CONSTRUCTION OF A LINGUISTIC THEORY FROM FIRST PRINCIPLES AND CONFRONTATION WITH CRUCIAL DATA[1][*]

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Abstract: This paper develops a 'signum ontology', i.e. a model for coherently linking the signum (cf. sign) as an abstract entity ultimately to speech phenomena. It begins by analysing basic aspects of language: physical, meaningful and 'word' (i.e. in terms of word-identity), abstract and concrete (sections 2–5, 7), within a semiotic framework (Section 6). The resulting relationships between phonological, grammatical and abstract semantic entities (Section 8) allow for the incorporation of allomorph and alloseme into the model (Section 9).

Having established core features of the model, I go back to the periphery, showing how maximally primitive notions (unascribed phonetic image correlate, and unascribed semantic image correlate / referent) provide a basis for coherently linking language reality (speech phenomena) to the abstractions of the model (Section 10), via a small number of serially applied basic principles, crucial among which is a set-forming criterion (Section 11). I show how the extra-linguistic models of general semantics and general phonetics (sections 12 and 13) link to the linguistic models of phonology and delology, and ultimately to the signum (sections 14–17), and the instantiational correlate of the signum, the lexonete (utterance) (Section 19).

I provide a complete model of the signum ontology (sections 20–21), showing that its overall structure requires two notions, the allomorphon and allosemon, which have no obvious correlate in standard linguistic theorising, but demonstrating also that they are essential for coherent analysis of two phenomena which are widely recognised in linguistics: incomplete neutralization and imperfect synonymy (sections 22–23). I demonstrate the integration of the signum ontology with the other component of the overall theory (extended axiomatic functionalism), the system ontology (Section 24). Finally, I attempt to show that the small number of basic principles used for establishing the signum ontology model in this paper can, in fact, be further reduced (Section 25).

Keywords: axiomatic functionalism, linguistic sign, signum, linguistic theory, ontology, member, set, Peircean first

1. Introduction

In this paper, I will progressively construct a linguistic theory (or, more accurately, one component of a two-component linguistic theory; see Section 24) by doing a number of things:

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1.   I will first (Section 2) identify a reasonable set of basic aims for a linguistic theory (allowing that different linguistic theories may legitimately have different aims, and that the aims which I identify are, potentially, one set of reasonable aims amongst other possible reasonable aims).

2.   At subsequent stages in the argument, I will, wherever possible, start with the simplest possible linguistic model (theory) given previous argumentation. I will only abandon this model when it is shown to be inadequate to the task of analysing language, replacing this with a minimally more complex model which is shown to be able to deal with problems previously raised. The development of the model thus proceeds progressively: at each stage a minimally more complex model replaces a less complex model whose inadequacy in specific respects has just been demonstrated.

3.   Sometimes I will demonstrate the inadequacy of an existing version of the model (theory) by consideration of general issues such as the nature of reality, or degrees of abstraction. I will then provide a more complex model which overcomes the identified inadequacies.

4.   On other occasions, I will demonstrate the inadequacy of an existing version of the model (theory) by confrontation with crucial real-language data, showing that the existing version of the model cannot adequately treat this data. I will then provide a more complex model which is able to deal with the identified data.

5.   Sometimes, I will reverse the process in 4. Thus, I will first present a more complex version of the model than previously provided, and subsequently illustrate this with data which are intended to provide a practical illustration of how this more complex version of the model is able to deal with data that less complex previously presented versions could not.

2. Basic aims and principles of a linguistic theory

I start from the position that the basic aim of a linguistic theory should be to provide analyses (descriptions) of the data which are coherent (i.e. statements within the analyses do not contradict one another), adequate to account properly for the data, and simple (i.e. avoiding unnecessary complications). The analyses should also, in order to qualify as scientific, be potentially refutable (i.e. it should be possible to say what kind of data would disprove the analyses, even though such data are not, by definition, forthcoming at the time of the analyses (cf. Dickins 1998: 37; Mulder 1989: 7, 55–65). This may seem a rather modest aim for a linguistic theory, particularly in comparison with the aims of the two dominant approaches to contemporary linguistics: what I will here term 'nativist generativism' and 'social-functionalism'.

Generativism involves the production of generative grammars, a generative grammar being definable along the lines: 'a fully explicit finite set of rules that can be applied to generate all those and only those sentences (often, but not necessarily, infinite in number) that are grammatical in a given language', coupled with an assertion that some set of fundamental characteristics (particularly syntactic features) of all human languages are the same (cf. for example, Carnie 2013). Generative theories are thus universalist; they involve an a priori claim that there are universal features common to all languages, these features being established 'prior' to the analysis of individual languages themselves. Thus, if one were to analyse

a language which had never previously been studied using a generative approach/model, the analysis would presuppose that this language has those features which are deemed to be universal by the particular generative approach/model which one was adopting: these features would be 'hard-wired' into the analysis (description). This contrasts with the standpoint taken by axiomatic functionalism, in which no analytical features are presumed (pre-assumed) to be universal. All analyses are language-specific. An analysis of any particular language is, in this sense, *ex nihilo*.

A further typical feature of generativist approaches (though one rejected by a few generativists, e.g. Gazdar, Klein, Pullum and Sag 1985) is that the universality of language which generativism presumes reflects specific genetically-endowed mind/brain structures shared by all human beings, such that young children, in particular, are able to acquire any natural language without in any sense being taught it. This is sometimes known as 'nativism' (e.g. Chomsky 2007). An approach to linguistics which is both generativist and nativist can thus be termed 'nativist generativism'.

There are profound practical problems with nativist generativism. Commenting on Pinker's arguments in favour of nativism, Rose states:

> In the computer-speak that Pinker favours, humans possess a 'language acquisition device' or LAD. However, it would appear that if it exists, as with other such proposed modules, it has no particular instantiation within brain structures or biochemistry (Rose 2006: 110).

Even indirect evidence of nativism is weak, e.g. how language acquisition takes place in relation to supposed features of 'universal grammar'. Clark and Lappin note:

> In spite of the centrality that Chomsky has accorded to the problem of acquisition, surprisingly little formal or empirical work has been done within the generative tradition to produce an explicit, computationally viable, and psychologically credible account of language acquisition (Clark and Lappin 2011: 214).

There are also more general objections to the testability – and therefore scientificity – of generative grammar and, indeed any universalist approach to linguistics (some of which are discussed in Dickins 1998: 27–34), as well as specifically meta-theoretical issues (discussed, for example, in Mulder and Rastall 2005).

