

Contrast in phonology, structural analogy, and the interfaces

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Introduction

It seems to me that many developments in the history of phonology have not pushed to their fullest potential – and so have never been evaluated properly. Phonologists have too often been faint-hearted’ in pursuing the consequences of their ideas. Because of this, changes in theoretical position in phonology (and syntax, for that matter) have often not been the result of conclusive argument and counter-argument, but rather more like adoption of a new fashion. The history of phonology is littered with half-constructed theories.

For example, classical phonemic theory failed to consistently implement the notion of contrast which was a crucial part of its foundations. Taking contrast seriously would have led to the postulation of polysystemicity, the recognition that in any language there is lexically not necessarily a single inventory of vowels and consonants, a single lexical inventory of phonemes. Different systems of contrastive units are appropriate at different positions. But this consequence of taking contrastivity seriously was sacrificed to symbol economy, which is not really a phonological imperative, but only important in ‘reducing languages to writing’ (to quote the subtitle to Pike’s *Phonemics*). Take the neutralisations in (1):

(1) spree

The full system of consonants can’t occur in any of the first three positions. Some phonemicists recognised such neutralisations but were not sure what to do about them, apart from indecisive talk about archiphonemes (cf. Davidsen-Nielsen 1978, on the history of the two concepts). The notable exception here is Twaddell (1935) and the ‘micro-phoneme’, which work was largely ignored. Our lexical representations should recognise that, for instance, in such a word the initial segment is in contrast only with its absence, if contrast is a relevant notion, as I’m assuming it is. So I’m going to try to be ruthless here about differentiating and representing the contrastive.

Why this ‘ruthless’ concern with contrastivity? I want to suggest that certain formal properties are fundamental to the phonology, in the sense that they may be contrastive. They must be registered lexically in at least some languages. These are properties – properties associated with the notion ‘head’ – not obviously dictated by the requirements of the interface with phonetics. This will occupy us in §2 of the paper. The first section is taken up with a preparatory discussion of linearity and contrast in syllable structure.

In §3 I’m going to suggest that such formal properties and others are shared by the phonology and syntax. This is what I mean by the ‘structural analogy’ of my title (cf. Anderson 1992, 2003, and references therein). In terms of the structural analogy assumption we expect the same structural properties to occur in the two different planes of phonology and syntax – other things being equal. I shall suggest that various notions connected with headhood do recur in this way. And, in support of the generality of such structural analogy, I shall also illustrate another syntax-phonology analogy, to do (in this case) with ‘harmony’.

Syntax and phonology, however, have to meet different interface demands. This reduces the scope for analogy; this is where other things are not equal. For the most part, syntax is responsible for the representation of a more complex domain, and so shows possibilities not shared by the phonology. These possibilities are often too incompatible with the demands of the phonetic interface. The final part of the paper sketches out some discrepancies and suggests the motivation for them.

1 Contrast and linearity within the syllable

The contrastive status of linearity, in particular, is something that phonologists have been ‘faint-hearted’ about – even in non-linear approaches, which should mostly be called multilinear: several

linear representations linked by conventions of association. And this ‘faint-heartedness’ continues into recent optimality-theoretic accounts. But much linearity within the syllable is non-contrastive: it is regularly either universally or language-particularly determined. Typically, within the syllable only orientation towards the centre need be stipulated, where the centre is the most sonorous element.

Take example (2):

(2) clamp

The other elements, once their orientation towards the centre is known, range themselves around the centre according to a hierarchy of perceived salience, sonority, exemplified in (3):

(3) *partial sonority hierarchy 1*
vowel < sonorant consonant < obstruent

This is very familiar – as are the distributional observations that follow in this section (cf. e.g. the textbook treatment in Giegerich 1992: ch.6). And, though the interface correlates of sonority are controversial, it is manifested phonologically not just in syllabic sequencing but also in processes of weakening and strengthening. Some languages show violation of sonority sequencing, but typically these are in accord with language-particular regularities, and do not introduce contrastivity.

