2	−1	0	0
a.″ am ↔ [+1 +**2** −pl]	−7	0	0	−1	−1	0	−1
a.‴ am ↔ [−**1** −2 −pl]	−7	0	0	−1	−1	−1	0
b. ☞ are ↔ [−1 +2 +pl]	−3	0	0	−1	0	0	0
b.′ are ↔ [−1 +2 −**pl**]	−21	0	−1	0	−1	0	0
c. is ↔ [−1 +**2** −pl]	−4	0	0	0	−1	0	−1
c.′ is ↔ [−1 −2 −pl]	−5	0	0	−1	−1	0	0

Note:
The resulting system does not derive a full elsewhere pattern. Suppose that /am/ were not present. In that case, /is/ rather than /are/ would be the optimal candidate for first person singular contexts. Englisch (2015) claims that this is a correct result since it exactly corresponds to the distribution of exponents in past tense contexts.

References

Ackema, Peter & Ad Neeleman (1998): Optimal Questions, *Natural Language and Linguistic Theory* 16, 443–490.

Aissen, Judith (1999): Markedness and Subject Choice in Optimality Theory, *Natural Language and Linguistic Theory* 17, 673–711.

Aissen, Judith (2002): Bidirectional Optimization and the Problem of Recoverability in Head Marking Languages. Ms., University of California, Santa Cruz.

Aissen, Judith (2003): Differential Object Marking: Iconicity vs. Economy, *Natural Language and Linguistic Theory* 21, 435–483.

Albright, Adam (2002): The Identification of Bases in Morphological Paradigms. PhD thesis, University of California, Los Angeles.

Albright, Adam (2008): Inflectional Paradigms Have Bases Too. Arguments from Yiddish.. In: A. Bachrach & A. Nevins, eds., *The Bases of Inflectional Identity*. Oxford University Press, Oxford.

Albright, Adam & Bruce Hayes (2002): Modeling English Past Tense Intuitions with Minimal Generalization. In: M. Maxwell, ed., *Proceedings of the Sixth Meeting of the ACL Special Interest Group in Computational Phonology*. ACL, Philadelphia.

Alexiadou, Artemis (2013): Where Is Non-Active Morphology?. In: S. Müller, ed., *Proceedings of the 20th International Conference on Head-Driven Phrase Structure Grammar, FU Berlin*. CSLI Publications, Stanford, pp. 244–262.

Alexiadou, Artemis & Gereon Müller (2008): Class Features as Probes. In: A. Bachrach & A. Nevins, eds., *Inflectional Identity*. Oxford University Press, Oxford, pp. 101–155.

Alsina, Alex (1996): Passive Types and the Theory of Object Asymmetries, *Natural Language and Linguistic Theory* 14, 673–723.

Anderson, Stephen (1992): *A-Morphous Morphology*. Cambridge University Press, Cambridge.

Aronoff, Mark (1994): *Morphology by Itself*. MIT Press, Cambridge, Mass.

Aronoff, Mark & Kirsten Fudeman (2005): *What is Morphology?*. Blackwell, Oxford.

Arregi, Karlos & Andrew Nevins (2012): *Morphotactics: Basque Auxiliaries and the Structure of Spellout*. Springer, Heidelberg.

Assmann, Anke, Doreen Georgi, Fabian Heck, Gereon Müller & Philipp Weisser (2012): Ergatives Move Too Early. Ms., Universität Leipzig (*Linguistische Arbeits Berichte* 90, 2013). To appear in *Syntax*.

Assmann, Anke, Doreen Georgi, Fabian Heck, Gereon Müller & Philipp Weisser (2015): Ergatives Move Too Early. On an Instance of Opacity in Syntax, *Syntax* 18, 343–387.

Baerman, Matthew (2007): Morphological Typology of Deponency. In: M. Baerman, G. Corbett, D. Brown & A. Hippisley, eds., *Deponency and Morphological Mismatches*. Oxford University Press (for The British Academy), Oxford, pp. 1–19.

Baerman, Matthew (2009): Inflection Classes Through Profligate Syncretism?. Ms., University of Surrey. Talk at Workshop on Polyfunctionality and Underspecification, Leucorea.

Baerman, Matthew, Dunstan Brown & Greville Corbett (2005): *The Syntax-Morphology Interface. A Study of Syncretism*. Cambridge University Press, Cambridge.

Baker, Mark (2015): *Case. Its Principles and Parameters*. Cambridge University Press, Cambridge.

Beckmann, Jill (1998): Positional Faithfulness. PhD thesis, University of Massachusetts,

Amherst.
Behaghel, Otto (1911): *Geschichte der deutschen Sprache*. Trübner, Straßburg.
Bierkandt, Lennart (2006): Kasusmorphologie des Diyari. Ein Ansatz im Rahmen der Distribuierten Morphologie. In: G. Müller & J. Trommer, eds., *Subanalysis of Argument Encoding in Distributed Morphology*. Vol. 84 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 43–62.
Bierwisch, Manfred (1967): Syntactic Features in Morphology: General Problems of So-Called Pronominal Inflection in German. In: *To Honor Roman Jakobson*. Mouton, The Hague/Paris, pp. 239–270.
Bittner, Maria & Ken Hale (1996a): Ergativity: Toward a Theory of a Heterogeneous Class, *Linguistic Inquiry* pp. 531–604.
Bittner, Maria & Ken Hale (1996b): The Structural Determination of Case and Agreement, *Linguistic Inquiry* pp. 1–68.
Blake, Barry (1994): *Case*. Cambridge University Press, Cambridge.
Blevins, James (1995): Syncretism and Paradigmatic Opposition, *Linguistics and Philosophy* 18, 113–152.
Blevins, James (2004): Inflection Classes and Economy. In: G. Müller, L. Gunkel & G. Zifonun, eds., *Explorations in Nominal Inflection*. Mouton de Gruyter, Berlin, pp. 51–95.
Bobaljik, Jonathan (1993): Ergativity and Ergative Unergatives. In: C. Phillips, ed., *Papers on Case and Agreement II*. Vol. 19 of *MIT Working Papers in Linguistics*, MITWPL, MIT: Cambridge, Mass., pp. 45–88.
Bobaljik, Jonathan (2002a): Realizing Germanic Inflection: Why Morphology Does Not Drive Syntax, *Journal of Comparative Germanic Linguistics* 6, 129–167.
Bobaljik, Jonathan (2002b): Syncretism without Paradigms: Remarks on Williams 1981, 1994. In: G. Booij & J. van Marle, eds., *Yearbook of Morphology 2001*. Kluwer, Dordrecht, pp. 53–85.
Bobaljik, Jonathan (2003): Paradigms (Optimal and Otherwise): A Case for Skepticism. Ms., University of Connecticut, Storrs.
Bobaljik, Jonathan (2007): The Limits of Deponency: A Chukotko-Centric Perspective. In: M. Baerman, G. Corbett, D. Brown & A. Hippisley, eds., *Deponency and Morphological Mismatches*. Oxford University Press (for The British Academy), Oxford, pp. 175–201.
Bobaljik, Jonathan & Phil Branigan (2006): Eccentric Agreement and Multiple Case Checking. In: A. Johns, D. Massam & J. Ndayiragije, eds., *Ergativity*. Springer, pp. 47–77.
Bobaljik, Jonathan & Susanne Wurmbrand (2003): Relativized Phases. Ms., University of Connecticut, Storrs.
Bonami, Olivier & Gilles Boyé (2010): Opaque Paradigms, Transparent Forms. Ms., U. Paris-Sorbonne & U. Bordeaux 3.
Bonet, Eulália (1991): Morphology after Syntax. PhD thesis, MIT, Cambridge, Mass.
Bonet, Eulalia (1995): Feature Structure of Romance Clitics, *Natural Language and Linguistic Theory* 13, 607–647.
Börjesson, Kristin (2006): Argument Encoding in Slovene. A Distributed Morphology Analysis of Slovene Noun Declensions. In: G. Müller & J. Trommer, eds., *Subanalysis of Argument Encoding in Distributed Morphology*. Vol. 84 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 115–130.
Brown, Dunstan (2006): Formal Analyses of Chukchi, Kayardild, Tülatulabal. Ms., Surrey Morphology Group. Available from