Generativism is sometimes referred to as 'formalism' (e.g. Newmeyer 2010), a usage which is confusing, since it does not clearly differentiate generativism from other formal (i.e. explicit, logically coherent) approaches to linguistic analysis, such as axiomatic functionalism. 'Formalism' in this sense is sometimes also confusingly contrasted with 'functionalism' (Newmeyer 2010) – or what I shall term here 'social-functionalism', to distinguish it from the sense in which 'function' 'functional' and 'functionalism' are used in an axiomatic-functionalist context. ('Function' in axiomatic functionalism is a matter of 'distinctive function', i.e. the appeal to non-arbitrary 'language-internal' set-forming criteria for determining fundamental linguistic identity/existence; cf. Section 15).

Social-functionalism proposes that language structure is determined by social structure. The currently dominant social-functionalist approach to linguistics is systemic-functional linguistics, originally put forward by Michael Halliday. According to Halliday:

> The structure of sentences and other units is explained by derivation from their functions
> – which is doubtless how the structures evolved in the first place. Language is as it is
> because of the function it has evolved to serve in people's lives (Halliday 1978: 4).

Systemic-functional linguistics proposes three socially-oriented universal linguistic semantic 'metafunctions', which dominate and directly structure 'lower' levels of analysis, particularly lexico-grammar: the ideational, the interpersonal, and the textual. The ideational metafunction is "language as ideation. […] It corresponds roughly to non-systemic terms such as Darstellung, representational, [semantic] content, and semantics" (Matthiessen, Kazuhiro, and Lam 2010: 115). The interpersonal metafunction is "language organised as a resource for enacting roles and relations between speaker and addressee as meaning" (Matthiessen, Kazuhiro, and Lam 2010: 126). The textual metafunction is "the enabling metafunction, providing the resources for presenting ideational and interpersonal meanings as a flow of information in text unfolding in its context" (Matthiessen, Kazuhiro, and Lam 2010: 220).

As a universalist theory, systemic-functional linguistics runs up against the same general problems of testability – and therefore scientificity – as does generativism (cf. Dickins 1998: 27–34). More simply, systemic-functional linguistics can be seen to 'straightjacket' languages into a set of basic categories (ideational, interpersonal, textual) which they do not, in practice, neatly fit. For a more specific critique along these lines, in relation to theme and rheme, as proposed universal sub-components of the textual metafunction, see Dickins (*in prep.*).

The notion that the currently dominant approaches to linguistics – nativist generativism and social-functionalism – are problematic, partly but not entirely because of their universalist orientation will not be pursued here. I will, however, stress a minimalist view of what a linguistic theory should do (as already set out at the beginning of this section): a linguistic theory should yield analyses which are coherent, adequate to account for the data, and simple, and that in order to qualify as scientific these analyses must be potentially refutable. It is this rather 'modest', though I believe realistic, view of the aim of linguistics which is adopted in this paper.

In relation to the basic orientation of linguistic analysis, the most appropriate place to start is by identifying the overall 'purport' of language, i.e. its 'underlying purpose', since this will determination the orientation of the analytical models which a linguistic theory seeks to establish. The purport of a language can be identified as the conveyance of information (meaning) by conventional means (cf. Mulder and Hervey 2009: Def. 1c; Dickins 2009: Dec. 1c). The 'vehicle' for this conveyance of meaning is something physical: in the case of spoken language, vocal sounds, and in the case of written language, marks on a piece of paper or patterns of light and dark on a computer screen.

This gives two basic aspects to language, physical and meaningful, or what I will here call 'purely physical' and 'purely meaningful' (for reasons to be explained later) as in Figure 1 (next page).

By differentiating between the purely physical and purely meaningful aspects of language, Figure 1 accounts in a very basic manner for the fact that I can make some sounds, representable as [kæt], for example, on a particular occasion, and mean by them a specific feline 'cat' (i.e. a particular cat which I am referring to). However, this is all that the model implied by Figure 1 allows us to do.

Figure 1
Basic aspects of language: purely physical and purely meaningful

purely physical aspect	purely meaningful aspect

Consider now my saying [kæt] on a second occasion and referring to a different cat. If we only had the linguistic model implied by Figure 1, all we could say would be that we have two completely unconnected utterances: two different [kæt]s and two different cats. Indeed under a Figure 1 theory, all we could do would be to list every single utterance which occurred as being different: there would, in an obvious sense, be no analysis of the language in question at all (even assuming we had also succeeded in incorporating into the theory some practical means of assessing what constituted our relevant 'universe of phenomena' – our language).

Pre-theoretically (intuitively), what unites all occurrences of [kæt] in English which refer to 'carnivorous quadruped (*Felis domesticus*)' (Oxford English Dictionary Online) is three things: 1. That all occurrences of [kæt] in some sense sound the same; 2. That all occurrences of [kæt] referring to *Felis domesticus* in some sense mean the same thing; and 3. That all occurrences of [kæt] involve the same word 'cat'.

3. Basic aspects of language: physical, meaningful and word

The identification of word alongside sound (purely physical aspect) and referent (purely meaningful aspect) might appear to give us Figure 2.

Figure 2
Basic aspects of language: physical, meaningful and word

purely physical aspect	word	purely meaningful aspect

4. Basic aspects of language: physical, meaningful and word – abstract and concrete

However, Figure 2 is not adequate to account for the fact that we are not merely concerned with individual occurrences of [kæt] referring to particular instances of *Felis domesticus*. We are also concerned with *all* instances of [kæt] referring to a single notion *Felis domesticus*. That is to say, we are concerned with an abstraction from individual sound-occurrences

[kæt] to an 'abstract sound' correlate of these, 'kæt' (notatable as /kæt/, and from reference to individual examples of *Felis domesticus* to an abstract meaning correlate of these *Felis domesticus*). Equally, we are concerned not only with individual occurrences of the word 'cat', but also the abstract notion of the word 'cat' – i.e. the notion that there is one word 'cat' in English notwithstanding that we can utter this word an unlimited number of times. These considerations give rise to the view that we need two levels of analysis in our model (theory): a concrete level and an abstract level, covering each of purely physical aspect, word, and purely meaningful aspect, as in Figure 3.

Figure 3
Basic aspects of language: physical, meaningful and word; abstract and concrete

Abstract	abstract purely physical-related aspect	abstract word	abstract purely meaningful-related aspect
Concrete	purely physical aspect	concrete word	purely meaningful aspect

5. Basic aspects of language: physical, meaningful and word – abstract and concrete

Further insights are obtained by analysing the columns according to the following categories: physical-related, and meaningful-related.

According to Figure 4 (next page), language has a purely physical/physical-related aspect and a purely meaningful/meaningful-related aspect (the left-hand and right-hand columns respectively), but it also has an aspect which involves a combination of the physical-related and the meaningful-related, the middle column (covering in Figure 4, 'abstract word' and 'concrete word').