The formulation in (4) reduces the stipulation of linearity further:

(4) a. a, k, l
b. a + m, a + p

It says that all we need to stipulate concerning linearity is what is in (4.b), where the + means precedence – but not necessarily immediate precedence. We don’t need to mark an onset consonant as preceding the centre if we assume that that is the unmarked position, as in (5):

(5) *unmarked syllable structure:*
C + V

Consonants precede the centre unless specified otherwise, as in (4.b). The orderings within (4.a) follow from (5). So from (5) we get (6.a) and from sonority we get (6.b):

(6) a. k + a, l + a
b. k + l (+ a), (a +) m + p
c. k + l + a + m + p

(6.c) gives the linearised result. It may be too that not even the stipulations in (4.b) need be made. But I won’t pursue this at this point, since I’m still leading up to the main object of this part of the paper.

This is associated with pointing to the insufficiency of sonority, to the existence of other determinants of possible sequences than sonority. Sonority is both violated, as in (7.a), and insufficiently constraining, as shown by (7.b), for English:

(7) a. sport, strip, squeeze
b. */kn-/, *pf-/, */-zd/, */-fp/

I'll be concerned with (7.a); (7.b) merely shows the need for additional constraints, perhaps to do with a preference for greater difference in sonority between adjacent consonants (as discussed in e.g. Steriade 1982). I once more won't pursue these. What is more interesting here – if again very familiar – is that typically there are only two positions to left and right of centre, as in (2). This is violated by (7.a): that's one reason we'll return to these. The restriction to two positions accounts for the anomaly of (8.a), despite the pairwise combinations (8.b) being OK:

- (8) a. *helmp, *creelmp
 b. helm, help, hemp
 c. *creelm, *creelp, *creamp
 d. creel, cream, creep
 e. text(s)
 f. field, fiend

And (8.a) would conform to the extended sonority hierarchy of (9):

- (9) *partial sonority hierarchy 2:*
 vowel < liquid < nasal < obstruent

No sonority violation is involved, and though the members of the clusters are not optimally far apart, this is also true of (8.b). More interesting still – and yet again very familiar – is that after the vowels in (8.c) and (d) only one position follows, as in (8.d), with (8.c) being anomalous. I note in passing that (8.e) and (f) illustrate violations of the restrictions on codas (including more detailed hierarchical requirements than are embodied in (9)), violations involving coronal obstruents (see again Giegerich 1992: ch.6). I won't have space to deal with these here.

There is a corollary to the different possibilities after the vowels in (8.b) and (8.d), the availability of two coda positions vs. one. And this is that one position of the two allowed in (8.b) is obligatory in accented monosyllables. So that the vowels in (10.b) do not occur in such coda-less potential forms as (10.a):

- (10) a. */ba/, */be/
 b. bad, bed
 c. /bi/ 'bee', /bei/ 'bay'
 d. neon, chaos

These are the traditional checked vowels, while those in (10.c) are free. Similarly there is nothing corresponding to (10.d), involving hiatus, with the vowels of (10.b). The checked vowels are vowels that (in regular, accentable syllables) must be complemented. Such a notion takes us into §2, which is concerned with the structural properties underlying these distributions.

2 Headedness and syllable structure

Being complemented is a potential property of a head. And the syllable-centre is indeed an excellent candidate as a head: it is an obligatory part of the construction that is characteristic of it – no centre, no syllable. The syllable is a projection of the centre. Some syllable centres are transitive; they take a complement. Others are intransitive. I represent the two sets of centres as in (11):

- (11) a. /a/, /e/ = V/C

- b. /i/,/ei/ = V

The checked, or transitive, centres of (11.a) require a complementary consonant, to the right of the slash.

In English intransitivity apparently correlates with an interface property, sometimes described as tenseness. There are alleged problems here with regard to Scottish English. But there is transparently no need to appeal to tenseness in Midi French, for instance, as is illustrated by (12) (from Aurnague & Durand forthcoming; see too Durand 1976, 1990: §6.1.9):

- (12) a. [e] tournée, tournait, pêcheur, pêcheur
 [ø] jeux, jeunet, creux
 [o] au, beauté, botte, rhinoceros
 b. [ɛ] colère, infect, prefecture
 [œ] jeune, jeûne, creuse
 [ɔ] roc, rauque, rhinoceros
 c. [i], [y], [u], [a]

