

What linguistic universals can be true of

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Abstract

Universals in linguistics were traditionally intended to be true of languages: “for all languages, p ” or “for all languages, if p then q ”. Our contention, by contrast, is that languages as such, or mental lexicons-and-grammars as such, are too global a scope for many universals. Linguistic universals are not axiomatically to be conceived of as universals of language: it is only derivatively — namely if universals are true of all parts of each language and of all representations of forms-in-constructions of each language — that this is what they may amount to. Only very basic organising principles of lexicons and grammars should really be expected to make their influence felt pervasively, over all parts and all representations.

Keywords

adjective order, asymmetry, coronal, gender, infixation, markedness, universals

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1. Introduction

What universals in linguistics were traditionally intended to be true of was languages: “for all languages, p ” or “for no language, not p ”, or, in the case of co-variation, “for all languages, if p then q ” (or, equivalently “if not q then not p ” or, restated non-implicationally, “not (p and not q)”) or “for no language, if p then not q ” (or “if q then not p ” or “not (p and not q)”). However time-honoured this manner of speaking and thinking, for many p 's and q 's it suggests too global a scope for constraints through which linguistic diversity is limited. It can be deceptive on several grounds to axiomatically equate “linguistic universals” with “universals of language”.

2. True of all languages

It is not only difficult but impossible to prove or disprove universal claims — linguistic universals as well as cognitive or phonetic universals in which they may be grounded — which are meant to be true of the domain of ALL human languages EVER; empirically true, that is, rather than true by definition of “language”.¹ For many languages which are known to exist or to have existed knowledge is inaccessible, limited, conjectural, or forever irretrievable; and outside a narrow window in the history of speaking man — some 10,000 years at best out of so far 100 or 200,000 — no knowledge about languages is to be had at all. Hypotheses about universals have to be formed, and their validity has to be ascertained, without any regard to languages outside this window, on the side of both the past and the future (assuming *homo loquens* has one). Therefore, the empirical basis of universals research can only be (a sample of) a subset of the domain for which universals could maximally claim validity, and have traditionally

¹ For those who require universals only to be POTENTIALLY true of languages, rather than ACTUALLY true, it is easy to establish universality: anything attested in one individual language (clicks, labial affricates, stem-internal reduplication, verb-second, a basic colour term for ‘turquoise’, etc., whatever deserves exhibition in DAS GRAMMATISCHE RARITÄTENKABINETT at <http://typo.uni-konstanz.de/rara/intro/>) is universal in this sense. The corresponding problem here is that there is no way of even guessing whether you know 1% or 99% of the contents of this common fund from which particular languages are making their choices.

been claiming validity: that of humanly possible languages. For several reasons, there is no way of dependably generalising from (a sample of) this subset to the entire domain, however uniformitarian one's convictions: (i) linguistic diversity is likely to have been massively reduced in the distant past through natural catastrophes decimating mankind, and unlike with life forms there are no fossil traces allowing us to infer what has happened to be lost; (ii) patterns of linguistic diversity have been randomly skewed throughout human history insofar as they were concomitant to the histories of populations — migrating or stagnant, conquering or conquered, surviving or extinguished, culturally influential or influenced; (iii) at any point in time, future linguistic diversity has been, and will be, a function of linguistic diversity of the past insofar as learners, however linguistically imaginative, cannot but model their own languages on only those languages that are still around to be learned.

To seriously confirm or disconfirm universals in the strict and most ambitious sense, it would need several reruns of the linguistic history of *homo sapiens sapiens* under randomly differing population-historical conditions, so as to be able to see how diversity and unity would be recreated through innovations and retentions in 4,000–8,000 successive generations of learners altering or preserving the human protolanguage (itself still the chimera which it was in 1866 when the Société Linguistique de Paris ruled the origin of language unfit as a topic for scholarly publication).

The only viable domain for universals research, then, is all-languages-as-known-to-us-now. The risk, inevitably, is that this subset is atypical of the set of all-languages-ever: what appear to be “universals” may, *sub specie aeternitatis*, only be historical contingencies.

3. True of all varieties

It may seem immodest but is really trivial: we would in fact want universals not only to be true of languages-as-known-to-us-now, but of each variety — dialect, sociolect, idiolect, register — of each known language. Naturally, if one variety of some language had some property *p* which another variety of the same language, and perhaps

the variety designated as a standard, was known to be lacking, no one would claim universal status for *p*. There are no, say, dialect universals, intended as valid only for dialects, as distinct from standard-language universals. (Which is not to say there can be no universals concerning the range of possible divergences from a norm.)

Fortunately, distinguishing what is a language and what is a variety of a language isn't one of your problems when you are in the universals business. Assuming there are lexicons-and-grammars mentally represented by individuals who on this basis perform speech acts which co-members of their speech communities can make sense of through their own mental lexicons-and-grammars, the individuals whose diversity and unity across mankind-as-known-to-us we are in the business of studying are individual mental lexicons-and-grammars — ALL of them about which knowledge is to be had. Of course, if you had a hard time trying to representatively sample languages, and are now being asked to sample mental lexicons-and-grammars instead, your practical problems will be enormous; but this is a different matter.

What matters for present purposes is the recognition that it is individual lexical and grammatical innovations which bring about linguistic diversity — those, that is, which prove socially successful, diffusing through speech communities or segments of them, effectuating change. And wherever diversity is limited through universals, it must be individual innovations, or sets of them in the case of co-variation, which are subject to constraints. It is not entire languages that are being innovated at one go.

4. True of all speech acts

Lexicons-and-grammars manifest themselves in speech acts: disregarding extraneous interferences, no single speech act, in any known variety of any known language, should therefore be violating any valid universal constraint on lexicons-and-grammars. Although this expectation is trivial, too, the proviso needs to be added that only such properties of speech acts are at issue as are subject to the regulation of lexicons-and-grammars.

For example, segment inventories universally distinguish between consonants and vowels, and no variety of any known (spoken) language is at odds with this

universal, interpreted phonetically or phonologically.² However, not all utterances to be heard — of words or whole sentences — will contain both consonants and vowels, phonetically or also phonologically: *xlp'χ^wtlp^hs k^wc'* 'then he had had in his possession a bunchberry plant' or *c'ktsk^wc'* 'he arrived' from Bella Coola only consist of consonants (some syllabic); *uouoa* 'false mullet' (a fish) or *axei: eia* (ending of chant) from Hawaiian only consist of vowels (Hyman 2007). Given the segment inventories of these two languages, one Salishan and the other Austronesian, and the way the available segments are deployed in lexical entries, it is not entirely accidental that vowel-less or consonant-less utterances should occasionally occur here (rather than, say, in English). Nonetheless, such occurrences are not as such rule-governed, and thus are not under the direct jurisdiction of constraints on linguistic diversity and on linguistic innovations which bring it about.

5. The scope of universals, often limited

With diversity ultimately due to individual innovations, the questions to be addressed, then, are these: Is it really WHOLE languages (as we know them), or WHOLE mental lexicons-and-grammars (as we are able to describe them), that universals are to be expected to be true of? And what if they do happen to be true of WHOLE languages, or WHOLE mental lexicons-and-grammars, but are not also true of some of their PARTS? In reply, our contention is that languages as such, or mental lexicons-and-grammars as such, are not the right kind of individuals to generalise over in universals research, or at any rate to begin to generalise. LINGUISTIC universals are not axiomatically to be conceived of as universals OF LANGUAGE: it is only derivatively — namely if universals are true of ALL PARTS of each (known) language and of ALL REPRESENTATIONS of forms-in-constructions of each (known) language — that this is what they may amount to. Individual innovations, bringing about diversity, may well be rather local in scope and affect some parts and some representations independently of others, and may be

² For an extensive and ongoing documentation of universals, including those discussed and not specially referenced in this paper, see THE UNIVERSALS ARCHIVE at <http://typo.uni-konstanz.de/archive/intro/>.

independently reined in by constraints of their own. Upon reflection, it is only very basic organising principles of lexicons and grammars which should really be expected to make their influence felt pervasively, over all parts and all representations.

6. True of only some language-parts

First, it may be the case that universals-intended-as-valid-for-known-languages are valid or invalid depending on whether they are intended to apply to LANGUAGES AS SUCH or to all PARTS of them — that is, all particular words in all their forms in all their particular constructions.