One obvious way in which Figure 4 is lacking is that language (when viewed pre-theoretically/intuitively) does not consist of individual words. Not only can we say 'cat', we can also say 'pretty cat', 'a pretty cat', 'that is a pretty cat', and so on. In each case, we have added something more to 'cat'. 'Cat' itself retains its same word identity – plus the same abstract purely physical-related aspect and the same purely meaningful-related aspect (*Felis domesticus*). Similarly, in 'pretty cat', 'a pretty cat', and 'that's a pretty cat', 'pretty' retains its same word identity, plus the same abstract purely physical-related aspect and the same purely abstract meaningful-related aspect (assuming we mean by 'pretty' in each case 'attractive and pleasing in appearance': Oxford English Dictionary Online). This analysis can be extended for 'a', 'that' and 'is'.

What this illustrates is that language involves not just individual words but combinations of words – at both the concrete and abstract levels (just as we can have individual utterances

of 'that is a pretty cat', so we can say that they are all utterances of a single abstraction – a sentence – 'that is a pretty cat'). We can also go down below the word. Thus, the 's' at the end of 'cats' has the same meaning 'plural' as the 's' at the end of 'rats' – i.e. and we apply the same distinction between abstract (real occurrence) and abstraction to the ultimate units making up words (morphemes) as we do to words (e.g. 'cat'), phrases ('a pretty cat') and sentences ('that's a pretty cat').

Figure 4
Basic aspects of language: physical-related, meaningful-related and word; abstract and concrete

	PHYSICAL-RELATED		Ø
	Ø	MEANINGFUL-RELATED	
Abstract	abstract purely physical-related aspect	abstract word	abstract purely meaningful-related aspect
Concrete	purely physical aspect	concrete word	purely meaningful aspect

We can apply the same principles to the purely physical-related (sound-related) aspects of language as we can to morphemes, words, phrases, etc. Thus, we can contrast the following purely in terms of physical-related (sound-related) aspects:

/kæt/ 'cat'
/kɪt/ 'kit'
/kɔt/ 'cot'
/pæt/ 'pat'
/pɪt/ 'pit'
/pɔt/ 'pot'
/kæd/ 'cad'
/kɪd/ 'kid'
/kɔd/ 'cod'

Here, the different 'sounds' (/æ/ vs. /ɪ/ vs. /ɔ/ in 'cat', 'kit' and 'cot'; /k/ vs. /p/ in 'cat' and 'pat'; /t/ vs. /d/ in 'cot' and 'cod', etc.) are, from one perspective, yielding different words. However, the different 'sounds' ((/æ/ vs. /ɪ/ vs. /ɔ/; /k/ vs. /p/; /t/ vs. /d/, etc.) are not morphemes, i.e. they do not have both a physical-related and a meaningful-related aspect: we

cannot directly relate the final /t/ element in 'cat', 'kit', and 'cot' to a word-part-identity, as we can the final plural 's' which occurs in 'cats' and 'rats'. Rather /t/ has only a physical-related aspect: it is purely a feature of the left-hand column in Figure 4.

What this tells us is that just as entities in the middle column in Figure 4 (inadequately termed 'abstract word' and 'concrete word') can be analysed in terms of size (building up from smallest to largest), so entities in the left-hand column (abstract purely physical-related aspect, and purely physical aspect) can be independently analysed in terms of size (building up from smallest to largest). Thus, we have quite distinct analytical *systems* in the left-hand column, and the middle column.

It is a little more difficult to see that the system in the right-hand column (purely meaningful-related aspect, and purely meaningful aspect) in Figure 4 are distinct from those in the middle column. However, the principles are the same. Intuitively, we can recognise this in a number of ways. Firstly, there is the fact that words may have more than one sense – what is traditionally known as polysemy. Thus, in 'garage', 'garage' might mean either 1. "Building, either private or public, intended for the storage and shelter of motor vehicles while not in use"; or 2. "Commercial establishment that sells petrol, oil, and similar products and freq. also undertakes the repair and servicing of motor vehicles" (definitions from Oxford English Dictionary Online), while, 'old' might mean either 1. "Having lived or existed a long time; not young or new", or "Former; not current; relating to past times, bygone". Thus, 'my old garage' might mean any of four things, given two possibilities for 'garage' and two for 'old'.

The second intuitive way in which it can be seen that there are distinct systems operating in the middle column and the right-hand column in Figure 4 is that words/phrases may mean either individually or only in combination. Thus, in 'give in' (= 'surrender', etc.), it is not possible to assign individual meanings to 'give' and 'in': all we can say is that the entire phrase has the meaning 'surrender' (etc.), even though in other contexts 'give' and 'in' have independent meaning. Similarly with idioms, e.g. 'round the bend' meaning 'mad', we have to treat the entire phrase as a single meaning-unit. However, whether we mean by 'round the bend', the idiomatic 'mad' or the non-idiomatic 'beyond the turn/corner' (etc.), we have intuitively the same complex entity in terms of the middle column (words, etc.).

Just as we can think of morphemes combining to make words, words to make phrases, etc. (Figure 4, middle column), so we can think of smaller units of meaning combining (in various ways) to make larger units of meaning. This and the facts of polysemy and size-difference between word (etc.) units and meaning-units (previous two paragraphs) gives us two separate small-to-large systems in the middle column and the right-hand column in Figure 4.
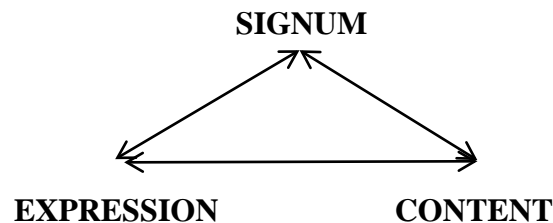
6. Signum, expression and content

It is useful at this point to consider language from a more specifically Saussurean-based semiotic point of view. Saussure regarded language from the perspective of the sign, or what is known in axiomatic functionalism as the signum (for the distinction between 'sign' and 'signum' in axiomatic functionalism, see: Mulder and Hervey 2009, Def. 2a2). For Saussure,

a sign was a biunity (bi-unity) of what he termed a signifier and a signified – roughly equivalent to what Hjelmslev (1953 / 1943) later termed an expression and a content, respectively. Using the terms 'signum', 'expression' and 'content', we can represent this relationship as in Figure 5.

Figure 5
Signum as biunity of expression and content

In Figure 5, the double-headed arrows express mutual implication: signum implies expression and content, expression implies signum and content, and content implies signum and expression.