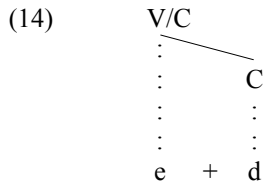
In traditional phonemic terms, the three vowels in (12.a) are in complementary distribution with the corresponding ones in (12.b). They are free vs. checked, necessarily intransitive vs. necessarily transitive. The vowels in (12.c) are indifferent to transitivity. We can represent each of the vowels in (12) contrastively as in (13):

- (13) a. {i}*/C
 {i,u}*/C
 {u}*/C
 b. {i}/C
 {i,u}/C
 {u}/C
 c. {i}, {i,u}, {u}, { }

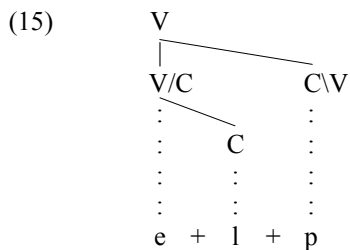
There's a set of vowels that reject a complement, one that requires one, and a third which is indifferent. In the representations in (13) I've used the familiar simplex secondary features, of **i**, **u**, the ('acute' and 'grave') vowel colours (of e.g. Anderson & Ewen 1987): each of the centres is of primary category vowel; the secondary features distinguish among the vowels. They appear alone and in combination in each of (13.a-c). If we assume the low or compact vowel (realised as {a}) is unspecified, then the other aperture differences are predictable from the transitivity specifications. What is contrastive in this system is combinations of the vowel colours and transitivity type.

To the extent that cross-linguistically split transitivity of the sort illustrated by (12/13.a-b) is associated in the first place with mid vowels, this reflects the complexity of the latter vis-à-vis the corner vowels. The complex high-mid vs. low-mid distinction fails in such systems to achieve contrastivity. Typically, also, distance from the {a} vowel correlates with decrease in sonority. In such free-checked pairs, however, the free vowel is further from {a} but does not show diminution in sonority – and may indeed be so reinforced as to attract the label 'tense', as in English /i/ (*beat*) vs. /ɪ/ (*bit*). This reflects its completeness, its intransitivity, the lack of a need for a complement.

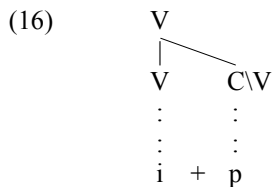
We can represent the structure projected by the vowel and consonant in (9.b) as in (14):



The solid line is a dependency arc initiating in the centre and terminating in the complement. The less sonorous coda consonants in (8.b) are not complements, but adjuncts, which, together with the centre and complement, project the structure shown in (15):



In the case of the adjunct, its presence is not a requirement of the syllable centre. Rather it is an element that seeks to be dependent on such a centre. It is represented in (15) as seeking a centre: this is the content of the backslash plus vowel notation. The effect on structure is to introduce into the graph a node of the same category as is sought, and on which the original depends, but without difference in precedence. The intransitive centre of (8.d) of course doesn't take a complement, but only an adjunct, as in (16):



There are typically no onset complements, only adjuncts: particular subsets of vowels typically don't require the presence of a consonant. This is but one of a number of signs that coda consonants are more intimately connected with the centre than the onset is. This means that we might remove the linearity stipulations from syllables entirely, in favour of (17.a), where bracketing indicates relative structural closeness. Linearisation is as in (17.b).

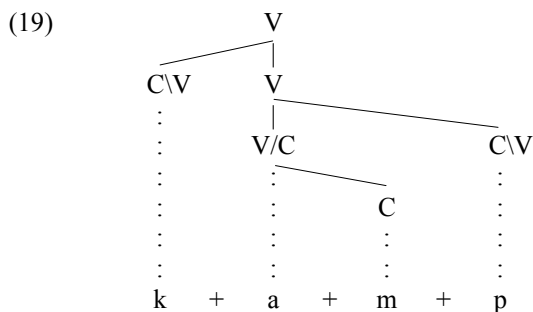
- (17) a. $k, l[p, m, a]$
- b. *linearisation with respect to the syllable centre:*
- i. $C[V] \Rightarrow C + [V]$
 - ii. $C, V \Rightarrow V + C$