http://www.smg.surrey.ac.uk/deponency/Deponency_ DATR_ analyses.htm.
Brown, Dunstan & Andrew Hippisley (2012): *Network Morphology*. Cambridge University Press, Cambridge.
Caballero, Gabriela & Alice Harris (2012): A Working Typology of Multiple Exponence. In: F. Kiefer et al., eds., *Current Issues in Morphological Theory: (Ir)Regularity, Analogy, and Frequency*. Benjamins, Amsterdam, pp. 163–188.
Caballero, Gabriela & Sharon Inkelas (2013): Word Construction: Tracing an Optimal Path Through the Lexicon, *Morphology* (23), 103–143.
Caha, Pavel (2007): The Shape of Paradigms. Ms., University of Tromsø.
Caha, Pavel (2008): The Case Hierarchy as Functional Sequence. In: M. Richards & A. Malchukov, eds., *Scales*. Vol. 86 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 247–276.
Caha, Pavel (2009): The Nanosyntax of Case. PhD thesis, Tromsø University.
Carnie, Andrew (2005): Some Remarks on Markedness Hierarchies, *Coyote Working Papers in Linguistics* 14.
Carstairs, Andrew (1986): Macroclasses and Paradigm Economy in German Nouns, *Zeitschrift für Phonetik, Sprachwissenschaft und Kommunikationsforschung* 39, 3–11.
Carstairs, Andrew (1987): *Allomorphy in Inflexion*. Croom Helm, London.
Carstairs-McCarthy, Andrew (1994): Inflection Classes, Gender, and the Principle of Contrast, *Language* 70, 737–787.
Carstairs-McCarthy, Andrew (1998): Paradigm Structure: Inflectional Paradigms and Morphological Classes. In: A. Spencer & A. Zwicky, eds., *Handbook of Morphology*. Blackwell, Oxford, pp. 322–334.
Carstairs-McCarthy, Andrew (2008): System-Congruity and Violable Constraints in German Weak Declension, *Natural Language and Linguistic Theory* 26, 775–793.
Chomsky, Noam (1965): *Aspects of the Theory of Syntax*. MIT Press, Cambridge, MA.
Chomsky, Noam (1995): *The Minimalist Program*. MIT Press, Cambridge, Mass.
Chomsky, Noam (2000): Minimalist Inquiries: The Framework. In: R. Martin, D. Michaels & J. Uriagereka, eds., *Step by Step*. MIT Press, Cambridge, Mass., pp. 89–155.
Chomsky, Noam (2001): Derivation by Phase. In: M. Kenstowicz, ed., *Ken Hale. A Life in Language*. MIT Press, Cambridge, Mass., pp. 1–52.
Chomsky, Noam & Morris Halle (1968): *The Sound Pattern of English*. MIT Press, Cambridge, Mass.
Comrie, Bernard (1978): Morphological Classification of Cases in the Slavonic Languages, *The Slavonic and East European Review* 56, 177–191.
Corbett, Greville (2005): The Canonical Approach in Typology. In: Z. Frajzyngier, A. Hodges & D. Rood, eds., *Linguistic Diversity and Language Theories*. John Benjamins, Amsterdam, pp. 25–49.
Corbett, Greville (2007): Deponency, Syncretism, and What Lies Between. In: M. Baerman, G. Corbett, D. Brown & A. Hippisley, eds., *Deponency and Morphological Mismatches*. Oxford University Press (for The British Academy), Oxford, pp. 21–43.
Corbett, Greville & Norman Fraser (1993): Network Morphology: A DATR Account of Russian Nominal Inflection, *Journal of Linguistics* 29, 113–142.
Corbett, Greville & Sebastian Fedden (2014): Multiple Categorization: The Case of Mian. Ms., Surrey Morphology Group.
Deal, Amy Rose (2014): Person-Based Split Ergativity in Nez Perce is Syntactic. Ms., Uni-