Signum is an abstraction. 'Signum' is useful as a term, because a signum can be any size, from morpheme through to sentence. It would be tempting to identify an expression with the abstract purely physical-related aspect (Figure 5) and content as the abstract meaningful-related aspect (Figure 5). However, as will be seen later, this cannot be coherently done: the relationship between expression and content and signum needs to be conceived differently from this. For the moment, we may note that the fact that the abstract purely physical-related aspect does not stand in a relationship of mutual implication with the signum is evident from the fact that the entities in the left-hand column in Figure 5 operate as a different system from those in the middle column, as argued above. The same is true of the entities on the right-hand column in Figure 5 (as also argued above) in relation to the entities in the middle column. I will return to the signum and semiotic issues later in this paper.

7. Basic aspects of language – with 'area of analysis' terms

Having introduced some 'entity' terms for central aspects of the theory, I will now introduce some provisional 'area of analysis' terms, in Figure 6 (next page).

The most obvious of these terms are 'phonetics' (as the analysis of real sounds) and phonology (as the analysis of abstractions 'organising' these sounds). '(Level of) utterances' is fairly self-explanatory, as I think are 'abstract semantics' (analysis of abstractions 'organising' meanings) and 'concrete semantics' (the analysis of real meanings).

'Grammar' is also a fairly traditional notion. It is important to note, however, that 'grammar' here has to be understood in a very specific sense: hence the usage '(connotative) grammar'. This is apparent from the discussion in Section 5 of 'old garage' and 'round the bend'. 'Old garage' as a grammatical entity is not a phrase having just one of the four possible senses ascribable to it from the discussion in Section 5 (i.e. 1. 'Not new building, either private or public, intended for the storage and shelter of motor vehicles while not in use'; 2.

'Former building, either private or public, intended for the storage and shelter of motor vehicles while not in use'; 3. 'Not new commercial establishment that sells petrol, oil, and similar products […]'; and 4. 'Former commercial establishment that sells petrol, oil, and similar products […]'). Rather as a grammatical entity, 'old garage' subsumes all these four possible senses (as well as other senses of 'old' and 'garage' not considered here).

Figure 6
Basic aspects of language – with 'area of analysis' terms

Abstract	phonology	(connotative) grammar	abstract semantics
Concrete	phonetics	(level of) utterances	concrete semantics

Similarly with non-idiom—idiom pairs, 'round the bend' as a grammatical entity is not a phrase having just one of the senses ascribable to it – the non-idiomatic 'beyond the turn/corner' (etc.), or the idiomatic 'mad'. Rather as a grammatical entity, 'round the bend' subsumes both these possible senses (as well as other senses of 'round' and 'bend' not considered here).

The notion of 'grammatical entity' also goes beyond word class. Thus, 'garage' is the same grammatical entity, regardless of whether it is a noun, as in i. 'Building, either private or public, intended for the storage and shelter of motor vehicles while not in use'; or ii. 'Commercial establishment that sells petrol, oil, and similar products […]', or whether it is a verb, as in iii. 'To place (a motor vehicle) in a garage for storage […]' (definitions from Oxford English Dictionary Online). For further discussion of 'connotative grammar' see Dickins (2009, section heading: *The scope of extended axiomatic functionalism compared to that of standard axiomatic functionalism*).

8. Relationship between phonological, grammatical and abstract semantic entities

I want to turn now to the relationship between phonological entities (entities in phonology) and grammatical entities (entities in (connotative) grammar) on the one hand, and that between abstract semantic entities and grammatical entities on the other. Consider the following:

1. The word – i.e. (connotative) grammatical entity[2] – 'garage' can be pronounced as either /ˈɡærɑːʒ/ or /ˈɡærɪdʒ/ in British English. I will assume, for the moment, that

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[2] 'Word' is not, in fact, a technical term in extended axiomatic functionalism. I will, however, use the term 'word' in this paper as a synonym for a certain, albeit ill-defined, kind of (connotative) grammatical entity / signum.

/ˈɡærɑːʒ/ and /ˈɡærɪdʒ/ are two different phonological entities (and try to demonstrate this in Section 14). Thus one (connotative) grammatical entity can correspond to two phonological entities.

2. The word (grammatical entity) 'garage' might mean either i. 'Building, either private or public, intended for the storage and shelter of motor vehicles while not in use'; or ii. 'Commercial establishment that sells petrol, oil, and similar products and frequently also undertakes the repair and servicing of motor vehicles', or even iii. (as a verb) 'To place (a motor vehicle) in a garage for storage […]' (definitions from Oxford English Dictionary Online). I will assume, for the moment, that 'Building, either private or public, intended for the storage and shelter of motor vehicles while not in use' and 'Commercial establishment that sells petrol, oil, and similar products […]' are two different abstract semantic entities (and try to demonstrate this in Section 17). Thus, one (connotative) grammatical entity can correspond to two abstract semantic entities.

3. The phonological entity /bɪn/ in English can correspond to two words (grammatical entities) 'been' (the past particle of the verb '[to] be') and the word 'bin' (meaning 'receptacle' etc.)

4. The abstract semantic entity (meaning, sense), representable as CH_2O (using standard chemical formula notation) in English can correspond to two words (grammatical entities) 'methanal' and 'formaldehyde'. Thus, one abstract entity can correspond to two grammatical entities (words, in this case).

Starting with 1. above, a grammatical entity (e.g. word) can be understood as a set of phonological entities (phonological forms), each of which is conceived as standing in a relation to ('belongs to') that grammatical entity (e.g. word). A phonological entity (phonological form) conceived as standing in a relation to a grammatical entity can be termed an allomorph. 'Allomorph' is a traditional term for a phonologically distinct variant of a word (i.e. an abstract word; Figure 4); in extended axiomatic functionalism, the notion 'allomorph' is extended to cover a phonologically distinct variant of any grammatical entity, not just a word. A grammatical entity can be regarded as a set of utterances (Figure 6). More obviously, perhaps, an abstract word (as a grammatical entity) can be considered as a set of concrete words (i.e. words actually uttered – or better, as models for these words actually uttered). A word, as a grammatical entity, can also, however, be regarded as a set of allomorphs (as argued in the previous paragraphs). Allomorph, however, is more abstract than concrete word (i.e. a model for something actually uttered). Thus, while the word 'garage' has two allomorphs, with phonological forms notatable as /ˈɡærɑːʒ/ or /ˈɡærɪdʒ/ in British English, it has a potentially unlimited number of concrete words – i.e. 'garage' can be uttered (realised, or more precisely, instantiated) a potentially unlimited number of times.