This account also allows us to describe the distribution of the velar nasal in English quite simply: it is never an adjunct, always a complement – as formulated in (18);

(18) $/ŋ/ = C, \neq C \setminus$

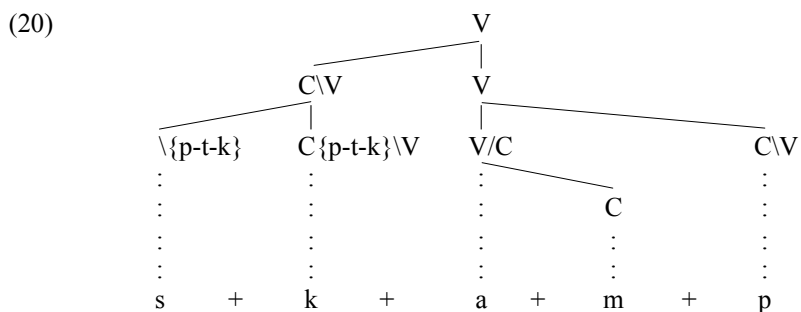
Most other consonants can be adjuncts or complements, as constrained by sonority.

Relative structural closeness is also reflected in order of adjunction. Coda adjunction is prior to onset adjunction, resulting in (19), and complementation is prior to both:



Finally in this section, let's return to (1) and, more generally, (7). These violate sonority and in some cases the restriction on coda size. This correlates with the special character of /s/ here. Say we take it to be an adjunct to the following plosive. If the /s/ is an adjunct to the following consonant, it is a rather special one. It belongs to a one-member set; and it is adjunct to a particular class of consonant: minimal plosives. We can recognise this distinctive character by calling it a specifier of the minimal plosives.

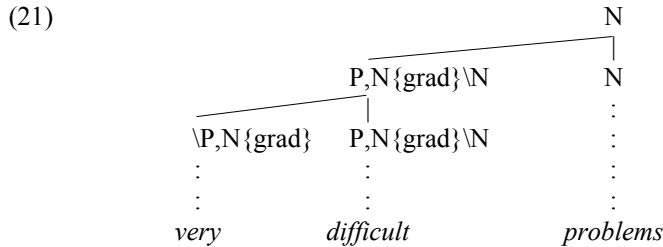
I associate this status with the structure projected in (20), where {p-t-k} abbreviates the distinctive specifications of the minimal plosives – which is not my concern here. Contrastively specifier /s/ is empty; it is identified purely by its being the specifier of the minimal plosives, as shown in (20):



The specifier is thus an adjunct that (unlike other adjuncts) belongs to a very restricted distributional class and selects its head very narrowly.

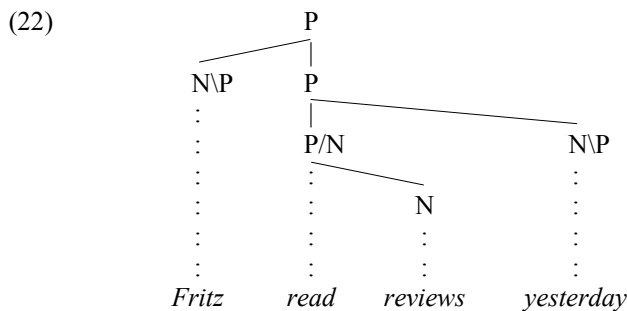
3 Structural analogies

Obviously, I've been using the terms complement, adjunct and specifier advisedly; by using terms more familiar from the syntax I've been anticipating the syntactic analogies. These are structural properties found in both syntax and phonology. Perhaps this is least clear in the case of 'specifier'. Partly, however, this is because there is not much consensus in the use of this term in the syntax. But there is a usage which is not far from whatever common understanding there might be concerning specifiers which corresponds to how I used the term in §2 in relation to the phonology. (21) contains on the left a syntactic specifier, according to this usage:



As a specifier it belongs to a small lexical class that characteristically adjoins to the maximal projection of a subclass of some category; here *very* specifies the subclass of gradable adjectives. As I have observed, in the phonology /s/ also belongs to a small class – indeed a one-member one – and it adjoins to the subclass of consonants that I’ve been calling minimal plosives. For our present purposes P in (21) etc is the notional feature (of predicability) that characterises verbs, N (referentiability) nouns, and the combination of the two adjectives. These are the syntactic equivalents of V and C. But for a fuller account see Anderson 1997.)