6.1. Some words as misfits

To see that this can make a difference, take the universal, often claimed to be unexceptional, that gender distinctions are unequally distributed over numbers, favouring the singular over non-singular numbers. This is an instance of the more general universal, widely invoked, that marked terms of morphological categories (such as plural or dual numbers) are more disposed than their unmarked opposites (such as singular) to license neutralisations of term-distinctions for categories they intersect with.³

If its lexicon and grammar, especially its inflectional morphology, are considered in their entirety, Spanish conforms to the universal, stated implicationally, that if a gender distinction is found in non-singular numbers, it will also be found in the singular: Spanish distinguishes two genders (masculine and feminine) in both singular and plural, and a marginal third (“neuter”) only in the singular. However, there are two words in Spanish, the independent 1st and informal 2nd person personal pronouns, which distinguish masculine and feminine only in the plural — consisting of original 1st/2nd person plural pronouns *nos/vos*, to which the adjective *otr-os/-as* ‘other’ has come to be added, which retains the gender contrast of adjectives — but not in the singular:

³ See further Plank & Schellinger 1997.

(1) Spanish personal pronouns (only subject forms given)

		SG			PL	
		MASC	FEM	NEUT	MASC	FEM
1st		-----	<i>yo</i>	-----	<i>nosotros</i>	<i>nosotras</i>
2nd	INFORMAL	-----	<i>tú</i>	-----	<i>vosotros</i>	<i>vosotras</i>
	FORMAL	-----	<i>usted</i>	-----	-----	<i>ustedes</i>
3rd		<i>él</i>	<i>ella</i>	<i>ello</i>	<i>ellos</i>	<i>ellas</i>

Similar patterns are not uncommon elsewhere. Sometimes gender distinctions are found to be inoffensively distributed over numbers when the languages concerned are looked at as a whole; but then some words in these languages, namely pronouns, preferably of 1st and 2nd person, as in Lithuanian (2), are seen to limit gender distinctions to the dual (which typically includes the numeral ‘two’, continuing to agree in gender in the manner of a lower numeral after being grammaticalised as part of a dual form), while the corresponding words in the singular — ‘I’ and ‘you’ — lack this gender contrast.⁴

(2) Lithuanian personal pronouns (only nominative forms given)

		SG		DU		PL		
		MASC	FEM	MASC	FEM	MASC	FEM	
1st		-----	<i>àš</i>	-----	<i>mùdu</i>	<i>mùdvi</i>	-----	<i>mēs</i>
2nd		-----	<i>tù</i>	-----	<i>jùdu</i>	<i>jùdvi</i>	-----	<i>jūs</i>
3rd		<i>jìs</i>	<i>jì</i>	<i>juōdu</i>	<i>jiēdvi</i>	<i>jiē</i>	<i>jōs</i>	

⁴ In other, ostensibly similar instances of particular words offending against this universal there are no other words which would exculpate the languages concerned. Sometimes words which are used to refer to sets of referents of potentially mixed gender, namely anaphoric pronouns (‘they’ as ‘he and she’ as opposed to ‘he and he’ and ‘she and she’), may have an extra gender form in their plural vis-à-vis the corresponding singular (rather than practising gender resolution in favour of the unmarked gender, as in French, or also rather than neutralising gender entirely in non-singular, as in English); naturally, no words will have SINGULARS of mixed gender, a contradiction in terms.

Another familiar morphological universal is familiarly intended as valid for whole languages: If a dual (a highly marked number) is distinguished in number systems, then a plural (less marked) will also be distinguished. While the universal is probably valid for all known languages, notwithstanding some where a plural would seem somewhat less entrenched than the dual in terms of frequency of occurrence or indeed of obligatoriness, it is not so uncommon for some words in languages with a dual, namely words designating natural pairs, to only inflect for dual but not for plural (Plank 1989: 317-318). Thereby, a semantically coherent subset of words violates a universal that remains true of the respective languages as a whole.

As a phonological example, consider a familiar instance of asymmetry in phoneme inventories (and see further Section 8 below): universally, “umlauted” vowels (front, round /y, ʏ, ø, œ/) imply their unumlauted counterparts (/u, u, o, o/). New High German has both series (with perhaps a tendency in dialects to unround umlaut vowels), and as a language therefore does not give offence; neither did earlier Germanic prior to umlauting, showing only the unumlauted series of vowels. When umlauting began, the corresponding vowel series used to be distributed unequally over the inventory of form classes: only stressed syllables of content or function words could have their vowel umlauted by a following high vowel or glide; elsewhere — that is, in affixes, whether stressed or unstressed, as well as in unstressed syllables of words — only unumlauted vowels would be found. Originally, therefore, as long as umlaut was a productive phonological process, each of these form classes individually would conform to the universal, too: there were either only unumlauted vowels, or unumlauted as well as umlauted vowels; no form class had only umlauted vowels. Then, with the phonological umlaut triggers gone and with umlaut partly morphologised, the distributions over form classes changed: now there are words (both content and function words, such as *Tür* ‘door’, a noun, *schön* ‘beautiful’, an adjective, *stöhnen* ‘groan’, a verb, and *für* ‘for’, a preposition) which have umlauted vowels lacking an unumlauted counterpart — which is precisely the asymmetry proscribed by the implication at issue. It is (i) words where umlaut has not been generalised and unumlauted and umlauted vowels alternate across inflectional paradigms and/or between base and derivation (morphologically conditioned) and (ii) words wholly

without umlaut which bring the vowel inventory of New High German up to standards, as defined by the implication that unumlauted imply unumlauted vowels.

6.2. Some word-forms as misfits

In a variation on this theme of exceptional parts (words) of unexceptionable wholes (languages), when all individual words, or rather lexemes, of a language behave as dictated by a universal, it may still be the case individual inflectional FORMS of some words misbehave.

With a symmetric gender system of masculine, feminine, neuter distinguished in both singular and plural, and with more gender neutralisations in plural than in singular, Latin, as a language, conforms to the universal about permissible gender-number skewings. However, there are several sets of words in Latin which inflect for gender, number, and case and distinguish genders in both singular and plural, but which deviate insofar as only in certain cases genders are distinguished in the plural but not in the corresponding singular case form. This more circumscribed kind of deviation is found, for example, in the nominative with all present participles and the so-called adjectives of one termination (such as *fēlīk-s* ‘happy’), where neuter is distinct from masculine/feminine only in the plural (3); in the genitive with all words following the pronominal inflection (such as the proximal demonstrative *is, ea, id* ‘he, she, it; this’), where masculine/neuter is distinct from feminine only in the plural (4); in the accusative with *o-/a*-stem adjectives (such as *māgn-us* ‘great’), where all three genders are only distinct in the plural (5).

(3) Latin adjectives of one termination (partial)

	SG			PL				
	MASC	FEM	NEUT	MASC	FEM	NEUT		
NOM	-----	<i>fēlīk-s</i>	-----	-----	<i>fēlīk-ēs</i>	-----	<i>fēlīk-ia</i>	
ACC	----	<i>fēlīk-em</i>	---	<i>fēlīk-s</i>	-----	<i>fēlīk-ēs</i>	-----	<i>fēlīk-ia</i>

(4) Latin pronominal inflection (partial)

	SG	PL
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	MASC	NEUT	FEM	MASC	NEUT	FEM
NOM	<i>is</i>	<i>id</i>	<i>ea</i>	<i>iī</i>	<i>ea</i>	<i>eae</i>
GEN	----- <i>ē-ius</i> -----			----- <i>e-ōrum</i> -----	<i>e-ārum</i>	

(5) Latin *o-/a*-stem adjectives (partial)

	SG			PL		
	MASC	NEUT	FEM	MASC	NEUT	FEM
NOM	<i>māgn-us</i>	<i>māgn-um</i>	<i>māgn-a</i>	<i>māgn-ī</i>	<i>māgn-a</i>	<i>māgn-ae</i>
ACC	----- <i>māgn-um</i> -----	<i>māgn-am</i>		<i>māgn-ōs</i>	<i>māgn-a</i>	<i>māgn-ās</i>

As a possible phonological analogue, assume that if the cluster [nz] is permitted word-finally, then [ns] will also be permitted in this position, provided there is a voicing contrast for sibilants to begin with. Due to the frequency of word-final devoicing in the world's languages, this would seem not too wildly implausible a universal to assume. Modern English as a whole, a language not given to final devoicing, would be inoffensive, with both [nz] and [ns] found word-finally. All words of English, in their basic form, behave as demanded by the putative universal, too, which only excludes the constellation “permissible [nz], impermissible [ns]”: with no (synchronic) morpheme boundary between the segments of the cluster, only [ns] occurs, but not [nz] (e.g., *pence, lance, fence, trance, prince, science, disturbance, conference, wince, nonce, hence, since, summons, good heavens!, Hanse, Heinz, trans-*).⁵ However, when a morpheme boundary intervenes, [nz] is the only surface option, with voicing assimilation obligatory in derived environments (plural *pen-s, heaven-s*, 3rd singular *win-s*, genitive *the nun's tale*, clitic copula *the hen's here*). Inflected word-forms, thus, show the very constellation that is prohibited, “permissible [nz], impermissible [ns]”.

