

When morphology comes in.

Dieter Wunderlich (Berlin), Morphology Workshop, Großbothen, 21. June 2008

1. Is morphology presyntactic or postsyntactic?

Traditionally viewed, morphology builds up the atoms of syntax, and thus is presyntactic. A complex word is formed from a stem by affixation. An affix merges with a stem that itself can be atomic or complex. Both agglutinative and polysynthetic morphology show many instances of recursion.

By contrast, Distributed Morphology claims that morphology is postsyntactic. Functional heads in syntax provide the context for insertion of vocabulary items (affixes).

The assumption that affixes bear morphosyntactic features is neutral to the question of morphology-syntax ordering. In Paradigm Function Morphology (Stump 2001), these features are spelled out by means of morphological realization rules. In other frameworks (such as Minimalist Morphology, Wunderlich 1995), they are specified by vocabulary items. In Optimality Theory, they belong to the input. Morphosyntactic features mostly have a corresponding semantic value, so they can be regarded as part of what a speaker intends to encode.

Postsyntactic morphology is confronted with some serious problems:

1. *Cyclicity*. Phenomena such as syllabification, stress-assignment and opacity (domain-specific phonological alternations) suggest that morphology works cyclically bottom-up. Various research on level-ordering in Lexical Phonology (Kiparsky 1982, Mohanan 1986), Cophonology (Inkelas & Orgun 1998), and Stratal OT (Kiparsky 2000, Bermúdez-Otero 1999, 2007).

(1) Vowel deletion in Tripoli Arabic (Kiparsky 2000)

	báʔar ‘cattle’	
Stem-level: singulativ	báʔr-a ‘a cow’	vowel deletion applies
Word-level: possessiv	báʔar-i ‘my cattle’	... does not apply

(2) Stress placement and vowel deletion in Palestinian Arabic (Kiparsky 2000)

Stem-level:	fihim	‘he understood’
subject marker	fihím-na > fhím-na	‘we understood’
Word-level: object marker	fihím-na	‘he understood us’

The assumption of (bottom-up) cyclic morphology is inconsistent with the (top-down) postsyntactic view.

2. *Blocking*. If there is a choice between a morphological form and a syntactic periphrase (like in Latin perfect) or between a simple form and a derived form (like in *worse* vs. *badder*), the former wins because it is less complex. The conditions that determine the distribution of simple and complex forms are always more perspicuously stated on the simple form (Kiparsky 2005). A postsyntactic approach cannot give such a preference.

3. *Semantically empty morphemes*. Morphology can add material for prosodic rather than syntactic function. (3) Quechua: The epenthetic syllable *-ni-* dissolves consonant clusters.

- a. *rika-shu-r-ni-(y)ki* compare: b. *puklla-r*
 see-2obj-SS-ni-2 play-SS
 ‘when he/she sees you’ ‘when playing’

(4) Romance languages: In the majority of *i*-verbs the augment *-esk-/-isk-* is added for regularizing the foot structure (attracts stress).

Italian	present indicative		present subjunctive	
	sing.	plur.	sing.	plur.
1	<i>fîn-ísc-o</i>	<i>fîn-iámo</i>	<i>fîn-ísc-a</i>	<i>fîn-iámo</i>
2	<i>fîn-ísc-i</i>	<i>fîn-íte</i>	<i>fîn-ísc-a</i>	<i>fîn-iáte</i>
3	<i>fîn-ísc-e</i>	<i>fîn-ísc-ono</i>	<i>fîn-ísc-a</i>	<i>fîn-ísc-ano</i>

Vocabulary items (such as Qu. *ni* and It. *isk*) lacking semantic and syntactic content are not triggered by any morphosyntactic feature, and thus cannot surface postsyntactically.

4. *Class features*. Morphology makes use of class features (e.g., associated with a theme vowel, or more abstract) that neither have a role in syntax nor can be inherited from it. How could they come into function postsyntactically?

Alexiadou & Müller (2008): Presyntactic morphology can specify in what sense rich morphology determines syntactic pro-drop, and it makes arbitrary class features invisible for syntax. Consequence: A numeration set contains already inflected forms.

The first question that comes into mind is: *Why is there morphology at all?*

Morphology is an unnecessary component of language. By and large isolating languages such as Vietnamese, Hawaiian can manage without it. On the other hand, morphology can be recursive, doing work of syntax (compounding, operations on argument structure, affixal verbs).