More generally, (22) shows the same pattern of complementation and adjunction as (19) – even to the extent of the observation that the onset and the subject are varyingly required to be present in different languages:



These analogies are not isolated – though there’s no space to substantiate this here. Let’s look at one more, one where this time the analogical property is more familiar from the phonology.

In the phonology we’re concerned with harmony. I’ll concentrate on stem-controlled vowel harmony, such as one finds in Finnish (cf. e.g. van der Hulst & van de Weijer 1995). (23.a) contains front words in Finnish, (23.b) contains back words:

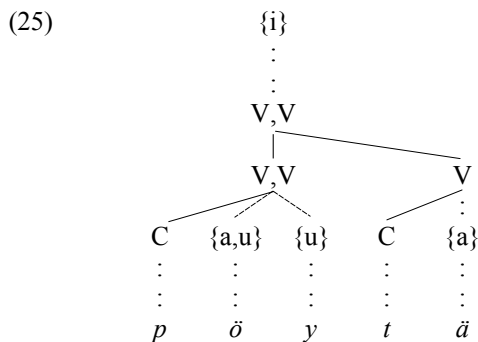
- (23) a. pöytä ‘table’, käyrä ‘curve’, tyhmä ‘stupid’ - ‘front words’
- b. pouta ‘fine weather’, kaura ‘oats’, tuhma ‘naughty’ - ‘back words’
- c. värttinä ‘spinning-wheel’, kesy ‘tame’ - ‘front words’ with neutral Vs
- d. palttina ‘linen cloth’, verho ‘curtain’ - ‘back words’ with neutral Vs

The vowels in each form are consistently front or back. (23.c-d) illustrate that some vowels can occur in both sorts of words: these are the neutral vowels spelled *i* and *e*. Frontness or backness is a property of the word stem. So the forms in (23.a) and (23.b) differ as represented in (24):

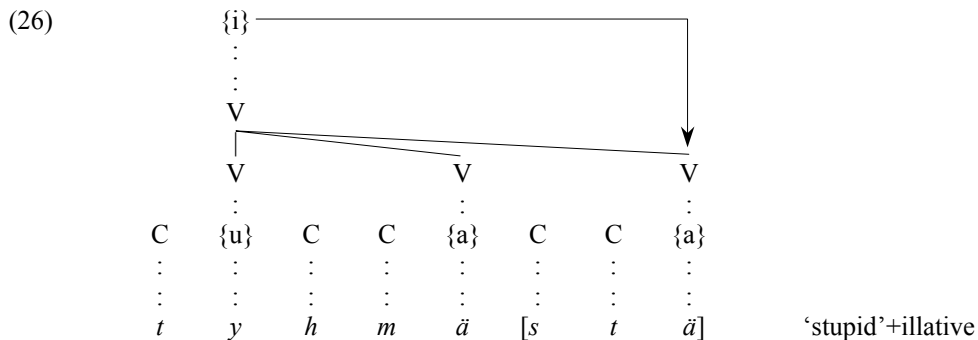
- (24) a. {i}[[p{u,a},{u}] + [t{a}]] = pöytä
- b. [[p,{u,a},{u}] + [t,{a}]] = pouta

The acuteness colour is a property of the lexical item: it stands outside the string of syllables, each of which is enclosed in square brackets. I've represented the individual vowels with the three vowel features – but this is not important here. And I've left out their primary categorisation, as V.

Derivatively, non-contrastively, the stem feature is associated with the word accent node, as in (25); and this feature is thus realised in any eligible place within the accentual domain, including each of the vowels in (25):



And this accentual domain includes material within affixes:



The vowel of the affix in (26) falls within the accentual domain, and the effect is of ‘spreading’. I note finally that Finnish neutral vowels are transparent; they do not block the spread. But elsewhere we do find ‘blockers’. Again I consider a well-studied example.