6.3. So what?

⁵ Proper names like *Jones, Stevens, Collins, Orleans* permit /nz/, with final -s perhaps analysed as a naming formative; so do *lens*, perhaps continually analysed as plural, and anglicised Latin expressions like *locum tenens* or *homo sapiens*, partly also prefix *trans-*.

When some parts of some (or perhaps also many) languages are found to be at odds with a universal that holds true for other parts, however close the affinity between the parts might seem with respect to the phenomenon concerned, it would be as rash to unceremoniously drop that universal or downgrade it from a categorical to a statistical universal as it would be complacent to accept it as confirmed, valid as it is for languages as a whole. Rather, the conclusion to be drawn is that universals are not perforce to be predicated of languages as a whole. And the question to be confronted is why some parts of lexicons-and-grammars are exempt from constraints limiting the diversity of other, kindred parts.

As to the examples discussed in this section, gender distinction is not a property of languages: it is particular words or word classes which distinguish gender and trigger gender agreement and which, in particular inflectional forms, agree in gender; on present evidence, innovating, maintaining, altering, abandoning gender distinctions can to some extent be done independently from one word or word class to other, or from one inflectional category to the other. Universals constrain the extent of this independence; but they must not constrain it too much. No gender distinction must be forced on 1st and 2nd person singular pronouns, most reluctantly gendered anywhere, whenever dual or plural 1st/2nd person pronouns have inadvertently gained themselves one through grammaticalisation. No gender distinction must be forced on words and their singular inflectional forms in Indo-European languages such as Latin when the case-marking pattern and exponents specifically for neuters prevails in the plural, overriding all other paradigmatic design specifications. Things may happen to parts of inflectional paradigms for all sorts of reasons, morphological, phonological, or syntactic, and symmetric or suitably asymmetric gender distinction may not always have the highest priority in actuating or counteracting paradigmatic changes.

Dual marking is not a property of whole languages, either: it is particular words and word classes which, in particular inflectional forms, inflect for this number category, and perhaps agree in dual. Again, on present evidence, innovations, maintenance, alterations, and losses of duals in relation to other numbers can to some extent proceed independently from one word or word class to the other. However rigidly the extent of this independence is constrained, no plural must be forced on

natural pair nouns whenever they have innovated a dual, the number most congenial to them.

Phonotactic constraints are not properties of whole languages, either: they may selectively apply or not apply to different kinds of domains, such as simple words and complex words. On present evidence, when progressive voicing assimilation only applies in derived environments of complex words, then contrasts in the final segment of clusters that would obtain otherwise, with voiceless preferred word-finally, must be allowed to be reversed.

Lastly, parts of segment inventories can be deployed selectively across the form classes of a language. With unlauded front, rounded vowels in Germanic this distribution over form classes and positions in words follows from the way this whole series was innovated. With umlaut susceptible to be morphologised, on present evidence, the umlaut series must be allowed to become independent of its unlauded counterpart series and lead a distributional life of its own.

In sum, it is an empirical issue to determine what the minimal units and processes are that can vary independently of one another from one lexicon-and-grammar to the other: one domain of occurrence of segments and clusters from others in phonology; one word class from other word classes, one word of one word class from other words of the same class, one inflectional form from other inflectional forms of the same word in inflection; one construction from other constructions, one form-in-construction from other forms in the same construction, rules of construction from other rules in syntax. It is a further empirical issue to ascertain co-variation for such elementary units and processes, and thereby to seek to generalise as far as possible, but not further. The challenge is to find reasons why not all individual parts always do as the strongest generalisations over whole languages would have it: sometimes, this reason is that non-conforming parts, newly grammaticalised or otherwise innovated, or left-overs of other parts recently lost, have not had enough time yet to come to conform.

7. True of only some representations of forms-in-constructions

Given that lexical forms and grammatical constructions are complex structures with potentially several representations, these representations may be constrained selectively, each according to its own rationale. Refining traditional approaches where universals were assumed to be globally true of forms-in-constructions per se, universals have more recently been distinguished as “descriptive” and “analytic”/“architectural” (Hyman 2007), as “deep” and “surface” (Newmeyer 2007), or as “abstract” and “concrete” (Plank 2007), depending on which kinds of representations they specifically constrain.

7.1. Morphology disarrayed when pronounced

As a first example, consider infixes. Their relevance here is that morphological constituents, in particular stems, may be licensed to be discontinuous in representations of words close to the way they are pronounced, whereas in morphological representations themselves such discontinuities are prohibited.⁶

On the face of it, affix order is evidently variable: there are suffixes, prefixes, circumfixes (perhaps including “parafixes”, consisting of an adfix and an infix), transfixes (unlike circumfixes morphologically not bipartite), and infixes — the first by far most common and the last by far least common crosslinguistically. An implicational universal can be stated (and has been stated) which would account for the unequal crosslinguistic distributions, insofar as the availability of one kind of affixes is made conditional on the presence of other kinds: If there are infixes, there will also be adfixes (= suffixes and/or prefixes, also circumfixes other than parafixes). Achronically, this constraint can be seen as a particular case, pertaining to stems, of a more general constraint against discontinuous constituents: Discontinuous constituents are dispreferred as being more difficult to store, access, and process than continuous constituents. This constraint can also be seen as derivative of a diachronic law: Adfixes are the only productive source of infixes, and phonological rearrangement is the only productive mechanism of getting adfixes inside stems (in the right phonological circumstances, with adfixes remaining external elsewhere). There are in fact one or two

⁶ For epic surveys of infixation see Ultan 1975, Moravcsik 1977, 2000, Yu 2007. A short story has been distilled from them in Plank 2003, 2007, now slightly rewritten in light of Yu 2007.

other scenarios for the emergence of infixes, in particular “entrapment” and “excrecence”: when an outer affix or function word is reanalysed as part of the stem, an inner affix may thus be trapped in between the two parts of new bipartite stems; an internal syllable or sequence of segments, originally meaningless but found to recur in several stems, may be reanalysed as a morphological word-part and eventually get inserted in other stems, too.⁷ At least in the case of entrapment, infixes imply affixes, too, diachronically and very likely also synchronically.

An even stricter constraint would be not to permit infixation at all, anywhere and at any time, rather than allowing it on the (achronic or diachronic) condition that there is also affixation. Though it is desirable to push constraints as far as possible, this move would seem glaringly at odds with crosslinguistic reality: there ARE affixes inside stems, and they DID get inside stems from external origins. However, when word representations are separated into an abstract morphological one, taking care of the construction of complex meanings and forms from their component parts, and a concrete one that is to be pronounced, the strict constraint does prove tenable if selectively imposed on morphological representations. In thereby absolving the morphology of the responsibility for infixes, at least those originating through metathesis, light is also shed on constraints on infix constructions that would otherwise seem accidental.