versity of California, Santa Cruz.
Di Sciullo, Anna Maria & Edwin Williams (1987): *On the Definition of Word*. MIT Press, Cambridge, Mass.
Dixon, R.M.W. (1972): *The Dyirbal Language of North Queensland*. Cambridge University Press, Cambridge.
Dixon, R.M.W. (1994): *Ergativity*. Cambridge University Press, Cambridge.
Don, Jan & Elma Blom (2006): A Constraint-Based Approach to Morphological Neutralization. In: *Linguistics in the Netherlands 2006*. Benjamins, Amsterdam, pp. 78–88.
Eisenberg, Peter (2000): *Grundriß der deutschen Grammatik. Band 1: Das Wort*. Metzler, Stuttgart.
Elson, Ben (1960a): *Gramatica Popoluca de la Sierra*. Number 6 *in* 'Gramáticas de Lenguas Indígenas de México', Biblioteca de la Facultad de Filosofía y Letras, Universidad Veracruzana.
Elson, Ben (1960b): Sierra Popoluca Morphology, *International Journal of American Linguistics* 20, 206–223.
Embick, David (2000): Features, Syntax, and Categories in the Latin Perfect, *Linguistic Inquiry* 31, 185–230.
Englisch, Johannes (2015): An Underspecification-Free Approach to Syncretism. Master's thesis, Universität Leipzig.
Fanselow, Gisbert (1991): Minimale Syntax. Habilitation thesis, Universität Passau.
Filimonova, Elena (2005): The Noun Phrase Hierarchy and Relational Marking: Problems and Counterevidence, *Linguistic Typology* 9, 77–113.
Finkel, Raphael & Gregory Stump (2007): Principal Parts and Morphological Typology, *Morphology* 17, 39–75.
Finkel, Raphael & Gregory Stump (2009): Principal Parts and Degrees of Paradigmatic Transparency. In: J. P. Blevins & J. Blevins, eds., *Analogy in Grammar: Form and Acquisition*. Oxford University Press, Oxford, pp. 13–53.
Fischer, Silke (2001): On the Integration of Cumulative Effects into Optimality Theory. In: G. Müller & W. Sternefeld, eds., *Competition in Syntax*. Mouton/de Gruyter, Berlin, pp. 151–173.
Fischer, Silke (2006): Zur Morphologie der deutschen Personalpronomina – eine Spaltungsanalyse. In: G. Müller & J. Trommer, eds., *Subanalysis of Argument Encoding in Distributed Morphology*. Vol. 84 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 77–101.
Frampton, John (2002): Syncretism, Impoverishment, and the Structure of Person Features. In: M. Andronis, E. Debenport, A. Pycha & K. Yoshimura, eds., *Papers from the Chicago Linguistics Society Meeting*. Vol. 38, Chicago, pp. 207–222.
Franks, Steven (1995): *Parameters of Slavic Morphosyntax*. Oxford University Press, New York and Oxford.
Fraser, Norman & Greville Corbett (1994): Gender, Animacy, and Declensional Class Assignment: A Unified Account for Russian. In: G. Booij & J. van Marle, eds., *Yearbook of Morphology 1994*. Kluwer, Dordrecht, pp. 123–150.
Gallmann, Peter (2004): Feature Sharing in DPs. In: G. Müller, L. Gunkel & G. Zifonun, eds., *Explorations in Nominal Inflection*. Mouton de Gruyter, Berlin, pp. 121–160.
Gazdar, Gerald, Ewan Klein, Geoffrey Pullum & Ivan Sag (1985): *Generalized Phrase Structure Grammar*. Blackwell, Oxford.
Georgi, Doreen (2006): A Distributed Morphology Approach to Argument Encoding in Kambera. In: G. Müller & J. Trommer, eds., *Subanalysis of Argument Encoding in Distributed Morphology*. Vol. 84 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 1–21.
Georgi, Doreen (2008): A Distributed Morphology Approach to Argument Encoding in Kambera, *Linguistische Berichte* 213, 45–63.
Granberry, Julian (1990): A Grammatical Sketch of Timucua, *International Journal of American Linguistics* 56, 60–101.
Grestenberger, Laura (2014): Feature Mismatch: Deponency in Indo-European Languages. PhD thesis, Harvard University.
Grimshaw, Jane (2001): Optimal Clitic Positions and the Lexicon in Romance Clitic Systems. In: G. Legendre, J. Grimshaw & S. Vikner, eds., *Optimality-Theoretic Syntax*. MIT Press, Cambridge, Mass., pp. 205–240.
Guillaume, Antoine (2008): *A Grammar of Cavineña*. Mouton de Gruyter, Berlin.
Hale, Ken (1972): A New Perspective on American Indian Linguistics. In: A. Ortiz, ed., *New Perspectives on the Pueblos*. University of New Mexico Press, Albuquerque, pp. 87–103.
Halle, Morris (1992): The Latvian Declension. In: G. Booij & J. van Marle, eds., *Yearbook of Morphology 1991*. Kluwer, Dordrecht, pp. 33–47.
Halle, Morris (1994): The Russian Declension: An Illustration of the Theory of Distributed Morphology. In: J. Cole & C. Kisseberth, eds., *Perspectives in Phonology*. CSLI Publications, Stanford, pp. 29–60.
Halle, Morris (1997): Distributed Morphology: Impoverishment and Fission. In: B. Bruening, Y. Kang & M. McGinnis, eds., *Papers at the Interface*. Vol. 30, MITWPL, pp. 425–449.
Halle, Morris & Alec Marantz (1993): Distributed Morphology and the Pieces of Inflection. In: K. Hale & S. J. Keyser, eds., *The View from Building 20*. MIT Press, Cambridge, Mass., pp. 111–176.
Halle, Morris & Alec Marantz (1994): Some Key Features of Distributed Morphology. In: A. Carnie, H. Harley & T. Bures, eds., *Papers on Phonology and Morphology*. Vol. 21 of *MIT Working Papers in Linguistics*, MITWPL, Cambridge, Mass., pp. 275–288.
Harbour, Daniel (2003): The Kiowa Case for Feature Insertion, *Natural Language and Linguistic Theory* 21, 543–578.
Harley, Heidi (1994): Hug a Tree: Deriving the Morphosyntactic Feature Hierarchy. In: A. Carnie & H. Harley, eds., *MITWPL 21: Papers on Phonology and Morphology*. MITWPL, Cambridge, Mass., pp. 275–288.
Harley, Heidi (2001): Lecture 11: Distributed Morphology. Halle & Marantz & Potawatomi Inflection. Ms., University of Arizona. Available from: http://dingo.sbs.arizona.edu/ hharley/courses/ABRALIN/Lecture2Processes.pdf.
Harley, Heidi (2004): The Importance of Impoverishment. Ms., University of Arizona.
Harley, Heidi & Rolf Noyer (2003): Distributed Morphology. In: L. Cheng & R. Sybesma, eds., *The Second GLOT International State-of-the-Article Book*. Mouton de Gruyter, Berlin, pp. 463–496.
Haspelmath, Martin (2007): Prominence Scales in Differential Object Marking: A Critique of Aissen (2003). Ms., MPI-EVA, Leipzig.
Heck, Fabian (1998): Relativer Quantorenskopus im Deutschen – Optimalitätstheorie und die Syntax der Logischen Form. Master's thesis, Universität Tübingen.
Heck, Fabian (2001): Quantifier Scope in German and Cyclic Optimization. In: G. Müller & W. Sternefeld, eds., *Competition in Syntax*. Mouton/de Gruyter, Berlin, pp. 175–209.
Heck, Fabian & Gereon Müller (2000): Successive Cyclicity, Long-Distance Superiority, and