(27) illustrates gravity harmony in Turkish (cf. the accounts in e.g. Goldsmith 1990, Carr 1993):

- (27)
- a. demir ‘anchor’
 - b. somun ‘loaf’
 - c. havruz ‘pot’
 - d. kız-in ‘girl’ *gen.*
 - e. son-un ‘end’ *gen.*
 - f. kurd-lar ‘worm’ *pl.*
 - g. son-lar-in ‘end’ *pl. gen.*

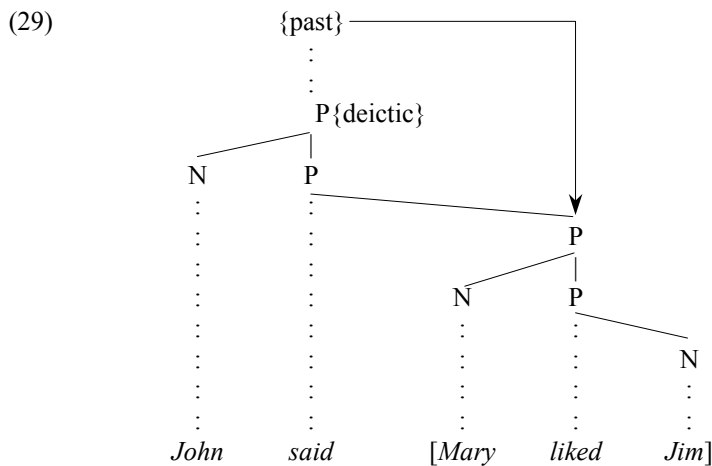
(27.a) is a non-grave word, (27.b) is a grave word. Gravity is again a feature of the lexical item manifested in vowels throughout the word. The first vowel in (27.c) is resistant to gravity. Again

the word feature spreads to affixes: compare non-grave (27.d) with grave (27.e). And the vowel in the affix in (27.f) resists gravity, as did the stem vowel in (27.c). Moreover, this vowel blocks the spread of gravity, as we can see in (27.g), where the vowel of the first suffix blocks spread to the second. The blocking vowel is said to be opaque.

In this brief and informal description of harmony I've used certain key terms: word feature rather than segmental feature; neutral vowel; opaque vowel. All of these are replicated in the syntax. One major manifestation of this is in so-called sequence of tenses – or what one might call tense harmony. This is apparent if we take the feature past manifested in (28) to be a feature of the clause:

- (28) a. She left last Tuesday
b. She left on Tuesday

(28) are past clauses; and in (28.a) pastness is manifested in a couple of places, on the verb and on the adjunct. The adjunct in (28.b) is neutral. An account parallel to vowel harmony suggests itself, as represented in (29):



Like the stem feature {i} of Finnish, the clausal past feature comes (derivatively, non-contrastively) to be attached to the head of the clause, as in (29), and manifested throughout its domain. The main clause verb in (29) is deictic; we have a deictic past, oriented to the moment of speaking. The past feature spreads to subordinate verbs which are non-deictic, as again shown in (29). *Liked* has a relative, non-deictic tense, oriented with respect to *said*.

(30.a) has a non-deictic past of its own as well as a spread past; again it is oriented with respect to *said*:

- (30) a. John said Mary had liked Jim
b. Mary liked to think Jim (had) admired her
c. John said Mary will come/is coming/has come/likes Jim
d. John said Bill thinks Mary liked Jim

Some verb forms are transparent to tense harmony, as with *think* in (30.b), which does not block the spread to the following verb. But spread is blocked if the subordinate verb is deictic, as in (30.c): a deictic verb is opaque. Each deictic verb introduces a new domain. The final verb in (30.d) is not oriented with respect to the first verb, because the second verb has introduced a new

domain. (For further discussion of relevant phenomena see Declerck 1988.) All of this suggests that we should not think of harmony phenomena as being limited to the phonology.

And my more general claim is that such structural parallels are not uncommon, and certainly not limited to the headhood phenomena that have recently drawn some attention (see e.g. Carr 2000, 2003, Tallerman 2003).