With the historical origin of affixes overwhelmingly external, owed to the univerbation of separate contiguous words (and only rarely to excrecence), morphology prefers order to be rigid: reorderings of affixes among each other and relative to stems are rare, and may need special licensing by prosodic or scope-semantic considerations; partial interlacings of external addenda with stems are morphological anathema — unless the fault lies with stems themselves, as when bipartite stems are being created, trapping affixes in between their parts, now infixes of sorts. It would certainly be odd if serial order in morphological representations were completely

⁷ Estimates differ on whether entrapment is exceedingly rare or not uncommon. The American English infix *-ma-* (as in *sophisti-ma-cated*) supposedly illustrates excrecence, being traced to /ma/'s in filler words such as *whatchamacallit* (< *what you may call it*) and *thing(a)mabob* (< *thingum(a)-bob*) by Yu (2007: 174-177). Yu (2007: 157-172) also suggests “reduplication mutation” — complex internal reanalyses of opaque reduplicative constructions — as a further scenario of infix emergence.

ignored when complex words are pronounced; nonetheless, the units structuring pronunciation are not identical to morphological ones, and for its own purposes pronunciation (or indeed also perception) may find divergent representations preferable, with relevant parts arranged differently. Arguably, then, infixations (at least if not due to entrapment) are the sole responsibility of phonology, which is not bound to maintain continuous morphological constituency should other considerations prevail; “infixes” (other than those entrapped) are adfixes attached to phonological rather than morphological units.

The relevant prosodic units and structures which are at a premium in phonological arrangements, including those of morphological representations with adfixes (with those affected underlined in examples), are these, and only these:

- (i) SYLLABLES, as syllabified at the stem or perhaps also the word level, with the arrangement of segments aiming at CV patterns, at permissible clusters, at having clusters internally rather than at word-edges, at sonority sequencing, or at overall syllabic compactness.

Examples:

- perfective verbs in Tagalog (Malayo-Polynesian, Austronesian) such as *k-um-ain* ‘ate’, *p-um-asok* ‘entered’;
- present stems of verbs of the relevant conjugation class in Latin (Italic, Indo-European) such as *fu-N-d-* ‘shed’, *vi-N-k-* ‘conquer’, *ru-N-p-* ‘break’ (with the nasal assimilating in place to the following consonant);⁸
- nominalisations of verbs in Leti (Malayo-Polynesian, Austronesian) such as *k-ni-akri* ‘act of crying’, *d-i-avra* ‘act of cutting’, *d-ni-ivri* ‘act of smashing’ (high vowels become glides before a non-high vowel and delete before a high vowel; /n/ deletes after /d/; hence: [knja.kri], [dja.vra], [di.vri], with

⁸ In Latin, it is only at the STEM level that the nasal stem formative in suffixal position would yield an impermissible coda cluster, with a more sonorous followed by a less sonorous consonant (*fud-N-*, *vik-N-*, *rup-N-*); as all inflectional suffixes begin with a vowel, WORD FORMS would be syllabified acceptably without metathesis (*fud.nō*, *vik.nō*, *rup.nō*, etc.). So, phonological infixation has to be seen as either applying at stem level, motivated by a coda cluster constraint, or at word-form level, in which case the motivation would be a cross-syllable dispreference of non-sonorous coda followed by sonorous onset.

the infix completely obliterated in the last case — thus, more complex onsets, but fewer syllables than there would be in sequentially faithful pronunciations of morphological representations: ni-kakri [ni.ka.kri], i-davra [i.da.vra], ni-divri [ni.di.vri]).⁹

- (ii) Syllable groupings, i.e., METRICAL FEET, with the arrangement of syllables aiming at the foot type preferred in the language.

Examples:

- construct state forms of nouns in Ulwa (Sumu, Misumalpan) such as *suu-ka-lu* ‘(his) dog’, *siwa-ka-nak* ‘(his) root’, *karas-ka-mak* ‘(his) knee’ (Green 1999: §4.3.2);
- 3rd person plural subject forms of predicates in Samoan (Malayo-Polynesian, Austronesian), expressed through stem-internal CV-reduplication, as in *ma-l_o-losi* ‘they are strong’, *sa-va-vali* ‘they travel’, *ata-ma-maʔi* ‘they are clever’ (Broselow & McCarthy 1983/84);
- English expletive and *-ma-* “infixation”, not otherwise very typical, as in *abso-bloomin-lutely*, *secre-ma-tary* (McCarthy 1982, Yu 2004, 2007).

- (iii) Consonantal patterns in STEM TEMPLATES.

Example:

- causative verb stems in Tiene (Bantu, Niger-Congo) such as *l-as-ab-* ‘cause to walk’, with derived verb stems in Tiene being of the shape $C_1VC_2VC_3$ and required to form a “prosodic trough” with C_2 coronal and C_3 non-coronal (Hyman 2006).

That affixes can only ever be adfixes in morphological representations (other than perhaps ones containing bipartite stems trapping former adfixes), as per the

⁹ See Blevins 1999, also for the complex allomorphy of the adfix/infix/parafix. Blevins’s own point is that Leti provides counterevidence to the theory of infixation as phonology. However, as phonological motivation she only recognises optimisation yielding CV syllables. But it is syllabic compactness, in accordance with the phonotactics of permissible onset clusters, which is the motive for infixation in Leti — and this is also phonology.

universal assumed here, is reflected by “infixes” always remaining EDGE-BOUND in pronunciation: they are never found further inside stems than after/before the initial/final constituents of the relevant prosodic unit — after any syllable-onset in Tagalog (perhaps sometimes vacillating between after the first consonant or after the entire onset cluster); after syllable-onsets in Leti, provided they yield a permissible cluster and the segmental environment permits syllabic reduction; before plosive syllable-coda in Latin; after the first iambic foot in Ulwa; before the word-final trochaic foot in Samoan; at left or right edges of final/initial trochees in English; before the final non-coronal consonant of the template in Tiene. Where infixation is specifically prominence-driven, with adfixes attaching to prosodically prominent units in phonological representations (stressed vowels or syllables, heads of feet), it is edge-bounded, too, since prominence itself is determined from word-edges.

Lending further support to the phonological theory of infixation, “infixes” are, in the relevant languages, always also realised as adfixes with stems where the prosody is satisfactory without phonological rearrangement. Thus, in Tagalog, the prefix *um-* remains in place with vowel-initial stems such as *um-awit* PERF of ‘sing’. In Latin, the nasal suffix remains in place with stems of the same conjugation class without a stem-final plosive such as *si-N-* ‘leave’, *ker-N-* ‘separate’, *(con-)tem-N-* ‘despise’, *pell-* (< *pel-N-*) ‘expell’. In Leti, the nominalising prefix *ni(a)-* remains in place with stems where syllables would not be compacted: *nia-keni* ‘the act of placing’ [nja.ke.ni]/**k-nia-eni* [knja.e.ni], *(n)i-atu* ‘knowledge’ [(n)ja.tu]/**a-(n)i-tu* [a.(n)i.tu]. In Ulwa, the construct suffix remains in place with iambic stems of two moras, contributed by one heavy syllable or two light ones, or of three moras, contributed by a light syllable followed by a heavy one, such as *kii-ka* ‘(his) stone’, *sana-ka* ‘(his) bee’, *sapaa-ka* ‘(his) forehead’. In Samoan, CV-reduplication is external when the final trochee is all the predicate consists of: *pe-pese* ‘they sing’, *la-laga* ‘they weave’. In Tiene, verb stems with a final coronal form a “prosodic trough” when suffixes with a non-coronal consonant remain external, such as *mat-is-* (→ *maas-*) ‘cause to go away’.¹⁰ Infixes due to entrapment are also prone to have stem-external realisations; but here the

¹⁰ Atypically, American English *-ma-* does not occur externally, and never has, not having had an adfix as its immediate source, but supposedly originating through excrescence (Footnote 7). When external, expletives (*bloomin’ absolutely, fuckin’ Chicago*, etc.) are words (adjectives or adverbs), not adfixes.

internal/external distribution tends to be regulated morphologically or indeed lexically (in terms of stem classes) rather than phonologically. All the same, there is evidence — e.g., from Lakhota (Siouan), whose verbs can have person markers prefixed or infixes depending on stem class (Albright 2000) — that even here distributions are prone to be increasingly regulated along phonological lines, corroding the contrast between origins by entrapment and metathesis.