Moving on to 2. above, just as a grammatical entity (e.g. word) can be understood as a set of phonological forms, each of which is conceived as standing in a relation to ('belongs to') that grammatical entity (e.g. word), so a grammatical entity (e.g. word) can be understood as a set of abstract semantic entities, each of which is conceived as standing in a relation to ('belongs to') that grammatical entity. An abstract semantic entity conceived as standing in a relation to a grammatical entity can be termed an alloseme.

As noted above, a grammatical entity can be regarded as a set of utterances (Figure 6). Thus, an abstract word (as a grammatical entity) can be considered as a set of concrete words

(i.e. words actually uttered – or better, as models for these words actually uttered). A word, as a grammatical entity, can also, however, be regarded as a set of allosemes (as argued in the previous paragraphs). Alloseme, however, is more abstract than concrete word (i.e. a model for something actually uttered). Thus, the word 'garage' has a small number of allosemes (senses) of which three were given above: i. 'Building, either private or public, intended for the storage and shelter of motor vehicles while not in use'; ii. 'Commercial establishment that sells petrol, oil, and similar products […]'; and iii. 'To place (a motor vehicle) in a garage for storage […]'. By contrast, 'garage' has a potentially unlimited number of concrete words – i.e. 'garage' can be uttered (realised, or more precisely, instantiated) a potentially unlimited number of times.

This model not only allows for allomorphy (one grammatical entity, more than one phonological form) and allosemy (polysemy) (one grammatical entity, more than one abstract semantic entity: what I shall later term 'delological form' / 'denotation'), but also for the converse of these: homomorphy: one phonological form corresponding to more than one grammatical entity; and homosemy: one abstract semantic entity corresponding to more than one grammatical entity. An example of homomorphy (see also above) is /bɪn/ as related to the two signa (grammatical entities) 1. 'receptacle'; and 2. past participle of the verb 'to be' (this latter probably being best analysed as a complex signum / grammatical entity). /bɪn/ = 'receptacle' and /bɪn/ = past participle of verb 'to be' are homomorphs. An example of homosemy (see also above) is the abstract semantic entity (meaning, sense), CH_2O (as a chemical formula) as related to the signa (grammatical entities / words) 'methanal' and 'formaldehyde'. Thus, one abstract entity can correspond to two grammatical entities (words, in this case). 'Methanal' and 'formaldehyde' (both having the sense also expressable by CH_2O) are homosemes – or, to use a more traditional linguistic term, they are synonyms.

9. Model of linguistics, incorporating allomorph and alloseme

We can visualise diagrammatically, the relationship of member-to-set[3] vertically (as has, in fact, been done implicitly in previous diagrams, as in Figure 7 (next page).
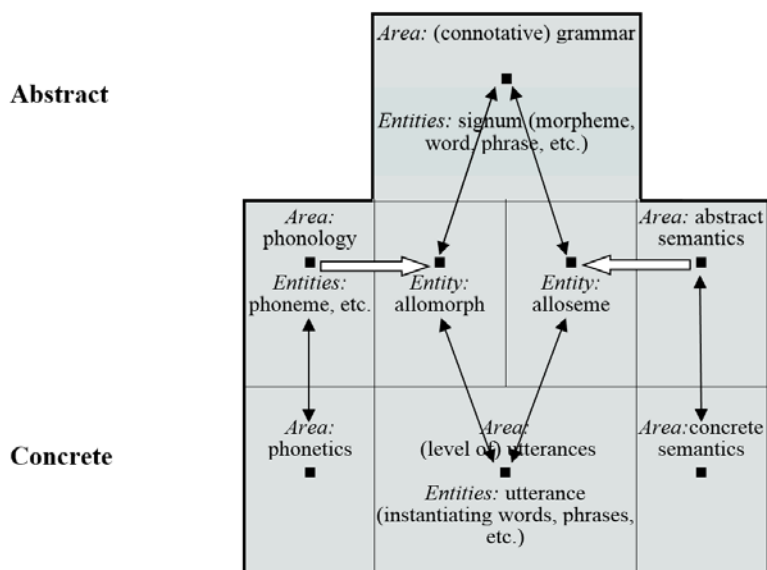
Figure 7 does a number of things. Firstly, it differentiates between area of analysis (abbreviated to 'area' in Figure 7) and entity/entities within that area (e.g. between (connotative) grammar as an area of analysis, and morpheme as an entity within that area of analysis). Secondly, it uses the vertical dimension more specifically than previous figures to represent member-to-set relationships – with the level of the set higher up than that of its member entities. Thus a signum (grammatical entity) is a set of allomorphs, and also a set of allosemes. An allomorph, however, is also a set of utterances (instantiating that allomorph), while an alloseme is a set of utterances (instantiating that alloseme). At a further remove, of course, a signum is also a set of utterances (instantiating that signum), while an alloseme is a set of utterances (instantiating that signum). A third thing which Figure 7 does is give a sense to the

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[3] Like many writers, Mulder uses the terms 'set' and 'class' interchangeably (as synonyms). In mathematics and set theory, however, 'class' is sometimes used to mean 'a collection of sets (or sometimes other mathematical objects) that can be unambiguously defined by a property that all its members share' (cf. http://www.encyclopediaofmath.org/index.php/Class). In order to avoid confusion, I will use the term 'set' throughout this paper.

horizontal dimension on the diagram, which can be termed *bringing into a relationship with*. Thus, an allomorph is a phonological entity (phoneme, or normally a string of phonemes), brought into a relationship with a signum (grammatical entity), an example of an allomorph being the phonological entity /bɪn/ brought into a relationship with the signum (grammatical entity) 'bin' having the sense (or one sense among many) 'receptacle' (etc.).

Figure 7
Model of linguistics, incorporating allomorph and alloseme

Similarly, an alloseme is an abstract semantic entity brought into a relationship with a signum (grammatical entity), an example of an alloseme being the abstract semantic entity CH_2O brought into a relationship with the signum (grammatical entity / word) 'methanal'.

Two types of arrows are used in Figure 7. The first of these ⇒ signifies 'bringing into a relationship' or more specifically, the bringing of 'form' across from one 'analytical column' to another – or what is more technically known as 'transformation'. This 'arrow of transformation' thus indicates that an allomorph involves bringing phonological form into a relationship with a grammatical identity (entity), while an alloseme involves bringing a 'form' in abstract semantics into a relationship with a grammatical identity (entity).

The second arrow in Figure 7 ↔ is (as noted in Section 6) an arrow of 'mutual implication'. This indicates that the entities in the areas of analysis connected by this arrow all imply one another logically. Signa, for example, imply utterances and vice versa: one cannot have a signum (as an abstraction) without utterances (or at least potential utterances) which realise it, and one cannot have utterances (using 'utterance' in the technical sense developed in this paper) without having a signum, or signa, which they realise.