Local Optimization. In: R. Billerey & B. D. Lillehaugen, eds., *Proceedings of WCCFL*. Vol. 19, Cascadilla Press, Somerville, MA, pp. 218–231.
Heck, Fabian & Gereon Müller (2003): Derivational Optimization of Wh-Movement, *Linguistic Analysis* 33, 97–148. (Volume appeared 2007).
Heck, Fabian & Gereon Müller (2007): Extremely Local Optimization. In: E. Brainbridge & B. Agbayani, eds., *Proceedings of the 26th WECOL*. California State University, Fresno, pp. 170–183.
Heck, Fabian & Gereon Müller (2013a): Extremely Local Optimization. In: H. Broekhuis & R. Vogel, eds., *Linguistic Derivations and Filtering*. Equinox, Sheffield.
Heck, Fabian & Gereon Müller (2013b): On Accelerating and Decelarating Movement: From Minimalist Preference Principles to Harmonic Serialism. In: *Rule Interaction in Grammar*. Vol. 90 of *Linguistische Arbeits Berichte*, Institut für Linguistik, Universität Leipzig, pp. 511–558.
Hippisley, Andrew (2007): Declarative Deponency: A Network Morphology Account of Morphological Mismatches. In: M. Baerman, G. Corbett, D. Brown & A. Hippisley, eds., *Deponency and Morphological Mismatches*. Oxford University Press (for The British Academy), Oxford, pp. 145–173.
Hockett, Charles (1954): Two Models of Grammatical Description, *Word* 10, 210–231. Reprinted in M. Joos, ed. (1957), *Readings in Linguistics I*, 386-399.
Jakobson, Roman (1936): Beitrag zur allgemeinen Kasuslehre: Gesamtbedeutungen der russischen Kasus, *Travaux du Cercle Linguistique de Prague VI* pp. 240–299. Reprinted in E. Hamp, et al. (eds.) (1966), *Readings in Linguistics II*, 51-89.
Jakobson, Roman (1962a): Beitrag zur allgemeinen Kasuslehre. Gesamtbedeutungen der russischen Kasus. In: *Selected Writings*. Vol. 2, Mouton, The Hague and Paris, pp. 23–71.
Jakobson, Roman (1962b): Morfologičeskije Nabljudenija. In: *Selected Writings*. Vol. 2, Mouton, The Hague and Paris, pp. 154–181.
Janda, Richard & Brian Joseph (1992): Pseudo-Agglutinativity in Modern Greek Verb-Inflection and "Elsewhere". In: *Proceedings from the 28th Regional Meeting of the Chicago Linguistic Society*. Vol. 1, pp. 251–266.
Jelinek, Eloise (1993): Ergative 'Splits' and Argument Type. In: J. Bobaljik & C. Phillips, eds., *Papers on Case and Agreement I*. Vol. 18 of *MIT Working Papers in Linguistics*, MITWPL, MIT: Cambridge, Mass., pp. 15–42.
Johnston, Jason (1996): Systematic Homonymy and the Structure of Morphological Categories. PhD thesis, University of Sydney.
Kallulli, Dalina (2013): Non-Canonical Passives and Reflexives. Deponents and Their Like. In: A. Alexiadou & F. Schäfer, eds., *Non-Canonical Passives*. Benjamins, Amsterdam, pp. 337–358.
Karch, Dieter (1975): *Zur Morphologie vorderpfälzischer Dialekte*. Niemeyer.
Keine, Stefan (2009): Impoverishment Effects on Agreement. Master's thesis, Universität Leipzig. To appear in the series *Linguistische Arbeiten*; Tübingen: Niemeyer.
Keine, Stefan (2010): Substitute Infinitives as Non-Substitutes, *Linguistische Berichte* 223, 331–341.
Keine, Stefan & Gereon Müller (2011): Non-Zero/Non-Zero Alternations in Differential Object Marking. In: S. Lima, K. Mullin & B. Smith, eds., *Proceedings of the 39th Meeting of the North East Linguistics Society*. GLSA, Amherst, Mass., pp. 441–454.
Keine, Stefan & Gereon Müller (2014): Differential Argument Encoding by Impoverishment. In: I. Bornkessel-Schlesewsky, A. Malchukov & M. Richards, eds., *Scales and Hierarchies*. Trends in Linguistics, Mouton de Gruyter, Berlin, pp. 75–130.
Keine, Stefan & Johannes Hein (2010): On the Structure of Morphological Systems. Ms., Universität Leipzig.
Kibrik, Aleksandr (1991): Organising Principles for Nominal Paradigms in Daghestan Languages: Comparative and Typological Observations. In: F. Plank, ed., *Paradigms*. Mouton de Gruyter, Berlin, pp. 255–274.
Kibrik, Aleksandr (2003): Nominal Inflection Galore: Daghestanian, with Side Glances at Europe and the World. In: F. Plank, ed., *Noun Phrase Structure in the Languages of Europe*. Mouton de Gruyter, Berlin, pp. 37–112.
Kimper, Wendell (2012): Positive Constraints and Finite Goodness in Harmonic Serialism. In: J. McCarthy & J. Pater, eds., *Harmonic Grammar and Harmonic Serialism*. Equinox, London.
Kiparsky, Paul (1973): 'Elsewhere' in Phonology. In: S. Anderson & P. Kiparsky, eds., *A Festschrift for Morris Halle*. Academic Press, New York, pp. 93–106.
Kiparsky, Paul (1998): Partitive Case and Aspect. In: M. Butt & W. Geuder III, eds., *The Projection of Arguments*. CSLI Publications, Stanford University, pp. 265–307.
Kiparsky, Paul (1999): Analogy and OT: Morphological Change as Emergence of the Unmarked. Ms., Stanford University.
Kiparsky, Paul (2001): Structural Case in Finnish, *Lingua* 111, 315–376.
Kiparsky, Paul (2005): Blocking and Periphrasis in Inflectional Paradigms. In: G. Booij & J. van Marle, eds., *Yearbook of Morphology 2004*. Springer, Dordrecht, pp. 113–135.
Klamer, Marian (1998a): *A Grammar of Kambera*. Mouton de Gruyter, Berlin.
Klamer, Marian (1998b): Kambera Intransitive Argument Linking, *Studia Linguistica* pp. 77–111.
Kress, Bruno (1982): *Isländische Grammatik*. 1 edn, VEB Verlag Enzyklopädie, Leipzig.
Lahne, Antje (2006): Contextual Allomorphy and Morpho-Phonological Processes in Sanskrit. In: G. Müller & J. Trommer, eds., *Subanalysis of Argument Encoding in Distributed Morphology*. Vol. 84 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 143–160.
Lahne, Antje (2007a): Deriving Polarity Effects in Inflectional Morphology. In: J. Trommer & A. Opitz, eds., *1 2 Many*. Vol. 85 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 1–22.
Lahne, Antje (2007b): A Multiple Specifier Approach to Left Peripheral Architecture. Ms., Universität Leipzig. To appear in *Linguistic Analysis*.
Laka, Itziar (1993): Unergatives that Assign Ergative, Unaccusatives that Assign Accusative. In: J. Bobaljik & C. Phillips, eds., *Papers on Case and Agreement I*. Vol. 18 of *MIT Working Papers in Linguistics*, MITWPL, MIT: Cambridge, Mass., pp. 149–172.
Legate, Julie Anne (2008): Morphological and Abstract Case, *Linguistic Inquiry* 39(1), 55–101.
Legendre, Géraldine, Paul Smolensky & Colin Wilson (1998): When is Less More? Faithfulness and Minimal Links in Wh-Chains. In: P. Barbosa, D. Fox, P. Hagstrom, M. McGinnis & D. Pesetsky, eds., *Is the Best Good Enough?*. MIT Press and MITWPL, Cambridge, Mass., pp. 249–289.
Levin, Juliette & Diane Massam (1985): Surface Ergativity: Case/Theta Relations Reexamined. In: S. Berman, ed., *Proceedings of NELS 15*. BLS, Amherst, Mass.
Levin, Lorraine (1986): Operations on Lexical Forms: Unaccusative Rules in Germanic Lan-