Reasserting their morphological adfix status, as continually encoded in morphological representations, “infixes” can again be RE-EXTERNALISED, even from the very stems they used to surface inside of. Thus, the adfix *um-*, which is widespread in Malayo-Polynesian and whose manifest position is either before stems when stems are vowel-initial or after the first consonant of consonant-initial stems, as illustrated above from Tagalog, is increasingly found in prefix position also with consonant-initial stems in Toba-Batak, with its own final consonant assimilating in place: e.g., *ud-dátu*, now alternating with older *d-um-átu* ‘wiser’, *ug-gógo*, now alternating with older *g-um-ógo* ‘stronger’, *ul-lógo*, now alternating with older *l-um-ógo* ‘drier’ (Crowhurst 1998).¹¹ Such re-externalisations will not happen once “infixes” have become lexicalised, part of internally unanalysed stem allomorphs, which they probably were as Latin turned into the Romance vernaculars; but then, being lexicalised, they are not constructive parts of morphological representations, either.

Other than their edge-boundedness, with “edges” defined prosodically, it is the preferred phonological shapes of “infixes” which bespeak their phonological nature. In terms of segments, infixes (other than entrapped ones) typically consist of labials, palatals, pharyngeals, laryngeals, liquids, and rhotics, and typically of only a single segment of these kinds: these segments are precisely those which are most susceptible to perceptually-driven metathesis in general (Yu 2007: 139-148). Even where the internalisation of an adfix makes little or no prosodic difference vis-à-vis an external placement, susceptibility to metathesis alone may suffice to prompt rearrangements of morphological representations — e.g., the placing of the negative suffix inside final syllables of verbs in Hua (non-Austronesian, Papua), with consistent CV structures

¹¹ With stems beginning with a labial or nasal consonant, *um-* had always remained external in Toba Batak, with /m/ assimilating in place: e.g., *up-pásak* ‘has beaten’, *uŋ-ŋáli* ‘colder’.

either way: *haru-ʔa-po* ‘not slip’ (compare **harupo-ʔa*). It is really only making prosodic matters worse which would not be expected.

What can be assumed to be crosslinguistically invariant, then, is order in morphological representations, always and ever obeying the constraint NO INFIXES!, except perhaps as the inadvertent result of entrapment or, very rarely of excrescence. What is variable is how, at any given time, speech communities rank phonological (in particular, prosodic) optimality relative to morphological faithfulness in pronouncing complex words. If complex words are not required to be prosodically optimal, or if stems and affixes have phonological shapes which, when combined, yield preferred prosodies anyhow (syllables, feet, templates), then adfixes will be realised as adfixes; otherwise they will be internalised around edges, with phonological (prosodic) constituents in an order which sounds better than arrangements faithful to the morphology. Given the historical mutability of “infixation”, the circumstances which license or indeed require, or also proscribe, phonological improvements of morphology would also be expected to be variable.

While it is true to say, achronically as well as diachronically, that infixes imply adfixes, this implication as such has no status in mental grammars (and, as such, is of little theoretical interest); it is (prosodic) phonology, acting on invariably infix-less morphological representations and obeying constraints of its own, that masterminds overt variation.

7.2. Conceptual semantics of syntactic construction restructured in context

The second example of a differential constraining of representations is about stacked attributive adjectives preceding or following a noun.¹² What are subject to separate constraints here are syntactic representations of such phrases which are responsive to conceptual and scope relations on the one hand and to information structure on the other.

When adjectives of different semantic classes are to be combined with a noun in attributive constructions, two decisions are to be made: first, whether to put the adjectives (all or some) before or after the noun; second, how to order the adjectives

¹² See further Plank 2007.

A higher-level descriptive generalisation over (6a/b) is as follows, drawing on conceptual differences of words subsumed under one word class and of conceptual similarities across word classes:

- (ii) The nounier a modifier, the closer to the noun.

The nouniness ranking COLOUR > SIZE > VALUE is independently motivated, on language-particular and general grounds. Well-known relevant evidence includes: the nounier modifier words actually are themselves nouns or are derived from nouns (e.g., *wooll-en* MATERIAL, *medicine* PURPOSE); they can enter a morphological relation with head nouns (compounding: e.g., *snow-ball* MATERIAL, *black-ball* COLOUR); their range of applicability to nouns of different semantic classes is narrower (e.g., *beautiful/*red idea* VALUE/*COLOUR in construction with abstract noun). The less nouny modifier words are verbal forms (participles) or are derived from verbs (e.g., *ugly* VALUE, originally deverbal, borrowed from Old Norse *ugga* ‘to dread’); they do not compound; their range of application is wider.

The nouniness feature mentioned last suggests a generalisation over the pattern at issue at an even higher level, where description metamorphoses into explanation. As modifiers are stacked, their natural stacking-order, hierarchical rather than linear, reflects the conceptual closeness or distance of modifiers from ultimate heads: less nouny property-concept modifiers prefer to take scope over nounier concepts. Thus, unmarked linear order is iconically motivated by preferences of scope construal:

- (iii) Linear closeness — VALUE SIZE COLOUR N / N COLOUR SIZE VALUE — mirrors scoping hierarchy — (VALUE (SIZE (COLOUR (N)))) — as itself determined by conceptual distance.

This is the sort of fundamental principle that one would like to be able to invoke as a general constraint on the construction of wholes from meaningful parts, and in particular their arrangement. And iconicity is an undoubted major force in universally

governing linear order in a wide range of syntactic domains where conceptual distance and scope are a factor.

It follows from this account that the anti-iconic ordering in (7b) should not occur, and it apparently does not. But neither should the equally anti-iconic ordering (7a), which does occur, even if not so frequently. In view of the existence of (7a), the obvious question is: Why is there no mirror image of (7a), i.e., (7b)? And more alarmingly, the question is whether a prized universal, stated at whatever level of generality, as in (i), (ii), or (iii), is invalidated by the overtly anti-iconic ordering in (7a).

The universal is rescued, as constraining not “language” or such forms-in-construction per se, but one kind of syntactic representation, and (7a)’s lack of a mirror image is explained, if Maltese et al. (with Semitic and Celtic languages as *alii* on record), instantiating the surface ordering in (7a), are analysed as being like English et al.: namely as having NPs where N is in final position. This similarity can only hold at a level of syntactic representation that is not a direct input to pronunciation — at a level where linear order is dictated by scope construal determined by conceptual proximity, only concerned with rendering conceptual meaning and unencumbered by any other expressive responsibilities. Thus, as to the relative ordering among multiple adjectives, iconicity could be assumed to rule OK everywhere and timelessly for representations at such a level, and the only variable here is whether modifiers come before nouns (6a, 7a/a’) or after (6b, 7a’).

The price to pay for an account where syntactic representations — abstract insofar as they are not the representations pronounced — are universally constrained as per (i)/(ii)/(iii) is a syntactic rule of N-fronting (7a), or half-way fronting as in (7a’), exemplified by Romance, tampering with abstract order.¹⁵ The question that comes with it is why only a few languages front or half-way front N, while many languages leave N where it is. And yet another question needs to be addressed, namely, why there are no abstract representations in line with iconicity which end up with a counter-iconic overt order through N-BACKING — that is, with overt (7b) derived from abstract (6b). Some explanatory mileage might be gotten out of the particular directional asymmetry

¹⁵ Following Cinque 1994 and Longobardi 1994, who took their inspiration from Romance, N-fronting has been much discussed in generative syntax, with more attention paid to technical implementation than to the typological milieu of such a rule.

in this respect where grammars are variable — displacing or not displacing N; but if displacement, then only by fronting, never by backing. Ordering under the iconic supervision of conceptual semantics can apparently be interfered with as the information to be presented in context is being structured, with the requirements of topic-comment or focus-background articulation potentially advising that scope-iconic order better be deviated from. Perhaps, as modifiers will naturally be comments, the displacement of N in NPs is to be understood as a sort of topicalisation — and, universally, topics tend to be overtly fronted, not backed.¹⁶

So, what appears as crosslinguistic disorderliness on the surface can be reduced to order when universals are envisaged as differentially constraining syntactic representations at different levels — one where conceptual and scopal relations are represented (constrained through (i)/(ii)/(iii)) and another where information structure is represented (subject to a prohibition against N-backing). Also, what would appear to be universally invariable here is that it is information-structural representations rather than conceptual-scopal representations that are being pronounced.