10. Primitive notions: unascribed phonetic image correlate, and unascribed semantic image correlate (referent)

In order to consider the entities at the edge of the theory – phonetics and phonology on the left, and concrete semantics on the right – and how these fit into the overall theory more

closely, I will now turn to the two most 'primitive' notions of relevance to the theory: *unascribed phonetic image correlate*, and *unascribed semantic image correlate* or referent.

Consider the difference between pointing at a tree and saying 'tree'. In both cases, we can be said to have referred to a tree – in both cases this tree is the referent. In pointing at a tree, however, I have merely identified (picked out) something. I have not ascribed this something to any category. By contrast, in saying 'tree', I have ascribed this referent to the category of trees. I could also, however, have ascribed the same referent to a narrower (hyponymous) category; thus, instead of saying 'tree', I could have said 'oak' (let us take it that the tree in question is an oak). Or I could have ascribed it to a narrower set still. Thus, I could have said 'sessile oak' (let us take it that the tree in question is a sessile oak). Or I could have ascribed it to a wider (hyperonymous/superordinate) category. Alternatively, again, I could have ascribed it to an overlapping category. Thus, I might have said 'hazard' (let us assume that the tree in question is a hazard, because it is rotten, and in danger of falling down onto a busy road; 'tree' and 'hazard' overlap, because some but not all trees are hazards, and some but not all hazards are trees). The above discussion of 'ascription' serves as a starting point. It fails, however, to adequately make the distinction between the use of an arbitrary set-forming criterion and a non-arbitrary set-forming criterion – the former yields a phonetic image (Section 13) or a semantic image / denotable (Section 12), while the latter yields – via the prior establishment of phonetic image and semantic image / denotable – a phonete (Section 14) or a delete/denotatum (Section 16).

A referent then is an irreducibly basic meanable entity without this entity being ascribed to a category. Or, rather, since we are necessarily modelling everything – even the most basic 'things' – when we are doing linguistics, a referent is an irreducibly basic model for a 'unascribed' meanable entity. 'Meanable entity' must be understood to cover not only objects (whether physical or abstract), but also qualities (e.g. "blue"), processes (e.g. "walk"), and relations (e.g. "on") (see Hervey 1979: 28-31; also Mulder and Rastall 2005). A referent is a model for a 'propertiless meanable entity'; all that it involves is its mere existence. 'Referent' would appear to be very similar to a Peircean 'first' – and may, indeed, be exactly the same as a Peircean 'first' (cf. Gorlée, 2009).

11. Primitive notions and set-forming criteria

When we conceptualise a referent (in any way), we ascribe it to – or bring it into a relationship with – a set, or better, with what we may call a *set-forming criterion* (Mulder 1989: 157 refers to this as a 'class-forming criterion'). A 'set-forming criterion' can be defined as 'the intension of the class [set] in question' (Mulder 1989: 157), i.e. it is the conceptualisation by which the referent in question is ascribed to a particular set. 'Set-forming criterion' will be considered in more detail in Section 25. In this section, I will consider how the notion 'set-forming criterion' operates in practice.

Let us symbolise referent as β, let us symbolise the set-forming criterion as a, and let us symbolise 'bring[ing] into a relationship with' as R. A referent brought into a relationship with a set-forming criterion can, on this basis, be symbolised as βRa. We can refer to this 'referent brought into a relationship with a set-forming criterion' or this 'ascribed referent' as a semantic image. Semantic image can also be represented as j. Thus $j = \beta Ra$.
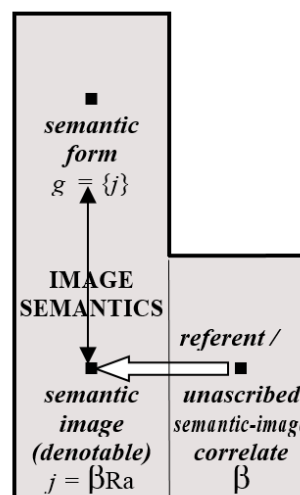
While referent provides a model for a 'propertiless meanable entity', semantic image provides a model for a 'propertied' meanable entity, i.e. it is a meanable entity which is ascribed to (belongs to) a category of meaningful entities. Thus, while a referent (in a particular case) is a model for a tree without being ascribed to the category of tree (or any other category), a semantic image (in a particular case) is a model for a tree which is ascribed to the category of trees.

Because a semantic image is a referent ascribed to a particular category, all the semantic images belonging to the same category can be grouped together (as a set) to provide a generalised semantic model of all semantic images which are regarded as the same (by virtue of having the same ascription) except for their real-world individuality (specificity). This set of semantic images can be termed a semantic form. Semantic form is defined as $\{\beta\}$Ra – i.e. a set of semantic images, each being brought into a relationship with the same set-defining criterion. Semantic form can also be symbolised as g. Thus semantic form can be defined as $\{\beta\}$Ra, or as $\{j\}$. Semantic form thus provides a general model for 'tree', for example, as a meanable notion.

12. General semantics

An alternative term for referent is unascribed semantic-image correlate. We can term the area of enquiry encompassing referent (or unascribed semantic-image correlate), semantic image and semantic form general semantics, and we can represent general semantics as in Figure 8.

Figure 8
General semantics

As will be seen subsequently (Section 16), general semantics provides models which are used for semantic analysis – and in particular, for connecting semantic abstractions to the real world.

13. General phonetics

On the non-semantic side of linguistics, we can produce corresponding models for 'general phonetics', which are used in particular for connecting phonological abstractions to the real world. Here we can start with the notion of an unascribed phonetic-image correlate, which we can symbolise as α. Just as a referent (unascribed semantic-image correlate) is a 'propertiless' model for a meanable entity, so an unascribed phonetic-image correlate is a 'propertiless' model for an individual real-world speech sound (uttered at a particular time and place). All that an unascribed phonetic-image correlate does is to identify this speech sound as existing. (Barry Heselwood has used the term '(auditory) perceptual-object' for what I term here an unascribed phonetic-image correlate; cf. Heselwood 2013: 204.)

We can, however, ascribe an unascribed phonetic-image correlate to a particular category, to produce a phonetic image, which we can symbolise as i. Just as we can symbolise this category in relation to referent (unascribed semantic-image correlate) as a, so we can use this same a in relation to unascribed phonetic-image correlate, and we can also use R to symbolise 'bringing into a relationship with' as we did with referent (unascribed semantic-image correlate). Accordingly, phonetic image can be defined as $i = \alpha Ra$.