guages. Ph.d. thesis, MIT, Cambridge, Mass.
Lieber, Rochelle (1992): *Deconstructing Morphology*. University of Chicago Press, Chicago.
Lumsden, John (1992): Underspecification in Grammatical and Natural Gender, *Linguistic Inquiry* 23, 469–486.
Macaulay, Monica (2005): On the 2 > 1 Prominence Hierarchy of Algonquian, *LSO Working Papers in Linguistics* 5, 1–24.
Marantz, Alec (1982): Re Reduplication, *Linguistic Inquiry* 13, 435–482.
Marantz, Alec (1991): Case and Licensing. In: German Westphal, B. Ao & H.-R. Chae, eds., *Proceedings of the Eigth Eastern States Conference on Linguistics*. University of Maryland, pp. 234–253.
Marlett, Stephen (1986): Syntactic Levels and Multiattachment in Sierra Popoluca, *International Journal of American Linguistics* 52, 359–387.
Matthews, Peter (1972a): *Inflectional Morphology: A Theoretical Study Based on Aspects of Latin Verb Conjugation*. Cambridge University Press, Cambridge.
Matthews, Peter (1972b): *Inflectional Morphology: A Theoretical Study Based on Aspects of Latin Verb Conjugation*. CUP, Cambridge.
Matthews, Peter (1974): *Morphology*. Cambridge University Press, Cambridge.
Matthews, Peter (1991): *Morphology*. Cambridge University Press, Cambridge.
McCarthy, John (1981): A Prosodic Theory of Non-Concatenative Morphology, *Linguistic Inquiry* 12, 373–418.
McCarthy, John (1999): Sympathy and Phonological Opacity, *Phonology* 16:3, 331–399.
McCarthy, John (2000): Harmonic Serialism and Parallelism. In: M. Hirotani, A. Coetzee, N. Hall & J.-Y. Kim, eds., *Proceedings of NELS 30*. GLSA, Amherst, Mass., pp. 501–524.
McCarthy, John (2002): *A Thematic Guide to Optimality Theory*. Cambridge University Press, Cambridge.
McCarthy, John (2003): Optimal Paradigms. Ms., University of Massachusetts, Amherst. Available from ROA: http://roa.rutgers.edu.
McCarthy, John (2005): Optimal Paradigms. In: L. Downing, T. Hall & R. Raffelsiefen, eds., *Paradigms in Phonological Theory*. Oxford University Press, Oxford, pp. 170–210.
McCarthy, John (2008): The Serial Interaction of Stress and Syncope, *Natural Language and Linguistic Theory* 26, 499–546.
McCarthy, John (2010): An Introduction to Harmonic Serialism, *Language and Linguistics Compass* 4, 1001–1018.
McCarthy, John & Alan Prince (1994): The Emergence of the Unmarked: Optimality in Prosodic Morphology, *Proceedings of the North East Linguistic Society* 24, 333–379.
McCarthy, John, Wendell Kimper & Kevin Mullin (2012): Reduplication in Harmonic Serialism, *Morphology* 22, 173–232.
McCreight, Katherine & Catherine Chvany (1991): Geometric Representation of Paradigms in a Modular Theory of Grammar. In: F. Plank, ed., *Paradigms*. Mouton de Gruyter, Berlin, pp. 91–111.
McFadden, Thomas (2004): The Position of Morphological Case in the Derivation: A Study on the Syntax-Morphology Interface. PhD thesis, University of Pennsylvania.
Mel'čuk, Igor (1999): Zero Sign in Morphology. In: *Proceedings of the 4th Int. Tbilissi Symposium on Language, Logic, and Computation*. Batumi.
Mithun, Marianne (1999): *The Languages of Native North America*. Cambridge University Press, Cambridge.