7.3. Coronals pronounced, but otherwise underspecified

Turning to phonology and phonetics, a universal claim to the effect that CORONAL is underspecified for all segments in all positions in all words of all languages would be easily faulted: in languages that have them in their segment inventories (all do), coronals are pronounced; that is, the relevant segments — sounds pronounced with the blade of the tongue raised from its neutral position (dental, alveolar, and probably palatal consonants, front vowels) — are specified for CORONAL at the level of pronunciation. Whether CORONAL is unspecified at any or all other levels of representation is a live issue. There is a whole family of patterns, rules, or constraints where coronal and non-coronal segments behave asymmetrically, with the patterns of inequality always the same: in any language, either only coronal segments can do

¹⁶ As to the question of why languages differ in letting or not letting nouns be displaced to begin with, another lead that remains to be pursued typologically is that languages with N-fronting are ones where V is initial, too (as in Semitic and Celtic), at least in abstract representations. Inflectional differences in the marking for gender and number have also been claimed to be implicated; but this is factually more dubious.

something which non-coronal segments can't, or whatever non-coronals do, corresponding coronals do, too. We believe the evidence available, plausibly analysed, strongly suggests that CORONAL underspecification at all levels is a valid universal. As an instantiation of the basic structural principle of the asymmetry of contrasts, it is a universal of such pervasive scope that discussion had better be postponed to the next and last section.

8. True throughout

In search of universals true of ALL parts and of ALL representations of forms and constructions, one would first turn to the basic organising principles of lexicons and grammars: these could be expected, and should then be demonstrated, to make their influence felt pervasively, over all parts and all representations, rather than only locally.

As an example, we will mention asymmetry as such a basic structural principle inspiring many individual universals in phonology. No part or no representation can offend against asymmetry by having the opposites reversed.

Phonological systems are centrally defined through contrasts. What counts is not lists of “phonemes”, however popular these are in typology, but the finite set of properties which define segmental contrasts — distinctive features, themselves considered universal. Phonological features make up lexical representations of morphemes; these are subject to changes in the different contexts in which they are perceived and pronounced. On the evidence of synchronic alternations, of change, of acquisition, and of perception and processing, phonological rules and constraints are universally asymmetric, just as representations of contrasts themselves are fundamentally asymmetric.

8.1. Asymmetry in phonological inventories

The first step in describing phonological systems is to set out the consonant and vowel inventories. This is what Pāṇini did, charting the consonants of Sanskrit and ordering them by place of articulation, aspiration, and voicing. When reciting the consonants in

Sanskrit (or modern Bengali), one begins with the back of the mouth (velar articulation) and ends with the labials; that is, a consonant chart like (8) is meant to be read left to right, top to bottom.

(8) Pāṇini's structured consonant system of Sanskrit

	VOICELESS		VOICED		NASAL
	UNASPIRATE	ASPIRATE	UNASPIRATE	ASPIRATE	
VELAR	k	k ^h	g	g ^h	ŋ
PALATAL	c	c ^h	ɟ	ɟ ^h	ɲ
RETROFLEX	ʈ	ʈ ^h	ɖ	ɖ ^h	ɳ
DENTAL	t	t ^h	d	d ^h	n
BILABIAL	p	p ^h	b	b ^h	m

In this chart, with no empty cells, the plosives and nasals are symmetric. But in this respect Sanskrit is very unusual: most sound inventories are asymmetric.

On the evidence of the UCLA Phonological Segment Inventory Database (UPSID¹⁷), comprising 451 languages, vowels are usually contrasted in terms of height or frontness/backness. As summarised in (9), and keeping aside actual feature descriptions, if we consider only high vowels, the most frequent vowel systems have a two-way contrast; if there is a three or four-way contrast, then vowels also contrast in rounding.

(9) Number of languages from UPSID with [i], [u], [y], [ɯ]

	FRONT		BACK	
ROUND	26	[y]	383	[u]
UNROUND	411	[i]	41	[ɯ]

¹⁷ We have used UPSID with the web interface developed by Henning Reetz: <http://iona.sprachwiss.uni-konstanz.de/L/L4904.html>

The most common high vowel is front unrounded [i], followed closely by back rounded [u]. The other two are almost equally infrequent. When we compare the languages which have these combinations, we find only four languages with four vowels, while 62 languages have a three-way contrast and 376 languages have a two-way contrast. However, not all combinations are equally likely: two-way contrasts predominantly include [i] and [u]; no two-way contrast includes [y] and [ʉ]; three-way contrasts invariably include either [u] or [i], as there are 31 languages with [i, u, ʉ] and 19 with [i, u, y]; of all languages which have [u] (383), only five have no [i]; of the 411 languages with [i], 36 have no [u].

This suggests the following implicational universal: The presence of [y] or [ʉ] in a vowel system implies the presence of either [i], [u], or both. This means that if there is a two-way contrast between high vowels, either [i] or [u] must exist. Accordingly, if a system changes such that a vowel of a three-way inventory is lost or merges with another, the vowel affected will be either [y] or [ʉ]. This is precisely what happened in English. Old English had a contrast between [i], [u], and [y], while the Modern English contrast is between [i] and [u]. All [y]'s have become unrounded, yielding [i].

This gets us directly to the question of phonological rules and their outputs. As mentioned earlier, contrasts in lexical representations do not remain unchanged. In fact, more often than not, contrasts may be neutralised or changed in different contexts. Here, too, we see indications of pervasive asymmetry.

8.2. Asymmetry in phonological rules

Phonological rules can be broadly divided into four types depending on whether they (i) introduce features, (ii) neutralise contrasts, (iii) delete or (iv) add segments. Rules that delete or add segments are usually governed by structural constraints, and those that add new and non-contrastive features are allophonic and, more often than not, phonetic in nature. Those that neutralise contrasts are the most problematic since they produce morphemic variations and alternations.

The phonological rules (both neutralising and allophonic) which most commonly ensue in featural changes are assimilation rules, with contiguous segments

becoming closer in phonological features. A remarkable fact about these rules is that they are unidirectional: the reverse never occurs in corresponding contexts.

(10) Common assimilatory rules

- i. Vowel Nasalisation: $V \rightarrow \bar{V} / _ \text{nasal } C$
But not: $\bar{V} \rightarrow V / _ \text{oral } C$
- ii. Umlaut or V-fronting: $/u/ \rightarrow [y] / _ /i, j/$
But not: $/y/ \rightarrow [u] / _ /u, w/$
- iii. Palatalisation: $/k/ \rightarrow [tʃ] / _ /i, j/$
But not: $/tʃ/ \rightarrow [k] / _ /u, w/$
- iv. Retroflexion: $/t/ \rightarrow [ʈ] / _ \text{high back } C \text{ or } V$
But not: $/ʈ/ \rightarrow [t] / _ \text{low front } C \text{ or } V$
- v. Rounding: $/e, a/ \rightarrow [o, O] / _ /u/$
But not: $/o, O/ \rightarrow [e, a] / _ /i/$

Although such assimilation rules never operate in reverse, reverse changes can occur, but not as assimilations. For example, nasal vowels can be denasalised, but the change then is not assimilatory in nature and can happen without any context. Moreover, if the assimilated phonemes change, they do not necessarily revert back to their origin.

Umlauted vowels like /y/ can become de-umlauted, but do not revert back to /u/; rather, they become unrounded /i/. Thus, feature changes are in essence asymmetric.

A further aspect of assimilation rules is the effect they have on the system: they can be allophonic or neutralising. All the rules mentioned above can be both. But again there is asymmetry, insofar as allophonic rules will become neutralising once the new feature has become contrastive, whereas neutralising rules cannot become allophonic. Consider the same rules as in (10).