Just as a single referent (unascribed semantic-image correlate) can be categorised in terms of different semantic images (e.g. 'tree', 'oak', 'sessile oak', 'thing', 'hazard), so can a single unascribed phonetic-image correlate be categorised in terms of different phonetic images. Thus, given an appropriate unascribed phonetic-image correlate, we could categorise this as [p], where [p] is taken to mean any kind of 'p' sound (including unaspirated, aspirated, etc.). Alternatively (assuming this is also correct, or appropriate), we could categorise the same unascribed phonetic-image correlate as [p^h], i.e. an aspirated 'p', i.e. as a member of a smaller category, properly included within [p]. We could, again, ascribe it to a larger category, encompassing 'p' sounds, such as [*consonant*] (where [*consonant*] designates 'consonant'; all 'p's are also consonants). Or we could ascribe this same unascribed phonetic-image correlate to a category which overlaps with [p], e.g. [*aspirated*] (some 'p's are aspirated, while others are not). This parallels the different ways in which a referent (unascribed semantic-image correlate) can also be variously categorised.
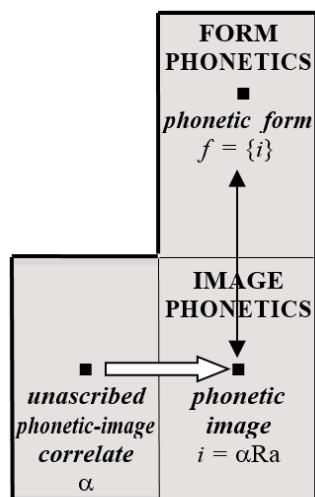
Just as semantic image can be symbolised as j, and defined as $j = \beta Ra$, so phonetic image can be symbolised as i, and defined as $i = \alpha Ra$ (where a is the set-forming criterion). Phonetic image provides a 'propertied' model for an individual speech-sound, occurring at a particular time and place, and thus gives us a basic model which we can use to describe the phonetic data.

Just as we can generalise from semantic image to the entire set of semantic images which are deemed identical apart from their time-space individuality (specificity), giving a semantic form, so we can generalise from phonetic image to the entire set of phonetic images which are deemed identical apart from their time-space individuality (specificity). This gives us a phonetic form. Just as semantic form can be symbolised as g and defined as $g = \{\beta\}Ra$, so phonetic form can be symbolised as f, and defined as $\{\alpha\}Ra$, or as $\{i\}$. Semantic form provides the basic general model which allows us to describe speech sounds not simply as individual occurrences, but as more abstract generalised notions – e.g. the speech sound [p^h], as a general notion, rather than simply a speech sound [p^h] which was uttered in a particular place at a particular time.

We can term the area of enquiry encompassing unascribed phonetic-image correlate, phonetic image and phonetic form *general phonetics*, and we can represent general phonetics as in Figure 9.

Figure 9
General phonetics

Just like the relationship between an entity in phonology (e.g. a phoneme) and an allomorph (Section 9), or that between an entity in abstract semantics and an alloseme (Section 9), the relationship between an unascribed phonetic-image correlate and a phonetic image involves 'transformation' (the 'carrying across' of 'form'), as does the relationship between an unascribed semantic-image correlate /reference and a semantic image /denotable, as indicated by the 'arrows of transformation' (⇦) in figures 8 and 9. Just as the 'vertically related' entities imply one another in Figure 7, so semantic image / denotable and semantic form in Figure 8, and phonetic image and phonetic form in Figure 9 imply one another (↔).
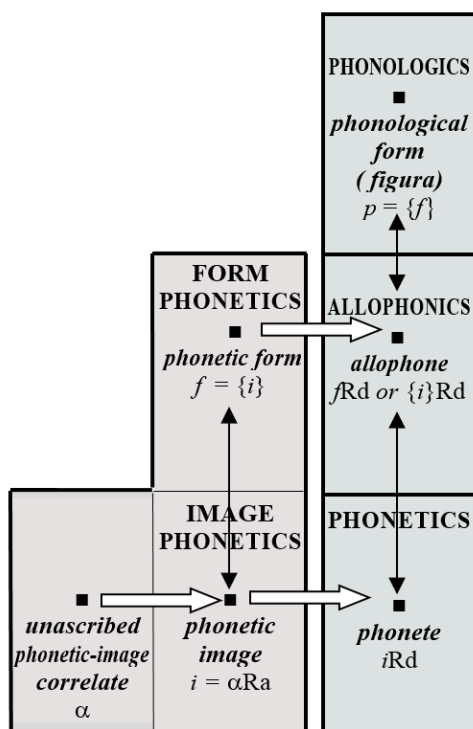
It might be asked why we should provide models of such basicness (primitiveness) as unascribed phonetic-image correlate and unascribed semantic-image correlate (referent). This question is partly answered in practice in Section 14 (in relation to unascribed phonetic-image correlate) and Section 16 (in relation to unascribed semantic-image correlate / referent; for this latter, cf. in particular the example in Section 16 'The surgeon is the goalkeeper'). There is, however, a more fundamental reason. In constructing any model or theory – in this case a theory of linguistics – we should aim to be maximally transparent at all points. This implies building notions up incrementally, starting from the most basic possible notions. In the case of the current theory, unascribed phonetic-image correlate and unascribed semantic-image correlate (referent) are the most basic possible notions, from which all other notions are coherently developed.

14. Relationship between general phonetics and phonology

We can now move on to think in more detail about the relationship between (general) phonetics and phonology. Consider Figure 10 (next page).

The right-hand column in Figure 10 can be compared to Figure 7, which distinguishes in its left-hand column between phonetics and phonology. 'Phonologics' in Figure 10 can equated with 'phonology' in Figure 7, and 'phonological form' / 'figura' in Figure 10 can be equated with 'phoneme, etc.' in Figure 7 (the reason for the differences in terminology will be explained later; Section 24). The vertical entities in Figure 10 are all related by mutual implication, while the horizontal ones are related by transformation.

Figure 10

I want now to consider what constitutes a phonological entity, i.e. phonological form (roughly) in Figure 10. A traditional view – and I believe the most coherent view – of what constitutes a phonological entity is that it is an entity which can make a difference to grammatical identity (cf. Figure 7) – i.e. a difference to the identity of a signum / grammatical entity (morpheme, word, phrase, etc.). Thus, the distinction between /ɪ/ and /i/ is a phonological one in English. /ɪ/ and /i/ are different phonemes (for current purposes, I will assume that the distinction between /ɪ/ and /i/ in English is simply one of two contrasting phonemes), because they can be shown to make a difference to grammatical identity, e.g. in distinguishing between 'sin' and 'seen' (notwithstanding that they don't always make a grammatical identity difference; cf. 'bin' and 'been', Section 9). Similarly, in the case of 'garage' in British English (cf. Section 18), we can show that /ˈgærɑːʒ/ and /ˈgærɪdʒ/ are in fact phonologically different, i.e. that /ɑː/ and /ɪ/ are phonologically different, because the 'ɑː' vs. 'ɪ' distinction elsewhere makes a difference to signum (word) identity, e.g. in 'Raj' vs. 'ridge', or 'part' vs. 'pit'.