Morgenroth, Lisa & Martin Salzmann (2013): Reanalyse syntaktischer Ergativität. Ms., Universität Leipzig.
Morphy, Frances (1983a): Djapu, a Yolngu Dialect. In: R. Dixon & B. Blake, eds., *Handbook of Australian Languages, Vol. 3*. Benjamins, Amsterdam, pp. 1–188.
Morphy, Frances (1983b): Djapu, A Yolngu Dialect. In: R. M. Dixon & B. J. Blake, eds., *Handbook of Australian languages, Vol. 3*. John Benjamins Publishing, Amsterdam, pp. 1–189.
Müller, Gereon (2002a): Free Word Order, Morphological Case, and Sympathy Theory. In: G. Fanselow & C. Féry, eds., *Resolving Conflicts in Grammars: Optimality Theory in Syntax, Morphology, and Phonology*. Buske, Hamburg, pp. 9–48. Special issue of *Linguistische Berichte*.
Müller, Gereon (2002b): Remarks on Nominal Inflection in German. In: I. Kaufmann & B. Stiebels, eds., *More than Words: A Festschrift for Dieter Wunderlich*. Akademie Verlag, Berlin, pp. 113–145.
Müller, Gereon (2003): Zwei Theorien der pronominalen Flexion im Deutschen (Versionen Standard und Mannheim), *Deutsche Sprache* 30, 328–363.
Müller, Gereon (2004): A Distributed Morphology Approach to Syncretism in Russian Noun Inflection. In: O. Arnaudova, W. Browne, M. L. Rivero & D. Stojanovic, eds., *Proceedings of FASL 12*. University of Ottawa.
Müller, Gereon (2005): Syncretism and Iconicity in Icelandic Noun Declensions: A Distributed Morphology Approach. In: G. Booij & J. van Marle, eds., *Yearbook of Morphology 2004*. Springer, Dordrecht, pp. 229–271.
Müller, Gereon (2006a): Pro-Drop and Impoverishment. In: P. Brandt & E. Fuß, eds., *Form, Structure, and Grammar. A Festschrift Presented to Günther Grewendorf on Occasion of his 60th Birthday*. Akademie Verlag, Berlin, pp. 93–115.
Müller, Gereon (2006b): Subanalyse verbaler Flexionsmarker. In: E. Breindl, L. Gunkel & B. Strecker, eds., *Grammatische Untersuchungen*. Narr, Tübingen, pp. 183–203.
Müller, Gereon (2007a): Extended Exponence by Enrichment. Argument Encoding in German, Archi, and Timucua. In: T. Scheffler, J. Tauberer, A. Eilam & L. Mayol, eds., *Proceedings of the 30th Annual Penn Linguistics Colloquium*. Vol. 13.1 of *Penn Working Papers in Linguistics*, University of Pennsylvania, Philadelphia, pp. 253–266.
Müller, Gereon (2007b): Notes on Paradigm Economy, *Morphology* 17, 1–38.
Müller, Gereon (2008): A Review of "The Syntax-Morphology Interface. A Study of Syncretism" by Matthew Baerman, Dunstan Brown, and Greville G. Corbett, *Word Structure* 1(2), 199–232.
Müller, Gereon (2009): Ergativity, Accusativity, and the Order of Merge and Agree. In: K. K. Grohmann, ed., *Explorations of Phase Theory. Features and Arguments*. Mouton de Gruyter, Berlin, pp. 269–308.
Müller, Gereon (2011): Syncretism without Underspecification in Optimality Theory: The Role of Leading Forms, *Word Structure* 4(1), 53–103.
Müller, Gereon & Daniela Thomas (2014): Three-Way Systems Do Not Exist. Ms., Universität Leipzig. To appear in Jessica Coon, Lisa Travis & Diane Massam (eds.), *The Oxford Handbook of Ergativity*. Oxford: Oxford University Press.
Müller, Gereon & Jochen Trommer, eds. (2006): *Subanalysis of Argument Encoding in Distributed Morphology*. Number 84 *in* 'Linguistische Arbeitsberichte', Institut für Linguistik, Universität Leipzig. Available from: www.uni-leipzig.de/∼va/?nav=papiere.

