Syncretism in Optimality Theory
An Overview

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Overview

Question:
How can instances of syncretism be derived in optimality theory?

Syncretism by Underspecification

A-Morphematic Approaches in Optimality Theory
- Müller (2002)
- Carstairs-McCarthy (2007)
- Non-Optimality-Theoretic Reconstruction

Morphematic Approaches in Optimality Theory
- McCarthy (2004)
- Wunderlich (2004)
- Grimshaw (2001)
- Trommer (2001, 2004)

Towards a New Morphematic Approach

Syncretism by Underspecification

P_1: 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.

Syncretism by Underspecification 2

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), DiSciullo & 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.

(1) 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).

(2) 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 (1997a), Wiese (1999), Trommer (n.d.)). The illustration here follows Wiese (1999).

(3) 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]

(4) 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.)

Determiner Inflection 2

(5) Feature Hierarchy:
[+masc] > [+obl] > [+fem] > [+gov].

P2: Competition of exponents

dies	Masc.Sg.	Neut.Sg.	Fem.Sg.	Pl.
Nom	$\underline{r}^5$, e^9	$\underline{s}^3$, r^5, e^9	$\underline{e}^9$	$\underline{e}^9$
Acc	$\underline{n}^4$, r^5, e^9	$\underline{s}^3$, n^4, r^5, e^9	$\underline{e}^9$	$\underline{e}^9$
Dat	$\underline{m}^1$, s^2, n^4, r^5, n^7, r^8, e^9	$\underline{m}^1$, s^2, s^3, n^4, r^5, r^6, n^7, r^8, e^9	$\underline{r}^6$, n^7, r^8, e^9	$\underline{n}^7$, r^8, e^9
Gen	$\underline{s}^2$, r^5, r^8, e^9	$\underline{s}^2$, s^3, r^5, r^6, r^8, e^9	$\underline{r}^6$, r^8, e^9	$\underline{r}^8$, 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.

A-Morphematic Approaches

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, 1997b, 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)):

   (6) [**D2**] $\mathrm{RR}_{\mathrm{D},\{\mathrm{TNS:pres},\mathrm{AGR:}\{\mathrm{PER:1},\mathrm{NUM:sg}\}\},[\mathrm{CONJ:}-\mathrm{T},-\mathrm{C}]}(\langle \mathrm{X},\sigma\rangle) =_{def} \langle \mathrm{Xm}',\sigma\rangle$

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.

Background Assumptions of Müller (2002b)

Background:

- Legendre et al. (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?

(7) 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_3: 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.

(8) 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

(9) 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.

(10) Inventory of declension markers in German
{/s/, /m/, /n/, /r/, /e/}

(11) SonHier (Sonority Hierarchy) (Prince & Smolensky (2004)):
*s ≫ *m ≫ *n ≫ *R ≫ *e

Competitions 1

T_1: 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_2: dies-er

I: /dies/: NOM.M, DAT.F,	CASE	*COR CM	*DC CM	*V CM	*SON CM	SONHIER *s	*m	*n	*R	*e
GEN.F, GEN.PL										
O_1: dies-es						*!				
O_2: dies-em							*!			
O_3: dies-en								*!		
☞ O_4: dies-er									*	
O_5: dies-e				*!						*
O_6: dies	*!									

Competitions 2

T_3: 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_4: 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	*!									

Competitions 3

T_5: 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	*!									

Background Assumptions of Carstairs-McCarthy (2007)

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

(12) 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

(13) ATTR-ADJ≠GRF:
A weakly inflected attributive adjective does not show up in the Grundform (i.e., it is not /Ø/).

(14) NOUNFEMSG=GRF:
An inflected feminine noun has zero exponence (it shows up in the Grundform).

(15) MASCSGACC≠NOM:
The accusative singular form of a weak masculine noun cannot be identical to the nominative form.

(16) ACC=NOM:
Weak accusative forms are identical to weak nominative forms.

(17) NOMSG=GRF:
Nominative singular forms are Grundforms (i.e., they have zero exponence).

(18) NOUNADJINFL-*en*:
Weak forms of nouns and adjectives have the exponent /-en/.

(19) Ranking:
ATTR-ADJ≠GRF, NOUNFEMSG=GRF, MASCSGACC≠NOM ≫
ACC=NOM, NOMSG=GRF ≫
NOUNADJINFL-*en*

Competitions 1: Masc.Nom

T_6: 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_7: 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					**!	

- NOMSG=GRF is a gradient constraint: /e/ is better than /en/.
- A slightly more general version of NOUNADJINFL-*en* might be possible that requires only consontal marking (with /n/ the sole, or the best, candidate).
- Mensch-e is not actually considered by Carstairs-McCarthy (2007). 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_8: 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_9: 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_{10}: 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_{11}: 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_{11}, which does not affect the outcome, everything is as before.