4 Limitations on structural analogy

I'm suggesting here that we should expect to find such analogies as are exemplified in §3 where the demands of the interfaces do not get in the way. Both syntax and phonology are grounded with respect to the domains that they interpret. And this imposes different requirements on the two planes. Moreover, their mutual articulation is asymmetric, particularly in relation to the lexicon: the syntactic interface with semantics impinges on the lexicon in a way that is not available to the phonetics, if we assume lexical entries are phonologically contrastive (including underspecified).

The semanticity of syntax demands properties not required in the phonology. And often these are incompatible with the phoneticity of phonology. This means that, for instance, the first set of analogies I presented above – concerning headhood – are accompanied by a number of discrepancies. Clause and syllable structure are more unlike than appears from comparison of (19) and (22).

One relatively trivial difference involves the existence of alternative word-order types: SOV, VSO etc. And this may be even more trivial if one subscribes to the 'antisymmetry hypothesis' (Kayne 1994). However that may be, this kind of variation in the syllable would be incompatible with sonority. But if we abstract away linearity, which within the syllable is simply non-contrastive, the configurational and categorial parallels remain.

More importantly, the adjunct in (22) is not typical of English; more common is the (31) type:

(31) Fritz read reviews on Tuesday

This seems to introduce a category not paralleled in the phonology, one – to put it crudely – linking verbs and nouns, a relational category, here manifested in English as a preposition.

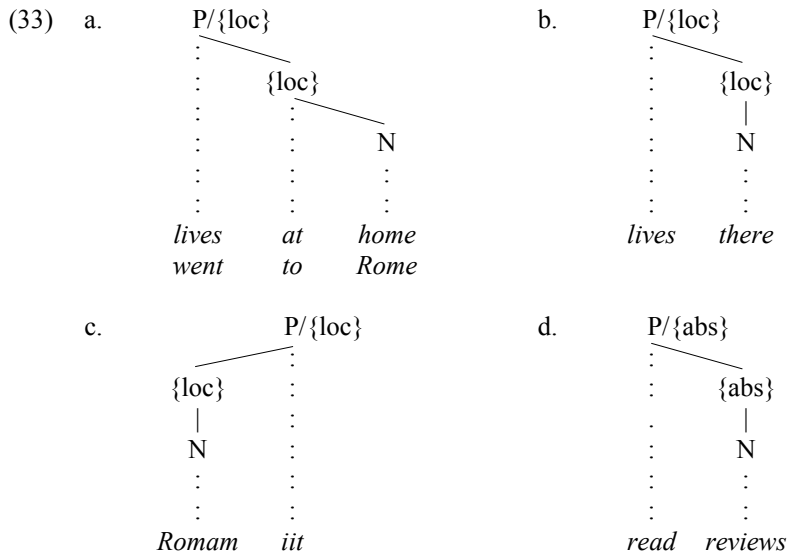
More importantly still, perhaps, (22) fails to express crucial connexions between the syntactic elements. Semantically, the subject is not an adjunct; it is a semantic complement as much as the object. (Now I'm trying not to be 'faint-hearted' about the notion complement.) In terms of satisfying the semantic valency of a verb, the subject is a complement. The verb selects participant types, manifested as the subject and complements.

Also, the verb may take several following semantic complements – as in (32):

- (32) a. Fritz received reviews from Millie
 b. Reviews ranged from terrible to indifferent
 c. Millie gave Fritz the reviews
 d. Fritz put the reviews in the bin

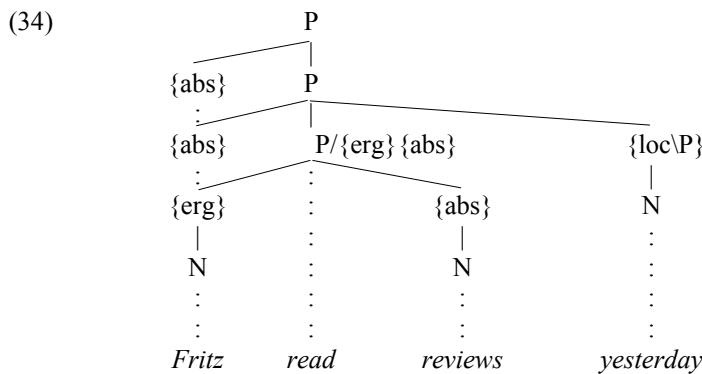
And some of these complements contain the new category encountered in (31), again manifested as a preposition. This category is there to distinguish different types of semantic participants among the complements and different types of circumstances among the adjuncts. It is present to serve a particular aspect of the semanticity of syntax: its role is to signal the manner of participation of elements in the perceived scene presented by the predication – the semantic relations that complements and adjuncts enter into.