Murasugi, Kumiko (1992): Crossing and Nested Paths. PhD thesis, MIT, Cambridge, Mass.
Neidle, Carol (1988): *The Role of Case in Russian Syntax*. Kluwer, Dordrecht.
Nesset, Tore (1994): A Feature-Based Approach to Russian Noun Inflection, *Journal of Slavic Linguistics* 2, 214–237.
Nevins, Andrew (2007): The Representation of Third Person and Its Consequences for Person-Case Effects, *Natural Language and Linguistic Theory* 25, 273–313.
Noyer, Rolf (1992): Features, Positions, and Affixes in Autonomous Morphological Structure. PhD thesis, MIT, Cambridge, Mass.
Noyer, Rolf (1998): Impoverishment Theory and Morphosyntactic Markedness. In: S. Lapointe, D. Brentari & P. Farrell, eds., *Morphology and its Relation to Phonology and Syntax*. CSLI, Palo Alto, pp. 264–285.
Noyer, Rolf (2005): A Constraint on Interclass Syncretism. In: G. Booij & J. van Marle, eds., *Yearbook of Morphology 2004*. Springer, Dordrecht, pp. 273–315.
Oltra Massuet, Isabel (1999): On the Notion of Theme Vowel: A New Approach to Catalan Verbal Morphology. Master of science thesis, MIT, Cambridge, Mass.
Opitz, Andreas (2006): A Reanalysis of Definiteness-Markers in Albanian Noun Inflection. In: G. Müller & J. Trommer, eds., *Subanalysis of Argument Encoding in Distributed Morphology*. Vol. 84 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 103–114.
Opitz, Andreas (2007): Case and Markedness in Tlapanec. In: J. Trommer & A. Opitz, eds., *1 2 Many*. Vol. 85 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 173–203.
Opitz, Andreas, Stefanie Regel, Gereon Müller & Angela D. Friederici (2013): Neurophysiological Evidence for Morphological Underspecification in German Strong Adjective Inflection, *Language* 89(2), 231–264.
Pater, Joe (2009): Weighted Constraints in Generative Linguistics, *Cognitive Science* 33, 999–1035.
Pater, Joe (2012): Universal Grammar with Weighted Constraints. In: J. McCarthy & J. Pater, eds., *Harmonic Grammar and Harmonic Serialism*. Equinox, London.
Pertsova, Katya (2007): Learning Form-Meaning Mappings in Presence of Homonymy: A Linguistically Motivated Model of Learning Inflection. PhD thesis, UCLA, Los Angeles.
Pesetsky, David (1997): Optimality Theory and Syntax: Movement and Pronunciation. In: D. Archangeli & T. Langendoen, eds., *Optimality Theory. An Overview*. Blackwell, Oxford, pp. 134–170.
Pesetsky, David (1998): Some Optimality Principles of Sentence Pronunciation. In: P. Barbosa, D. Fox, P. Hagstrom, M. McGinnis & D. Pesetsky, eds., *Is the Best Good Enough?*. MIT Press and MITWPL, Cambridge, Mass., pp. 337–383.
Pike, Kenneth L. (1965): Non-Linear Order and Anti-Redundancy in German Morphological Matrices, *Zeitschrift für Mundartforschung* 31, 193–221.
Plank, Frans (1979): Ikonisierung und De-Ikonisierung als Prinzipien des Sprachwandels, *Sprachwissenschaft* 4, 121–158.
Plank, Frans (1991a): Of Abundance and Scantiness in Inflection: A Typological Prelude. In: F. Plank, ed., *Paradigms*. Mouton de Gruyter, Berlin, pp. 1–39.
Plank, Frans (1991b): Rasmus Rask's Dilemma. In: F. Plank, ed., *Paradigms*. Mouton de Gruyter, Berlin, pp. 161–196.
Plank, Frans (1999): Split Morphology: How Aggluatination and Flexion Mix, *Linguistic Typology* 3.
Postma, Gertjan (1998): Agreement, Anti-Agreement, and the Structure of the Verbal Paradigm, *Groninger Arbeiten zur Germanistischen Linguistik* 37, 169–194.
Prince, Alan & Paul Smolensky (1993): Optimality Theory. Constraint Interaction in Generative Grammar. Book ms., Rutgers University.
Prince, Alan & Paul Smolensky (2004): *Optimality Theory. Constraint Interaction in Generative Grammar*. Blackwell, Oxford.
Rezac, Milan (2003): The Fine Structure of Cyclic Agree, *Syntax* 6, 156–182.
Rude, Noel Emerson (1985): Studies in Nez Perce Grammar and Discourse. PhD thesis, University of Oregon.
Sadler, Louisa & Andrew Spencer (2001): Syntax as an Exponent of Morphological Features. In: G. Booij & J. van Marle, eds., *Yearbook of Morphology 2000*. Kluwer, Dordrecht, pp. 71–96.
Sauerland, Uli (1996): The Late Insertion of Germanic Inflection. Generals paper, MIT.
Schäfer, Florian (2012): Local Case, Cyclic Agree, and the Syntax of Truly Ergative Verbs. In: A. Alexiadou, T. Kiss & G. Müller, eds., *Local Modelling of Non-Local Dependencies in Syntax*. De Gruyter, Berlin, pp. 273–304.
Schulz, Patrick (2010): The Form, Function, and Meaning of Morpho-Syntactic Features. B.A. Thesis, Universität Leipzig.
Silverstein, Michael (1976): Hierarchy of Features and Ergativity. In: R. Dixon, ed., *Grammatical Categories in Australian Languages*. Australian Institute of Aboriginal Studies, Canberra, pp. 112–171.
Smolensky, Paul (1995): On the Internal Structure of Con, the Constraint Component of UG. Ms., Johns Hopkins University.
Smolensky, Paul (1996): On the Comprehension/Production Dilemma in Child Language, *Linguistic Inquiry* 27, 720–731.
Smolensky, Paul (2006): Harmonic Completeness, Local Constraint Conjunction, and Feature Domain Markedness. In: P. Smolensky & G. Legendre, eds., *The Harmonic Mind*. Vol. II, MIT Press, Cambridge, Mass., chapter 14, pp. 27–160.
Smolensky, Paul & Geraldine Legendre (2006): *The Harmonic Mind*. MIT Press, Cambridge, Mass.
Spencer, Andrew (2007): Extending Deponency: Implications for Morphological Mismatches. In: M. Baerman, G. Corbett, D. Brown & A. Hippisley, eds., *Deponency and Morphological Mismatches*. Oxford University Press (for The British Academy), Oxford, pp. 45–70.
Starke, Michal (2006): Nanosyntax Class Lectures. Ms., University of Tromsø.
Sternefeld, Wolfgang (2006): *Syntax*. Stauffenburg, Tübingen. Two volumes.
Stiebels, Barbara (2002): *Typologie des Argumentlinkings: Ökonomie und Expressivität*. Akademie Verlag, Berlin.
Stiebels, Barbara (2006): Agent Focus in Mayan Languages, *Natural Language and Linguistic Theory* 24, 501–570.
Stiebels, Barbara (2015): Multiple Exponence: Typology, Triggering Factors, and Theoretical Modelling. Ms., Universität Leipzig.
Stroomer, Harry (1995): *A Grammar of Boraana Oromo (Kenya): Phonology, Morphology, Vocabularies*. Köppe, Köln.
Stump, Gregory (2001): *Inflectional Morphology*. Cambridge University Press, Cambridge.
Stump, Gregory (2006): Heteroclisis and Paradigm Linkage, *Language* 82, 279–322.
Stump, Gregory (2007): A Non-Canonical Pattern of Deponency and Its Implications. In: M. Baerman, G. Corbett, D. Brown & A. Hippisley, eds., *Deponency and Morphological*