(11) Allophonic to neutralising: adding new contrasts

- i. Vowel Nasalisation: $V \rightarrow \bar{V} / _ \text{nasal } C$
- ii. Umlaut or V-fronting: $/u/ \rightarrow [y] / _ /i, j/$
- iii. Palatalisation: $/k/ \rightarrow [tʃ] / _ /i, j/$
- iv. Retroflexion: $/t/ \rightarrow [ʈ] / _ \text{high back } C \text{ or } V$

- v. Rounding: /e, a/ → [o, O] / ~~u~~

What happens diachronically is that the contexts which led to the assimilations are deleted (as indicated) or are otherwise no longer transparent. A case in point is vowel nasalisation in Indo-Aryan languages. The modern Bengali descendant of Sanskrit *panca* is [pãtʃ] ‘five’, with the vowel nasal and the nasal consonant deleted. This is a typical example where an allophonic rule of vowel nasalisation in the context of a nasal consonant has led to a new contrast being added. Vowels in Bengali contrast in nasality as in [kãda] ‘to cry’ vs. [kada] ‘mud’. The rule of vowel nasalisation still exists, but now it is neutralising: [tʃa] ‘want’ (imperative), [tʃae] 3SG.PRESENT, [tʃãn] 3SG.HONORIFIC.PRESENT. A similar situation exists in German. Umlaut was allophonic in high vowels in Old High German, but is now contrastive in New High German: cf. OHG *fuß – füþi* ‘foot’ SG – PL, NHG *Fuß – Füþe*; OHG *türi – türi* ‘door’ SG – PL, NHG *Tür – Türen*. The context of umlauting has been reduced to a schwa in the plural and has been deleted in the singular for ‘door’. Consequently there is an extra vowel in the phoneme inventory for modern German, /y/.

To illustrate schematically how a phonological system may change, assume that a language has the three segments, two consonants, /p/ and /m/, and one vowel, /a/. Several rules can affect words like /pam/ or /pap/ made up of these three segments.

(12) Changes in phonological systems

Scenario A

Representation	/pam/	/pap/	/pamp/
Change 1 vowel nasalisation	pa)m	----	pa)m p
Change 2 final consonant deleted	pa)	pa	pa)m
Output	[pa]	[pa]	[pa)m]

Scenario B

Representation	/pam/	/pap/	/pamp/
Change 1 vowel nasalisation	pa)m	----	pa)mp
Change 2 initial consonant deleted	a)m	ap	a)mp

Output	[a)m]	[ap]	[a)mp]
--------	-------	------	--------

The two scenarios differ with respect to which consonant is deleted. Vowel nasalisation in both scenarios initially leads to an allophonic alternation: [a] before an oral consonant, [ã] before a nasal consonant. However, after consonant deletion, we have a new contrast in Scenario A since vowel nasalisation is now no longer predictable: both [a] and [a) occur at the end of a word, and the latter also occurs before nasal consonants. Scenario B is different. Here, despite consonant deletion, the nasality of the vowel remains allophonic: it always occurs before a nasal consonant. In Scenario A, not only does the nasalised vowel become contrastive after final consonant deletion, but the rule of vowel nasalisation still functions before nasal consonants. Thus, nasality on vowels becomes contrastive AND vowel nasalisation consequently becomes a neutralising rule rather than allophonic. In contrast, nothing has changed in Scenario B: no new contrast has been added and the allophonic status of vowel nasalisation remains unaltered.

The gist of this schematic example is not that a new “sound” has been added in Scenario A, but rather that a feature has become contrastive — nasalisation on vowels. It is features rather than phonemes which are at the heart of phonology, and therefore also of phonological universals, and both contrasts and phonological alternations are governed by the specification of features. What we require of a phonological feature system is that it should be able to account for universal contrasts as well as for asymmetries in the output of phonological rules and for constraints on phonological change. As a pervasive organising principle of the grammar of sounds, the same feature system should also be able to deal with language production and comprehension. Asymmetry is an essential structural principle of the feature system which we think responds to these challenges well, to be outlined now.¹⁸

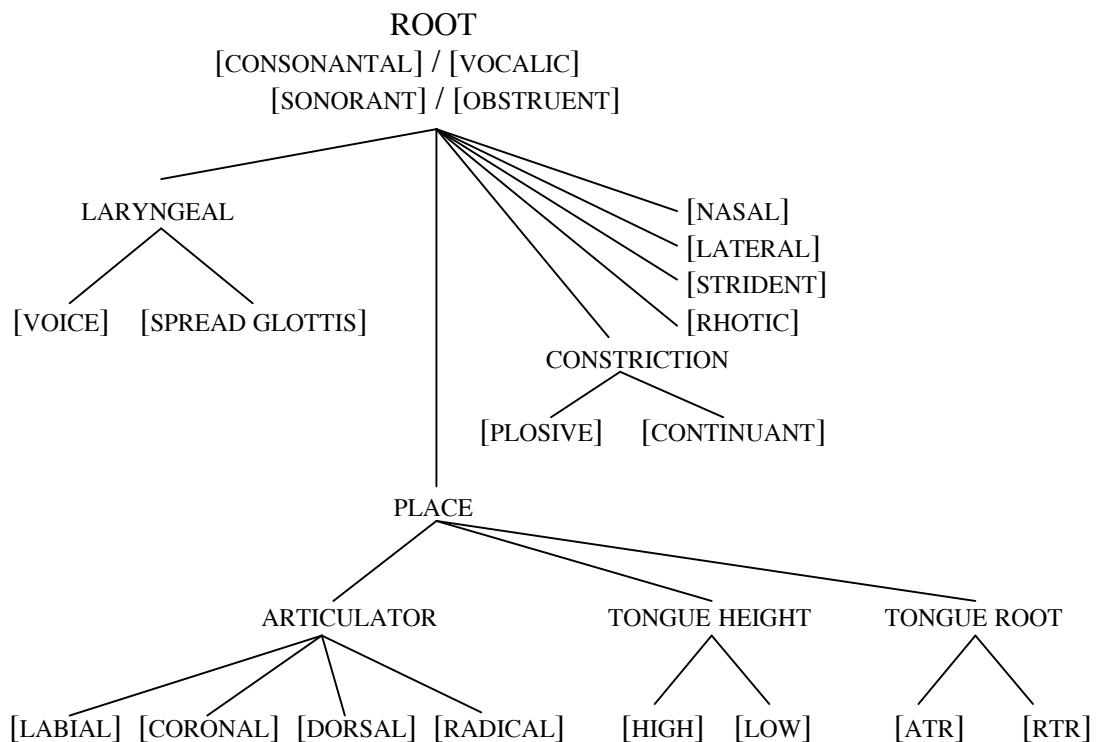
8.3. Asymmetry and phonological feature organisation

¹⁸ Based on earlier work by Lahiri & Reetz 2002. Also see Ghini 2001, Lahiri & Evers 1991, and a more detailed description in Lahiri & Reetz 2007.

Asymmetry is inherent to features, feature distributions, and the direction of phonological rules. The question is how to account for this in modeling mental lexicons-and-grammars. One approach among several in the literature is underspecification (Dresher & Zhang 2005, Ghini 2001, Kabak 2007, Lahiri & Reetz 2002), holding that asymmetries are encoded directly through the lack of featural specification. Objecting to underspecification, proponents of full specification have devised a variety of extra mechanisms to get asymmetry grafted onto symmetric contrasts, or they recognise some degree of underspecification for purposes such as allophonic alternations; but here is not the opportunity to really argue for the superiority of the “direct” approach that we adopt (see Lahiri & Reetz 2007).

For the feature theory of our underspecification approach, FUL (short for Featurally Underspecified Lexicon), two crucial assumptions are that consonants and vowels share features (cf. also Clements & Hume 1995) and that place features are subdivided into ARTICULATOR and TONGUE HEIGHT or APERTURE features.

(13) FUL’s feature system



The feature tree in (13) embodies several claims about universal contrasts. Lexical representations in all languages must distinguish CONSONANT and VOWEL. A further universal contrast is that between SONORANT and OBSTRUENT. Furthermore, no language will lack a contrast in PLACE of articulation. Since PLACE is divided into ARTICULATOR and TONGUE HEIGHT, the claim is that all languages must have at least two consonants contrasting in ARTICULATOR. And here comes the first role of underspecification: the consonantal contrast will universally be between underspecified CORONAL and another ARTICULATOR feature. Vowels, however, need not contrast in ARTICULATOR, and theoretically a language could have only one vowel. In this case there would be no PLACE feature necessary. If a contrast in vowels exists, then the first cut will universally be in TONGUE HEIGHT, contrasting HIGH or LOW.¹⁹ While every language will have a PLACE contrast in consonants, it will not necessarily have a LARYNGEAL contrast. Further, there are no feature dependencies: STRIDENT can be a property of non-coronal consonants.