This is a type of category absent from phonology; it is a functional rather than a lexical category. Presence of functional categories – like this one, or determiners, or finiteness – is a crucial difference between syntax and phonology. Functional categories can be expressed in various ways, as can be illustrated with the relational category I have just been drawing attention to, as indicated schematically in the exemplificatory representations in (33); they can be expressed as an independent word (33.a), in cumulation with other categories (33.b), inflexionally (33.c), or internally and ultimately positionally (33.d) (on which see again Anderson 1997):



Abs(olutive) and loc(ative) (roughly, ‘neutral’ or ‘theme’ and ‘place’) are secondary features of this relational category; and the P takes complements identified in such terms, as indicated in (33). This variety in expression of the category is in itself incompatible with the phoneticity of phonology.

(22) thus needs to be expanded to include a range of functional categories, including the one I’ve been talking about here, so that, as far as the latter is concerned, each of the nouns is connected to the verb by a semantic relation, along the lines of (34):



‘Erg(ative) (roughly ‘agent’) is a further secondary feature expressing as semantic relation.

The two {abs} above *Fritz* are not subcategorised for, but are there by virtue of a general principle that requires each P to be accompanied by the ‘neutral’ relation, even if it is not so subcategorised. Such a principle is again alien to a phonology lacking functional categories. A consequence of this is ‘argument-sharing’, whereby an unsubcategorised-for {abs} shares the nominal of a subcategorised-for semantic relation, as expressed by the double-motherhoods in (34), where lowest P is subcategorised for {erg}. Each semantic relation complements a P or is adjoined to one or is present by virtue of the universality-of-abs principle alluded to. And each semantic relation is complemented by a N, in these cases internally.

One (initially paradoxical) conclusion to be drawn from these observations is that the traditional picture of the clause given in (22) is more appropriate to the syllable than to the clause. The revised clause structure of (34), which is still greatly simplified, particularly functionally, but which nudges the representation towards more semantic expressivity, may remind the reader of antiquarian bent of developments that have been called ‘case grammar’, which sought to enrich syntactic structure in this way (see e.g. Fillmore 1968, Anderson 1971, 1977).

Space precludes looking at other examples of the requirements of semanticity and their syntactic consequences, unparalleled in the phonology. One set of obvious examples involves derivationality, the capacity to derive one syntactic category from another. The transference of this to the other plane would render the phonetic basis of phonology incoherent: how would one interpret a vowel derived from a consonant? But in the syntax, on the other hand, the derived form in (35) allows a scene to be presented by the syntax as an entity, or an entity to be viewed as the result of an event:

(35) John’s painting of the wall didn’t please Jill

And it allows for the representation of a scene within a scene.

Even more scope for the representation of scenes within scenes etc. is provided by embedding. This is at most very limited in the phonology, though some analyses have envisaged embedding of, for example, tone groups (for references see Anderson 2003). Again sonority considerations severely limit the possibilities for embedding in the phonology. – Just as it limits the scope for what has often been described as ‘movement’, where there are conflicting demands on the positioning of an element, as in (36):

(36) a. Who(m) is it that Bill wants to meet?
b. Betty seems to know the truth

The long-distance dependencies here are made possible by semanticity, and can be characterised in terms of argument-sharing. Argument-sharing in the phonology is much more local (manifested as ambisyllabicity and the like). And so on.

Conclusion

I have argued that there are structural properties that in the phonology may have the fundamental capacity of being contrastive and which are shared with syntax. However, these parallels are limited by the groundedness of the two planes. The planes respectively interface with domains which may impose different demands on them.

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Notes

*This is a revision of a paper presented on 07/07/03 at the conference 'From representations to constraints' at the University of Toulouse-Le Mirail. This version has benefited from comments made by other participants in the conference.

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