Competitions 4: Fem.Acc

T_{12}: 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_{13}: 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).

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).

(20) 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/)

(21) 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 (21-a).
   (ii) β satisfies (21-b).
   (iii) β is more sonorous than α.

Reanalysis of Carstairs-McCarthy's (2007) 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).

(22) 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 specificaations in (22) are trivial).

(23) 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).

Reanalysis of Carstairs-McCarthy's (2007) approach cont'd

(24) 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/

Optimal Paradigms

Background assumptions (see McCarthy (2005)):

- A standard (i.e., reference grammar) notion of paradigm is presupposed (set of inflected forms based on a common lexeme or stem).
- Candidates are entire paradigms.
- There are correspondence relations between potential outputs.
- Analogy effects can be modelled by OP (output-output) faithfulness constraints; among other things, OP faithfulness derives "Majority rules" effects.

Scope:

- The approach captures phonological effects among existing morphological exponents of an inflectional paradigm.
- The approach presupposes the existence of appropriate morphological exponents filling the entire paradigm space (i.e., for each morpho-syntactic specifiaction – each paradigm cell –, there is a morphological exponent).
- The Optimal Paradigms model therefore does not seem to have much to say about syncretism (except for cases where – perhaps partial – syncretism is phonologically conditioned).

Optimization in Minimalist Morphology

Background:

- Minimalist Morphology (Wunderlich (1996, 1997b)) 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)).

Russian Declension

(25) 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

(26) Case features:

a. Nom = ( )
b. Acc = $(+\text{hr})_V$
c. Gen = $(+\text{hr})_N$

(27) 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] $\vee$ PAL]	G.sg (class 2 & 3)
e.	/-a/, +hr / C] $\vee$ o]	A/G.sg (class 1 & 4)
f.	C], +pl,+hr / a] $\vee$ 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

(28) Lexical entries for some Russian case affixes

<table>
<tr><td></td><td colspan="3">inanimates</td><td colspan="3">animates</td></tr>
<tr><td></td><td>class 2</td><td>class 3</td><td>class 1</td><td>class 2</td><td>class 3</td><td>class 1</td></tr>
<tr><td></td><td>‘map’</td><td>‘door’</td><td>‘table’</td><td>‘squirrel’</td><td>‘mother’</td><td>‘student’</td></tr>
<tr><td>N.sg.</td><td>a]</td><td rowspan="2">PAL]</td><td rowspan="2"></td><td>a]</td><td rowspan="2">PAL]</td><td rowspan="2"></td></tr>
<tr><td>A.sg.</td><td>/-u/, (+hr)$_V$</td><td>/-u/, (+hr)$_V$</td></tr>
<tr><td>G.sg.</td><td colspan="2">/-y/, (+hr)$_N$</td><td>/-a/, +hr</td><td colspan="2">/-y/, (+hr)$_N$</td><td>/-a/, +hr</td></tr>
<tr><td>N.pl.
A.pl.</td><td colspan="3">/-y/, +pl</td><td colspan="3">/-y/, +pl</td></tr>
<tr><td>G.pl.</td><td>C],
+pl,+hr</td><td>/ej/,
+pl,+hr</td><td>/ov/,
+pl,+hr</td><td>C],
+pl,+hr</td><td>/ej/,
+pl,+hr</td><td>/ov/,
+pl,+hr</td></tr>
</table>

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.

Constraints and their Ranking

(29) 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 $\gg$ MAX(+hr) $\gg$ *(+hr)/$_V$ anim

(30) 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.

(31) Ranking of the constraints
SPEC, COMP, MAX(+hr)/–pl, a] $\gg$ *(+hr)/$_V$ –anim $\gg$ 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

(32) Selection of optimal forms in an accusative singular context

a. Inanimate class 2 nouns (a])

	SPEC | COMP | MAX(+hr)/ –pl, a]	*(+hr)/ –anim	MAX(+hr)
karta	*!		*
kart-y	*!		
☞kart-u			

b. Inanimate class 1 nouns (masc)

	SPEC | COMP | MAX(+hr)/ –pl, a]	*(+hr)/ –anim	MAX(+hr)
☞stol			*
stol-a		*!	
stol-y	*!		

Competitions 2: Animate Nouns

(33) 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

(34) 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.

Animacy Effects in the Plural

(35) Selection of optimal forms in an accusative plural context

a. Inanimate class 2 nouns (a])

	Spec	Comp	Max(+hr)/ –pl, a]	*(+hr)/ –anim	Max(+hr)
☞kart-y					*
kart-ov	*!			*	
kart				*!	

b. Animate class 2 nouns (a])

	Spec	Comp	Max(+hr)/ –pl, a]	*(+hr)/ –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).

Optimal Clitics

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_4: 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.