Morphology surely differs from syntax in that it is more restricted.

Affixes either have a fixed position in the complex word (often defined by a rather complex template), or their position is variable with respect to each other (including negation, passive, causative, reflexive), but then they have a fixed scope – in contrast to syntactic movement which usually leads to scope ambiguities (determined by either underlying or surface position). The components of a word usually don't agree with each other. Moreover, it is not possible to mark the component of a word as topic or focus.

In this talk, I would like to offer an evolutionary aspect to the debate about morphology-syntax ordering. More specifically, I'll argue for the co-evolution of morphology and phonology.

Before that -

2. Not all morphology is derived from syntax

How did morphology emerge?

A broadly accepted view (in particular, among syntacticians): „Today's morphology is yesterday's syntax“: Syntactic items become reduced (and often semantically bleached), cliticized, and finally integrated as affixes into the word. Prominent grammaticalization paths of this sort are: postposition > clitic > case suffix, future auxiliary > clitic > future suffix.

Such a pathway might be true for parts of agglutinative morphology, but is highly questionable in view of the set of phenomena Anderson 1992 called „a-morphous“.

(5) Accent alternation in English

Nomen: prótest, pérmit

Verb: protést, permít

(6) Tone alternation in Mono (Banda language, Congo) (Olson 2001:50)

Nonfuture (high tone on the verb): ?a ná 'we go/we went'

Future (high tone on the pronoun, low tone on the verb): ?á nà 'we'll go'

(7) Umlaut in German (originally conditioned by /i/ or /j/ in the following syllable)

Singular: Vater, Bruder, Mutter

Plural: Väter, Brüder, Mütter

(8) Feature spread in Terena (Arawakan; Brazil) (Eastlack 1968)

3sgPoss	1sgPoss: nasalization	2sgPoss: palatalization
ajo 'his brother'	a ^{N:N} o ^N 'my brother'	a ^{P:P} o ^P 'your brother'

(9) Ablaut in PIE: both e/o-alternation and vowel length are correlated with accent

	'foot'
Nom.sg.	*pod-s
Nom.pl.	*pod-és
Abl.sg.	*ped-ós

	'look'
Present	*dérk-e
Aorist	*drk-é
Perfect	*de-dork

- (10) Ablaut in the Semitic languages. Arabic:

Consonantal root	Active: vowel melody a	Passive: vowel melody u-i
ktb 'write'	katab	kutib
f'l 'do'	fa'al	fu'il

- (11) The broken plural of Arabic has a iambic foot structure (the second syllable becomes heavy), similarly the diminutive. (McCarthy 1983, 1993, 2000, McCarthy & Prince 1990)

	Singular	Plural	Diminutive
'arrow'	qidH	qi.daaH	qu.dayH
'bank'	bank	bu.nuuk	bu.nayk
'man'	ra.jul	ri.jaal	ru.jayl
'sultan'	sul.Taan	sa.laa.Tiin	su.lay.Tiin

- (12) Gemination in Choctaw (Lombardi & McCarthy 1990)

	Base form	Completive ('y-grade')
'break'	ko.baf.fi	kó b .baf.fi
'return'	fa.la.ma	fál. laa .ma
'throw'	pi.la	piy. yii .la
'work'	tok.sa.li	tok.sáy. yaa .li

- (13) Truncation in Koasati (Lombardi & McCarthy 1990)

	Singular	Plural
'kick'	latá f -ka-n	lat-ka-n
'hang'	ataká a -li-n	atak-li-n
'trip'	iyyakohó p -ka-n	iyyakof-ka-n

Many of these phenomena (including also infixation and reduplication) were described by Templatic Morphology (McCarthy 1981) and the later Prosodic Morphology (McCarthy & Prince 1990, 1998), as well as by subsequent work in Prosodic OT. In these accounts, particular morphological categories (in terms of affix, root, stem, MWord) are identified with prosodic categories (mora, syllable, foot, PrWord), or regulated by means of constraints dealing with the morphology-prosody mapping. Obviously, the phonologists' perspective on morphology differs from that of syntacticians.

