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 many universals have a narrower scope than languages as such, or mental lexicons-and-grammars as such. 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

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 covariation, "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 on linguistic diversity. It can be deceptive on several grounds to axiomatically equate "linguistic universals" with "universals of language".

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S. Scalise et al. (eds.), *Universals of Language Today*, 31–58,
DOI: 10.1007/978-1-4020-8825-4_3,

The only viable domain for universals research, then, is all-languages-present-and-past-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 and codified in reference grammars, 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; but that would be a diachronic issue.)

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 indivduals 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.

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.[4]

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:

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

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

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

[4] For extensive documentation see Plank & Schellinger 1997, and, as always, THE UNIVERSALS ARCHIVE.

(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 umlauted 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	---------- *fēlīk-s* ----------			----- *fēlīk-ēs* -----		*fēlīk-ia*
ACC	---- *fēlīk-em*	---	*fēlīk-s*	----- *fēlīk-ēs* -----		*fēlīk-ia*

(4) Latin pronominal inflection (partial)

	SG			PL		
	MASC	NEUT	FEM	MASC	NEUT	FEM
NOM	*is*	*id*	*ea*	*iī*	*ea*	*eae*
GEN	---------- *ē-ius* ----------			----- *ē-ōrum* -----		*ē-ārum*

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 another, 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 umlauted 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 unumlauted 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

stems (in the right phonological circumstances, with adfixes remaining external elsewhere). There are in fact one or two other scenarios for the emergence of infixes, in particular "entrapment" and "excrescence": when an outer adfix 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.[8] At least in the case of entrapment, infixes imply adfixes, 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 adfixation. 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 excrescence), morphology prefers order to be rigid: (i) reorderings of affixes among each other and relative to stems are rare, and may need special licensing by prosodic or scope-semantic considerations; (ii) 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 adfixes in between their parts, now infixes of sorts. It would certainly be odd if serial order in morphological representations were completely 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.

[8] Estimates differ on whether entrapment is exceedingly rare or not uncommon. The American English infix *-ma-* (as in *sophisti-ma-cated*) supposedly illustrates excrescence, 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.

ma-lo-losi 'they are strong', *sa-va-vali* 'they travel', *ata-ma-ma/i* '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 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-bound, 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

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.[13] 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 among each other. (Adjectives are property-concept words with a grammar of their own, distinct from those of both nouns and verbs. Property-concept words of a nominal or verbal nature, with no distinct word class of adjective, should show similar positional proclivities in the languages concerned.) In languages where the ordering is relatively rigid at phrase level, the first decision is usually clear-cut; while the second tends to be less categorical, there usually are clear preferences, as illustrated for only three semantic adjective classes in the following examples:

(6) a. English et al.
a beautiful big red ball VALUE SIZE COLOUR N

b. Bahasa Indonesia et al.
bola merah besar tjantik N COLOUR SIZE VALUE

[13] See further Plank 2007.

(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 responsibilites. 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.[16] 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 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

[16] 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.

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

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:	$V \rightarrow \tilde{V}$ /__ nasal C
	But not:	$\tilde{V} \rightarrow V$ /__ oral C
ii.	Umlaut or V-fronting:	/u/ → [y] /__/i, j/
	But not:	/y/ → [u] /__/u, w/
iii.	Palatalisation:	/k/ → [tʃ] /__/i, j/
	But not:	/tʃ/ → [t†] /__/u, w/
iv.	Retroflexion:	/t/ → [t] /__high back C or V
	But not:	/t/ → [t] /__low front C or V
v.	Rounding:	/e, a/ → [o, ɔ] /__/u/
	But not:	/o, ɔ/ → [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:	$V \rightarrow \tilde{V}$ / ~~__nasal C~~
ii.	Umlaut or V-fronting:	/u/ → [y] / ~~__/i, j~~/
iii.	Palatalisation:	/k/ → [t†] / ~~__/i, j~~/
iv.	Retroflexion:	/t/ → [t] / ~~__high back C or V~~
v.	Rounding:	/e, a/ → [o, ɔ] / ~~__/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

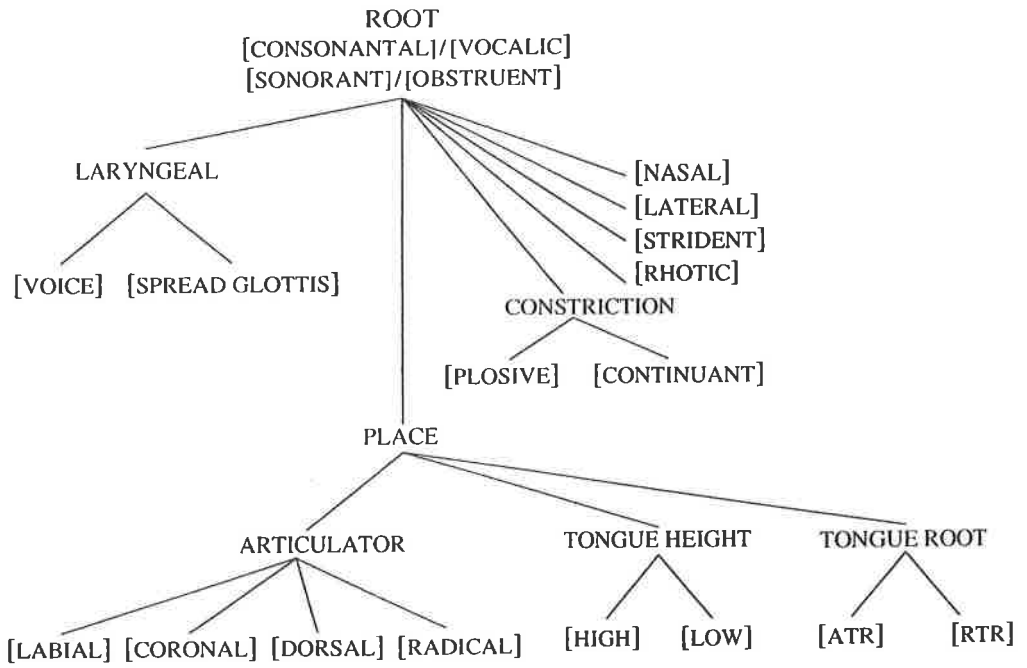
phonological feature system is that it should be able to account for universal contrasts as well as for asymmetries in the output of phonological rules and for constraints on phonological change. As a pervasive organising principle of the grammar of sounds, the same feature system should also be able 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, as to be outlined now.[20]

8.3 Asymmetry and Phonological Feature Organisation

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 2007, 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



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

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	*NOMISMATCH*	/t, d, n/	[ ]
[t, d, n]	COR	*MISMATCH*	/p, b, m/	LAB
[k, g, ŋ]	DOR	*MISMATCH*	/p, b, m/	LAB
[t, d]	COR	*MISMATCH*	/k, g/	DOR
[k, g, ŋ]	DOR	*NOMISMATCH*	/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 sucessfully 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 their 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

it would cause something of a jolt, and the brain would detect a change and respond accordingly. The classical MMN is a 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.

Acknowledgments We are grateful to the Sonderforschungsbereich 471 at Konstanz, funded by the Deutsche Forschungsgemeinschaft, for encouraging joint undertakings like ours, bringing about the present paper. Authors' names are in alphabetical order; the phonology is (mostly) Lahiri's, the morphology and syntax (mostly) Plank's, and our typological conclusions emerged and connected along the way. Sergio Scalise was a most supportive editor, and we'd also like to thank one anonymous reviewer for critical, but sympathetic comments and questions.

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