The Italian Clitic Lexicon

(36) 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	[$\mathbb{R}$ 1 sg $\mathbb{G}$ $\mathbb{C}$]	(to) me(self)
ti	[$\mathbb{R}$ 2 sg $\mathbb{G}$ $\mathbb{C}$]	(to) you(self)
ci	[$\mathbb{R}$ 1 pl $\mathbb{G}$ $\mathbb{C}$]	(to) us(self)
vi	[$\mathbb{R}$ 2 pl $\mathbb{G}$ $\mathbb{C}$]	(to) you(self)
si	[+R $\mathbb{P}$ $\mathbb{N}$ $\mathbb{G}$ $\mathbb{C}$]	(to) you(self)

Note:
"$\mathbb{X}$" means "no specification for X".

Competitions

T_{14}: 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_{15}: 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 $\sim$ fully specified context of a functional head in DM.
  Outputs $\sim$ (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.)

Distributed Optimality

Basic assumptions (Trommer (2001, 2006)):

- 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.

Conclusion:

- Again, the approach crucially relies on underspecification.
- As before, one might possibly make a case that the competing underspecified vocabulary items must be present in the input already.

Underspecification and Optimality

Assumption (see also Itô et al. (1995), Artstein (1998)):

- Underspecification (especially input underspecification) is a dubious concept in optimality theory (e.g., with respect to input/output similarity); it is a tool that belongs in a different model of grammar.
- To the extent that there are effects that look like they involve underspecification, they should be derived from standard optimality-theoretic constraint interaction.

If so, an new optimality-theoretic approach to syncretism is called for.

Towards a New Morphematic Approach

Basic assumptions:

1. There is no underspecification of exponents.
2. Paradigms are epiphenomena (Bobaljik (2007)).
3. Not all members of a paradigm (exponents) are present in the input; only leadings forms are (see Wurzel (1984), Albright (2007) on somewhat related concepts).
4. A mismatch of paradigm cells and leadings forms gives rise to syncretism: Initial gaps are filled by using "wrong", i.e., unfaithful exponents (Weisser (2006)).
5. Mismatches between the exponent's specification and the target specification are minimized; this is not accomplished by a single Minimality Principle (as in Weisser (2006)), but by a set of ranked faithfulness constraints for the features involved (as in Grimshaw (2001), Trommer (2001, 2006), Wunderlich (2004)).
6. Feature decomposition yielding natural classes is needed exactly as before.

Case Study: Determiner Inflection in German

P_5: 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

(37) Nine leading forms (see Wiese (1999)):

$/r/_1 \leftrightarrow$ [+masc,–fem,–gov,–obl]
$/n/_2 \leftrightarrow$ [+masc,–fem,+gov,–obl]
$/m/_3 \leftrightarrow$ [+masc,–fem,+gov,+obl]
$/s/_4 \leftrightarrow$ [+masc,–fem,–gov,+obl]
$/s/_5 \leftrightarrow$ [+masc,+fem,+gov,–obl]
$/e/_6 \leftrightarrow$ [–masc,+fem,–gov,–obl]
$/n/_7 \leftrightarrow$ [–masc,–fem,+gov,+obl]
$/r/_8 \leftrightarrow$ [–masc,+fem,–gov,+obl]
$/r/_9 \leftrightarrow$ [–masc,–fem,–gov,+obl]

Analysis

(38) Input:

a. a stem with fully specified morpho-syntactic features
b. an abstract case exponent EXP that stands for the set of possible (fully specified) exponents of the inventory.

The work is done by faithfulness constraints for exponents which may have to be violated so as to fulfill undominated MATCH. (Stem faithfulness is ranked higher.)

(39) Constraints:

a. MATCH:
The morpho-syntactic features of stem and exponent are identical in the output.
b. IDENTMASC:
[±masc] of the input must not be changed in the output on an exponent.
c. IDENTOBL:
[±obl] of the input must not be changed in the output on an exponent.
d. IDENTFEM:
[±fem] of the input must not be changed in the output on an exponent.
e. IDENTGOV:
[±gov] of the input must not be changed in the output on an exponent.

(40) Ranking:
IDENTMASC ≫ IDENTOBL ≫ IDENTFEM ≫ IDENTGOV

Note: This ranking is identical to Wiese's (1999) feature hierarchy.

Abstract Scenario

(41) Ranking:
IdentMasc ≫ IdentObl ≫ IdentFem ≫ IdentGov

P_6: Leading exponents

dies	[+masc,–fem]	[+masc,+fem]	[–masc,+fem]	[–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/$_9$

1. In 9 cases, Match can be satisfied without violating a faithfulness constraint.
2. In the remaining 7 cases, faithfulness must be violated.

Competitions 1

T_{16}: Nom.Neut.Sg contexts

I: 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 simplify comparison, the feature value changes incurred by the exponents are not marked; rather, their original status is given.

Competitions 2

T_{17}: Acc.Pl. contexts

I: 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]	*!				

ToDos

- impoverishment
- fission

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