3. Morpho-phonological conspiracies

Morphology and phonology strongly interact in the word also outside of the domain of prosodic morphology. On the one side, phonological alternations can become dependent on morphological contexts, that is, morphologically conditioned alternations can preserve formerly free alternations in particular morphological domains. On the other side, both affixes and stems can achieve allomorphs that are phonologically conditioned. If the phonological rule determining the allomorphy becomes morphologically conditioned, the allomorphy itself turns into a morphologically conditioned one, and therefore must be listed lexically. Nevertheless, an affix might be selected by a stem in virtue of its phonologically features. For example, stems ending in a vowel may select another allomorph than stems ending in a consonant, which eventually leads to a distinction of inflectional classes. By contrast, stems aren't selected by affixes. Stem allomorphs either bear distinct morphological features (e.g., present, aorist, and perfect stem), or are sensitive to certain classes of affixes.

Hungarian has a class of suffixes with an optional initial vowel (among them those marking plural, accusative, possessor, superessive, etc.), and it has a productive class of nouns with a second stem. As it turns out, the second stem is always optimal with a vowel-initial suffix allomorph, while the first stem goes with the suffixes that invariantly begin with either a consonant or a vowel. Four different types of stem-allomorphs with this property are found.

(14) The interaction of allomorphs in Hungarian nouns (Stiebels & Wunderlich 1999)

	Dative -nAk	Essive -Ul	1pl.Poss -Unk	1pl.Poss -nk
bor 'wine'	bor-nak	bor-ul	bor-unk	*
ajtó 'door'	ajtó-nak	ajtó-ul	*	ajtó-nk
bokor 'bush'	bokor-nak	bokor-ul	*	*
bokr 'bush'	*	*	bokr-unk	*

The respective allomorphs are listed lexically, while their selection and interaction is determined phonologically.

That seems to be a situation quite often cross-linguistically. The three operations possible for marking a particular aspect in Uto-Aztecan can be considered allomorphs; they are selected in virtue of the respective syllable structure of stems. Similarly, the allomorphic operations forming the causative in South Central Dravidian are selected by considering the right edge of the stem.

(15) Mora affigation in Uto-Aztecan languages

The first syllable of a verb is heavy in the marked aspect (Haugen 2008)

- (i) Gemination in CV.CV... verbs
ni.mi > *nim.mi* 'walk'; Durative in Northern Paiute
- (ii) Addition of a laryngeal in CV.V... verbs
mi.a > *mi'.a* 'go'; Durative in Northern Paiute
- (iii) Vowel-lengthening in CVC.CV... verbs
yep.sa > *yep.sa* 'arrive'; Habitual in Yaqui

(16) Prosodic template in South Central Dravidian languages

The causative verb ends in a (relatively) unmarked consonant (Garrett & Blevins 2008)

- (i) Devoicing of a stem-final voiced consonant
ko:g 'be small' > *ko:k* 'reduce'
- (ii) Replacement of a stem-final consonant by p
cu:c 'see' > *cu:p* 'show'
- (iii) Adding p to a stem-final vowel
e 'arrive' > *ep* 'cause to arrive'

Although the three operations are somewhat related to each other (motivated phonologically), there is no necessity that exactly these three operations exist side-by-side. Therefore they must be listed.

A prominent feature of morphology is the large amount of memorized forms. As I pointed out, allomorphs usually are memorized, even if their selection or interaction is determined phonologically. Such a state of affairs invites class-specific generalizations, so that the vocabulary gets partitioned, and analogical extensions are made possible. Even more important might be the fact that memorized items are processed according to their frequency rather than complexity. In any case, it is astonishing to what extent idiosyncratic classes are stable diachronically. For the perfect forms of the consonantal stems of Latin one finds five (or six) different patterns, some already present in PIE 3,000 years before that time, and surviving in most of the Romance daughter languages until 2,000 years later.

(17) Perfect in the consonantal stems of Latin

	base stem	perfect stem	
reduplication	curr	cucurr	'run'
ablaut (vowel lengthening)	ed	e:d	'eat'
s-suffix	scri:b	scri:ps	'write'
v-suffix	ser	se:v	'sow'
u-suffix	ser	seru	'line up'
no change	vert	vert	'turn'

In addition, all perfect stems, including those that are regularly formed by means of v/u, add -i, which already was the case in PIE.

4. Co-evolution of phonology and morphology

What I have demonstrated is that modulatoric (nonconcatenative) morphology is tightly interwoven with phonology. In the following, I will pursue an evolutionary perspective.