Mismatches. Oxford University Press (for The British Academy), Oxford, pp. 71–95.
Trommer, Jochen (1999a): Morphology Consuming Syntax' Resources. In: *Procceedings of the ESSLI Workshop on Resource Logics and Minimalist Grammars*. University of Nijmegen. http://www.ling.uni-osnabrueck.de/trommer/papers.html.
Trommer, Jochen (1999b): Morphology Consuming Syntax' Resources. In: *Procceedings of the ESSLI Workshop on Resource Logics and Minimalist Grammars*. University of Nijmegen, pp. 37–55.
Trommer, Jochen (2001): Distributed Optimality. PhD thesis, Universität Potsdam.
Trommer, Jochen (2003): Participant Reduction and Two-Level Markedness. In: J. Spenader, A. Eriksson & Ö. Dahl, eds., *Variation within Optimality Theory. Proceedings of the Stockholm Workshop*. Stockholm University, Department of Linguistics, pp. 102–108.
Trommer, Jochen (2005a): A Feature-Geometric Approach to Amharic Verb Classes. Ms., Universität Leipzig.
Trommer, Jochen (2005b): Markiertheit und Verarmung. Ms., Universität Leipzig. Presented at the Honorary Doctorate Colloquium for Manfred Bierwisch, Leipzig 2005.
Trommer, Jochen (2006a): Person and Number Agreement in Dumi, *Linguistics* 44, 1011–1057.
Trommer, Jochen (2006b): Third-Person Marking in Menominee. Ms., Universität Leipzig.
Trommer, Jochen (2008): A Feature-Geometric Approach to Amharic Verb Classes. In: A. Bachrach & A. Nevins, eds., *The Bases of Inflectional Identity*. Oxford University Press, Oxford, pp. 206–236.
Trommer, Jochen (2011): Phonological Aspects of Western Nilotic Mutation Morphology. Habilitation thesis, Universität Leipzig.
Trommer, Jochen (2014): Moraic Prefixes and Suffixes in Anywa, *Lingua* 140, 1–34.
Trommer, Jochen (2015): Moraic Affixes and Morphological Colors in Dinka, *Linguistic Inquiry* 46, 77–112.
Ura, Hiroyuki (2000): *Checking Theory and Grammatical Functions in Universal Grammar*. Oxford University Press, New York.
Ura, Hiroyuki (2006): A Parametric Syntax of Aspectually Conditioned Split-Ergativity. In: A. Johns, D. Massam & J. Ndayiragije, eds., *Ergativity*. Springer, pp. 111–141.
Watters, David E. (2002): *A Grammar of Kham*. Cambridge University Press, Cambridge.
Weisser, Philipp (2006): A Distributed Morphology Analysis of Croatian Noun Inflection. In: G. Müller & J. Trommer, eds., *Subanalysis of Argument Encoding in Distributed Morphology*. Vol. 84 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 131–142.
Weisser, Philipp (2007): Case Borrowing. In: J. Trommer & A. Opitz, eds., *1 2 Many*. Vol. 85 of *Linguistische Arbeitsberichte*, Universität Leipzig, pp. 23–41.
Weisser, Philipp (2014): Mismatch Verbs: A Unified Account of Unaccusatives and Deponents. In: F. Rainer, F. Gardani, H.-C. Luschützky & W. Dressler, eds., *Morphology and Meaning*. Benjamins, Amsterdam, pp. 315–330.
Wiese, Bernd (1994): Die Personal- und Numerusendungen der deutschen Verbformen. In: K.-M. Köpcke, ed., *Funktionale Untersuchungen zur deutschen Nominal- und Verbalmorphologie*. Niemeyer, Tübingen, pp. 161–191.
Wiese, Bernd (1999): Unterspezifizierte Paradigmen. Form und Funktion in der pronominalen Deklination, *Linguistik Online* 4. (www.linguistik-online.de/3_99).
Wiese, Bernd (2000): Warum Flexionsklassen?. In: R. Thieroff, M. Tamrat, N. Fuhrhop & O. Teuber, eds., *Deutsche Grammatik in Theorie und Praxis*. Niemeyer, Tübingen, pp. 139–153.
Wiese, Bernd (2001a): Paradigmen aus formbezogener Sicht. Handout, IDS Mannheim.
Wiese, Bernd (2001b): Pronominale Deklination. Handout, IDS Mannheim.
Wiese, Bernd (2003): Zur lateinischen Nominalflexion: Die Form-Funktions-Beziehung. Ms., IDS Mannheim. www.ids-mannheim.de/gra/personal/wiese.html.
Wiese, Bernd (2004): Categories and Paradigms: On Underspecification in Russian Declension. In: G. Müller, L. Gunkel & G. Zifonun, eds., *Explorations in Nominal Inflection*. Mouton de Gruyter, Berlin, pp. 321–372.
Wiese, Richard (1996): *The Phonology of German*. Clarendon Press, Oxford.
Williams, Edwin (1994): Remarks on Lexical Knowledge, *Lingua* 92, 7–34.
Williams, Edwin (1997): Blocking and Anaphora, *Linguistic Inquiry* 28, 577–628.
Woolford, Ellen (1997): Four-Way Case Systems: Ergative, Nominative, Objective and Accusative, *Natural Language and Linguistic Theory* 15, 181–227.
Woolford, Ellen (2007): Aspect Splits as Contextual Faithfulness. Ms., University of Massachusetts, Amherst.
Wunderlich, Dieter (1996): Minimalist Morphology: The Role of Paradigms. In: G. Booij & J. van Marle, eds., *Yearbook of Morphology 1995*. Kluwer, Dordrecht, pp. 93–114.
Wunderlich, Dieter (1997a): Cause and the Structure of Verbs, *Linguistic Inquiry* 27, 27–68.
Wunderlich, Dieter (1997b): Der unterspezifizierte Artikel. In: C. Dürscheid, K. H. Ramers & M. Schwarz, eds., *Sprache im Fokus*. Niemeyer, Tübingen, pp. 47–55.
Wunderlich, Dieter (1997c): A Minimalist Model of Inflectional Morphology. In: C. Wilder, H.-M. Gärtner & M. Bierwisch, eds., *The Role of Economy Principles in Linguistic Theory*. Akademie Verlag, Berlin, pp. 267–298.
Wunderlich, Dieter (2000): Reconsidering Structural Case in Finnish. Ms., Universität Düsseldorf.
Wunderlich, Dieter (2004): Is There Any Need for the Concept of Directional Syncretism?. In: G. Müller, L. Gunkel & G. Zifonun, eds., *Explorations in Nominal Inflection*. Mouton de Gruyter, Berlin, pp. 373–395.
Wunderlich, Dieter (2006): Towards a Structural Typology of Verb Classes. In: D. Wunderlich, ed., *Advances in the Theory of the Lexicon*. Mouton de Gruyter, Berlin, pp. 57–166.
Wurzel, Wolfgang Ullrich (1984): *Flexionsmorphologie und Natürlichkeit*. Akademie Verlag, Berlin.
Wurzel, Wolfgang Ullrich (1987): Paradigmenstrukturbedingungen: Aufbau und Veränderung von Flexionsparadigmen. In: W. U. Wurzel, ed., *Studien zur Morphologie und Phonologie II*. Number 156 *in* 'Linguistische Studien, Reihe A: Arbeitsberichte', Akademie der Wissenschaften der DDR, Zentralinstitut für Sprachwissenschaft, Berlin, pp. 135–155.
Wurzel, Wolfgang Ullrich (1990): The Mechanism of Inflection: Lexical Representation, Rules, and Irregularities. In: W. U. Dressler, ed., *Contemporary Morphology*. Mouton de Gruyter, Berlin.
Wurzel, Wolfgang Ullrich (1998): Drei Ebenen der Struktur von Flexionsparadigmen. In: R. Fabri, A. Ortmann & T. Parodi, eds., *Models of Inflection*. Niemeyer, Tübingen.
Xu, Zheng, Mark Aronoff & Frank Anshen (2007): Deponency in Latin. In: M. Baerman, G. Corbett, D. Brown & A. Hippisley, eds., *Deponency and Morphological Mismatches*. Oxford University Press (for The British Academy), Oxford, pp. 127–143.
Zombolou, Katerina & Artemis Alexiadou (2014): The Canonical Function of the Deponent Verbs in Modern Greek. In: F. Rainer, F. Gardani, H. Luschützky & W. Wurzel, eds.,

Morphology and Meaning. Selected Papers from the 15th International Morphology Meeting, Vienna 2012. Benjamins, Amsterdam, pp. 331–344.

Zwicky, Arnold (1985): How to Describe Inflection. In: M. Niepokuj, M. V. Clay, V. Nikiforidou & D. Feder, eds., *Proceedings of the 11th Annual Meeting of the Berkeley Linguistics Society*. BLS, Berkeley, University of California, pp. 372–386.