Inevitably following from this conception, assimilation rules which spread features are asymmetric. Thus, PLACE assimilation is predicted to spread specified place features (LABIAL, DORSAL) to unspecified CORONAL. This does not mean that LABIAL consonants cannot become DORSAL in a similar context; but this would imply allomorphy on the part of morphemes involved in such a process. Further, a rule of place assimilation for labials (ii) cannot exist without an assimilation rule for coronals (i):²⁰

(14) Asymmetric PLACE assimilation

- | | | | | |
|-----|---------------------------|--------|----|------|
| i. | /n/ | /b/ | —> | [mb] |
| | unspecified | LABIAL | | |
| | single morpheme with /nb/ | | | |
| ii. | /m/ | /g/ | —> | [ŋg] |

¹⁹ For Dresher & Zhang (2005) languages can differ with respect to which feature is underspecified. Consequently CORONAL need not always be underspecified; if CORONAL is active in a phonological process, it will be specified. In our version of underspecification no such crosslinguistic variability is envisaged: underspecification is not subject to any activity — it is a representational fact.

²⁰ See also Mohanan 1993, as confirmed for a wider range of languages in Jun 2004.

LABIAL DORSAL
 implies allomorphy /mg/ – /ŋg/

Underspecification does not depend on syllable structure nor on possible allophonic processes alone. For example, while it is often assumed that for word-final place assimilation final coronals are underspecified because they are vulnerable to change, in our approach CORONAL is underspecified in all positions, initial as well as medial, too.

8.4. Feature asymmetry in perception

The pervasiveness of featural asymmetry also extends to speech perception, and we conclude by briefly summarising relevant experimental evidence.

The assumption is that variation in speech is resolved by the listener in two steps: (i) the auditory system parses the acoustic signal into features and not segments; (ii) a mapping process, using a ternary logic of *MATCH*, *MISMATCH* and *NOMISMATCH*, matches the features extracted from the acoustic signal with those stored in the mental lexicon.

The *MATCH* condition is transparent. A *MISMATCH* results when a feature extracted from the signal is in conflict with the feature in the representation. However, certain non-perfect matches are tolerated due to underspecification: this is the *NOMISMATCH* condition. Matching predictions for consonants are given in (15), with no feature within brackets indicating underspecification.

(15) Mapping of features for consonants

Signal		Match	Representation
[p, b, m]	LAB	<i>NOMISMATCH</i>	/t, d, n/ []
[t, d, n]	COR	<i>MISMATCH</i>	/p, b, m/ LAB
[k, g, ŋ]	DOR	<i>MISMATCH</i>	/p, b, m/ LAB
[t, d]	COR	<i>MISMATCH</i>	/k, g/ DOR
[k, g, ŋ]	DOR	<i>NOMISMATCH</i>	/t, d, n/ []

Through a semantic priming task (lexical decision, crossmodal) we tested CORONAL underspecification in word-medial and word-final positions in German (Lahiri & Reetz 2002). For the medial condition, where no assimilation is ever possible, words like *Ho[n]ig* ‘honey’ predictably facilitated recognition of *Biene* ‘bee’, and *Ha[m]er* ‘hammer’ primed *Nagel* ‘nail’. Pseudoword variants of these primes, however, gave asymmetric results: **Ho[m]ig* successfully primed *Biene*, but **Ha[n]er* did not prime *Nagel*. That is, the LABIAL [m] of the pseudoword **Ho[m]ig* was tolerated as a variant of the underspecified /n/ in *Ho[n]ig* and successfully facilitated the recognition of *Biene*; but the coronal [n] of the pseudoword **Ha[n]er* was rejected by the lexically specified /m/ in *Ha[m]er*.

In a more recent electro-encephalographic (EEG) study using words varying in medial coronal vs. non-coronal consonants we examined whether such an asymmetry would also be found with a more direct technique for measuring brain activity (Friedrich et al. 2006). Word-medial coronals in *Hor[d]e* ‘horde’ are placeless in our feature theory, and the claim is that its corresponding non-coronal variant, as in **Hor[b]e*, cannot mismatch this empty PLACE slot and therefore would activate *Hor[d]e*. A similar mapping would not occur with pseudowords with a coronal like **Pro[d]e* and a corresponding real word *Pro[b]e* ‘test’. CORONAL extracted from **Pro[d]e* mismatches the specified LABIAL of *Pro[b]e* and therefore cannot activate this word. The prediction is that lexico-semantic memory search processes would be successful when **Hor[b]e* is presented and activates the corresponding coronal word *Hor[d]e*, but not when the coronal variant **Pro[d]e* is presented, since this would lead to an immediate correct rejection as a non-existing lexical item. Thus, an asymmetry was expected at least for the initial N400 pseudoword effect, which is most likely related to lexico-semantic processing.

The task was speeded lexical decision to auditory stimuli. For the behavioural results, the error rates revealed significant differences. Non-coronal pseudowords like **Hor[b]e* (<*Hor[d]e*) had significantly more errors than coronal pseudowords like **Prode* (<*Pro[b]e*), suggesting that subjects more easily recognised **Pro[d]e* as a nonword, but had more difficulty in rejecting **Hor[b]e* as a nonword since it did activate the real word *Hor[d]e*. In the ERP data, the early N400 results showed a clear

asymmetry in the earlier activation period of 100–250ms. Mean amplitudes of the coronal pseudoword variants were significantly more negative than their non-coronal base words. By contrast, ERPs for non-coronal variants did not differ from their base words in this initial part of the N400 pseudoword effect. Furthermore, a significant difference between both types of pseudoword variants, but not between both types of words, relates this early ERP deflection to mismatch detection in the case of coronal pseudowords.

Thus, medial coronal consonants, which contrast with dorsal and labial consonants, also show an asymmetric pattern. Non-coronal pseudowords with labial or dorsal consonants are accepted as variants of the corresponding coronal word, but not vice versa as shown in the error data as well as in the early N400 effect. Medial consonants do not undergo any assimilation such that the pseudowords could have been “experienced” or become familiar to the listeners. Further, since word frequency was controlled, full specification or specification of phonetic detail cannot account for these results.

The same predictions hold for vowels. Given the underlying contrast between /o/ e ø/ in German, /o/ is specified for DORSAL and LABIAL, while the others are unspecified for CORONAL.

(16) Underspecified vowel representation

Signal		Match	Representation
[o]	DOR	<i>NOMISMATCH</i>	/ø/ [] LAB
		<i>NOMISMATCH</i>	/e/ [] []
[e], [ø]	COR	<i>NOMISMATCH</i>	/ø/ [] LAB
			/e/ [] []
[e], [ø]	COR	<i>MISMATCH</i>	/o/ DOR, LAB

A magnetoencephalographic study reports topographic differences in the processing of mutually exclusive isolated CORONAL and DORSAL vowels in German (Obleser et al. 2004). Further, Eulitz & Lahiri (2004) used a component of the event-related brain activity, Mismatch Negativity (MMN), to investigate the issue of asymmetry in mapping. MMN is assumed to be an automatic detection measure of the

brain's ability to detect change in sounds, particularly to phonemes. If a sound is presented many times in a sequence (known as the "standard"), it is considered to tap the long-term sound representation, that is, our underlying lexical representation. If another sound is presented right after the sequence (a "deviant"), it would cause something of a jolt, and the brain would detect a change and respond accordingly. The classical MMN is high-amplitude difference between standard and deviant around 180 ms from the onset. Eulitz & Lahiri (2004) noted both an amplitude and a latency difference. As predicted by the matching algorithm, for the pair [o]~[ø], when /o/ was the standard (i.e., underlyingly specified for DORSAL) and [ø] the deviant such that [CORONAL] is extracted, there was a higher and earlier MMN peak than the other way round. Similar predictably asymmetric patterns of results were obtained for the other pairs. Thus, just as for the consonants, the vowels showed asymmetric perceptual responses as predicted by our approach to featural underspecification.

With such confirming experimental evidence from only a few languages so far, we are nevertheless confident that at no level of representation — structuring how words are stored in the mental lexicon, how they are accessed, and how they are perceived and pronounced — can featural contrasts, and the phonological systems and rules defined through them, EVER be at odds with asymmetry.

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