Let us first consider how phonology could have emerged. Studdert-Kennedy 2005 and Oudeyer 2005 argue that phonology results from self-organization of a complex system, running through an increasing number of random speaker-hearer interactions.

The human speech code is characterized by

- (i) Discreteness: The continuum of possible sounds is broken into discrete units.
- (ii) Systematic reuse: These units are systematically reused to build higher-level structures of sounds, like syllables.
- (iii) Universal tendencies: Recurring units of vocalization systems are characterized by universal tendencies.
- (iv) Sharing: The speakers of a particular language use the same phonemes and they categorize speech sound in the same manner.
- (v) Diversity: Each language categorizes speech sounds in its own way, and sometimes does this very differently from other languages.

Oudeyer's computer simulations show „that the formation of sound systems with the properties (i) to (v) are the result of self-organization occurring in the interactions of modules which were not necessarily selected for communication“. His model uses the constructional features of sound processing, which involves a chain of information from an acoustic input via two neural maps (a perceptual and an articulatory one) to a control system for the vocal tract (which itself contains several independent organs).

(18) → ear → [perceptual map → articulatory map]_{brain} → control system + vocal tract →

There are several agents equipped with this apparatus. „At random times, they produce a vocalization, and agents next to them hear the sound and adapt their neural maps. Each agent also hears its own sounds, using this to learn the mapping from perception to motor commands.“ If an agent hears certain sounds more often than others, he will also tend to produce them more often.

„At the start, every agent produces sounds with targets that are randomly spread across the continuum. [...] Their neural maps selforganize and synchronize so that after a while they produce complex sounds with targets belonging to a small number of well-defined clusters [attractors or 'phonemes']: the continuum is then discretized.“ „In each simulation run, the set of clusters that appears is different (so there is diversity).“

One of Oudeyer's assumptions was „that the agents activate spontaneously, often, and randomly, the neurons of their motor map“. To make sense of such a system, the agents probably would have associated certain meanings with the higher-level structures of sounds (syllables, feet etc.). Let us assume that they were able to use the items of their lexical vocabulary either referentially (i.e. to refer to objects and circumstances of interest) or predicatively (i.e. to characterize the type of those objects or circumstances), and that they tried to understand the utterances that they hear.

Under these conditions, the simultaneous emergence of some kind of morphology is inevitable. In rapid speech, several pronunciation variants of a word are produced and, consequently, can be interpreted as semantic variants of the word (see also Carstairs-McCarthy 2005).

The realization of a vowel depends on its consonantal context, and the realization of a consonant depends on its vocalic context. Moreover, vowels are differently realized in an open or closed, and in an stressed or unstressed syllable (→ablaut). Consonants are differently realized word-internally or at the edge of a word (→consonant mutation). Both vowels and consonants tend to be lengthened in a more heavy or stressed syllable (→gemination, vowel lengthening). Certain segments of speech (syllables, words) can be repeated in order to strengthen or intensify the message (→reduplication).

Within an increasing number of speaker-hearer interactions, these differences can amount in establishing specific morphological categories, thus indicating whether a referring expression is used specifically or nonspecifically, whether it relates to a single object or a set of objects, and whether a predicative expression is used with a certain aspect or modality. Indeed, most of the morphological phenomena that do not have an obvious syntactic origin can be considered as reinterpretations of phonologically conditioned alternations.

In acquiring the language, phonological features are generalized, abstracting over several pronunciation variants, but also (more or less simultaneously) morphological features are generalized, abstracting over several interpretation variants. Thus, in the process of iterated learning over several generations, a whole system of morpho-phonology comes into existence. Even if certain phonological alternations get morphologized, some other phonological alternations do not. But, as I said before, they can become restricted to certain morphological domains, so that the phonological system can be changed without changing at the same time those features that are morphologically conditioned.

Moreover, phonological effects restricted to the edge of a word might be reinterpreted as affixes, maybe by adding certain phonological material for optimizing the perception of such an alternation. Although the main argument goes with nonconcatenative morphology, it is not excluded that some affixes such as single consonants and syllables emerge from phonology rather than be inherited from syntax.

5. Rare morphologies

Typologically rare phonologies can emerge through the interaction of several processes, each phonetically expected, however rare in combination. Besides, they can arise from morphologically triggered generalizations, and maintain if they are supported by paradigmatic contrasts. Garrett & Blevins (2008) discuss three of those cases that involve generalization of unexpected phonological alternations via analogy.

In Ancient Greek, coronal stops surface as *s* before /*m*/ in the perfect middle (with 1sg. *-mai* as well as 1pl. *-met^ha*). This process was triggered by analogy to the regular spirantization before the coronal obstruents in 2sg. *-sai* and 3sg. *-tai*.

(19) Unexpected spirantization in Greek (before *-mai* in /*pseud-* ‘deceive’)

	morphemes	Spirantization in the reconstructed forms	Paradigm leveling in the attested forms
1sg	é-pseud-mai	*é-pseud-mai	é-pseus-mai
2sg	é-pseud-sai	*é-pseus-sai	é-pseus-sai
3sg	é-pseud-tai	*é-pseus-tai	é-pseus-tai

In Classical Greek, *d-m > s-m* was further extended to all verb forms, including the perfect middle participle (with *-ménos*) and nominalizations (with *-mé*).

According to Garrett & Blevins, nasal-obstruent metatheses in the East Cushitic languages arised by reinterpreting progressive assimilation (occurring with simple roots) as regressive (independently occurring with derived stems). For example, *-s-te > -sse* with the personal suffix *-te* (2sg/3sg.fem) was reanalyzed as **-t-se (> -sse)*, which „looked like metathesis“; this pattern then was extended to the 1pl suffix *-ne*; thus, the ending became regularized (in this case *-se*).

(20) Unexpected nasal-obstruent metathesis in the simple perfect of Bayso (East Cushitic)

/ajees/ ‘speak’	morphemes	surface form	reinterpretation	surface form
2sg/3sg.f	/ajees-te/	ajeesse	*ajeet-se	ajees-se
1pl	/ajees-ne/			ajeen-se

In the verbal system of the Kondh languages (South-Central Dravidian), velar-labial stop sequences metathesize: $kp > pk$, $gb > bg$, apparent from the interaction of causative formation (devoicing, p-substitution, or p-suffix) and plural action stem formation (*-ka*, *-pa*, or *-ba*).

(21) Unexpected velar-stop metathesis in the plural action stems of Pengo (Kondh, Dravidian)

Intransitive verb root	Causative form	Reanalysis (devoicing and reduction)	Plural action form	Looks like metathesis with the allomorph <i>-pa</i>
pag 'be split'	pap 'split'	*pag-p > pakp > pap	pap-ka	/pag-pa/ > papka
rik 'break'	rip 'break'	*rik-p > rikp > rip	rip-ka	/rik-pa/ > ripka

With the allomorph *-ba* one gets the plural action form for itr. 'be split' /pag-ba/ > *pabga*, following the same pattern.

Given that Garrett & Blevins' analysis is right, phonetically unexpected alternations exist that originate via analogical generalization of a fortuitous morphological pattern. The last two metatheses occur in all languages of a whole subfamily (East Cushitic, Kondh), which shows that these alternations are diachronically stable. To the extent that phonologically rare, but diachronically stable alternations are found in the languages of the world, the morpho-phonological interactions responsible for them must be widespread and deeply involved in the history of language. I suspect that the number of those phenomena is rather high, in particular in languages of small groups not standing under the pressure of standardization, so that there is good reason to believe that this type of interaction is as old as vocalic language is.

6. Summary

I argued for presyntactic morphology from different perspectives.

- (i) Certain morphological phenomena (cyclicity, blocking, semantically empty morphemes, arbitrary inflection class features) cannot be readily explained if one assumes morphology to be postsyntactic.
- (ii) A number of phonological exponents of morphological categories, summarized under the headings 'modulatoric' or 'nonconcatenational' morphology, are certainly not inherited from syntax.
- (iii) Morpho-phonological conspiracies observed with allomorphy and its conditioning, and the diachronic stability of what is memorized, indicate that morphology and phonology go together more intimately than postsyntactic morphology suggests.
- (iv) Extending models that simulate the emergence of discrete phonology, a plausible way can be sketched of how modulatoric morphology emerged from reinterpreting phonological alternations.
- (v) The existence of rare phonologies developed via analogical generalization of a fortitious morphological pattern indicates that morphology must be presyntactic in order to have this impact on phonology.

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