15. Grammatical difference and phonological identity

There are two issues which arise here. The first is how we know what are different grammatical entities (in this case, how do we know, for instance, that 'sin' and 'scene' are different grammatical entities); I will consider this in Section 18. The second issue which arises is more specifically relevant at this point is: why should it be the case that an ability to make a difference to grammatical identity should demonstrate phonological identity?

The answer to this goes to the heart of functionalist thinking – as the term 'functional', or 'functionalist' is understood in axiomatic functionalism. The basic theoretical statement of extended axiomatic functionalism (also of Mulder and Hervey's 'standard axiomatic functionalism') is Axiom A: *All features in semiotic sets are functional* (Dickins 2009; also Mulder and Hervey 2009). This is then defined by the first definition, Def. 1a: *'Functional' for 'separately relevant to the purport of the whole of which it is a part'* (Dickins 2009; also Mulder and Hervey 2009). We also need to think of languages as not only being systems (systematic), but as consisting of interrelated (interlocking) systems. At the apex of this system in the signum ontology is the signum (signa being grammatical entities, in the case of natural language); all the other systemic entities – in phonology (Figure 7, Figure 10) and (abstract) semantics (Figure 7) – are ultimately dependent on signa. If a putative entity in phonology or (abstract) semantics does not make a difference somewhere in the overall system in terms of signum identity (grammatical identity), this putative phonological or (abstract) semantic entity is not in fact an entity at all.

Accordingly, if a sound difference – e.g. the difference in English between light 'l' (occurring in onset position in the syllable) and dark 'l' (occurring in coda position in the syllable) – never makes a difference to grammatical identity (e.g. word identity) anywhere in the system of English, this sound difference is not a phonological difference – i.e. we do not have two phonological entities (phonemes, in this case), but merely one, with 'variants' (i.e. allophones, to be discussed below).

Another way of dealing with this issue is to see what the alternative would be. We will, accordingly, consider what the results would be if we were to allow sound differences which do not somewhere in the overall system (e.g. of English) make a difference to signum identity (grammatical identity) to be regarded as instances of phonological differences. I will take again the example of light 'l' and dark 'l' in English.

It might be thought that this would result in a strictly limited addition to the phoneme inventory of English: instead of having one /l/ phoneme English (realised as dark 'l' or light 'l' according to its position, in the onset or the coda of the syllable), we would have two 'l' phonemes: /ɫ/ (realised as dark 'l', occurring in coda position), and /l/ (realised as light 'l', occurring in onset position). This conclusion, however, is wrong; and to understand why it is wrong, it is useful to return to Figure 10.

Figure 10 introduces a notion not found in earlier comparable figures – and particularly Figure 7: that of the allophone. As discussed earlier, to arrive at phonetic image *i*, from unascribed phonetic-image correlate α, one needs to bring unascribed phonetic-image correlate into a relationship R with a set-forming criterion a. Thus $i = \alpha Ra$ (figures 9 and 10). A phonetic image is just a model for a speech sound (uttered at a particular time and place). It does not bear any relationship to a phonological entity. Thus, if I utter the sound [pʰ] at 11.43 am on June 25, 2014 in room 4.05 in the Michael Sadler Building, University of Leeds,

England, and I simply note this as a specific, individual speech sound, this – or rather the model for this – is a phonetic image.

If, however, I categorise this individual speech sound [pʰ] as being a realisation of the phonological entity (phoneme) /p/ in English (e.g. occurring in the word 'pit'), this is no longer just a phonetic image, but what is termed in extended axiomatic functionalism a phonete.

Like a phonetic image, a phonete still has time-space individuality (specificity), but it also has something more – the bringing into a relationship with a phonological identity (in the case of [pʰ] discussed immediately above, this phonological identity is the English phoneme /p/). Just as a phonetic image is defined as $i = \alpha Ra$ (unascribed phonetic-image correlate brought into a relationship R with a set-forming criterion a), so a phonete is defined as a phonetic image i (or αRa) brought into a relationship R with a phonological entity/identity (in the case English /p/, this is a phoneme) – phonological entity/identity being symbolised as d. Thus, a phonete is defined as iRd.

It was argued above that one can have sets of phonetic images which are identical except for their time-space individuality (specificity): these are phonetic forms (Figure 9), phonetic form being symbolised as f and defined as $f=\{i\}$. One can, correspondingly, have sets of phonetes which are identical except for their time-space individuality (specificity). These sets of phonetes are allophones. As a set of phonetes, an allophone can be defined as $\{i\}$Rd (i being a phonetic image and iRd being the formula for a phonete, as already noted). Allophone can also, equivalently, be considered as a phonetic form f, brought into a relationship with a phonological entity/identity, i.e. as as fRd.

Figure 10 thus introduces a further level which is missing in Figure 7 – the level of allophonics, which stands between that of phonetics (used technically in extended axiomatic functionalism to mean the level of phonetes) and that of phonology – or what is technically termed phonologics in extended axiomatic functionalism, for reasons which will be explained in Section 24.

We can now return to an issue raised earlier in this section: why sound differences which do not anywhere in the overall system (e.g. of English) make a difference to signum identity (grammatical identity) cannot coherently be regarded as instances of phonological differences. The example given earlier was that of light 'l' and dark 'l' in English. I noted that it might be concluded that this would result in a strictly limited addition to the phoneme inventory of English: instead of having one /l/ phoneme English (realised as dark 'l' or light 'l' according to its position, in the onset or the coda of the syllable), we would have two 'l' phonemes: /ɫ/ (realised as dark 'l', occurring in coda position), and /l/ (realised as light 'l', occurring in onset position). I will here consider in more detail why this conclusion is wrong.

The problem with this analysis is that it is based on the false premise that English intrinsically only has two 'l' sounds – dark 'l' [ɫ], and light 'l' [l]. In fact, as seen, we can categorise sounds in numerous – in fact innumerable – ways. An example given earlier was that of an English sound, which we might categorise as [p] (taken to be indeterminately aspirated or unaspirated) or [pʰ], or *consonant*] or even [*aspirated*]. We can similarly say, if we like, that English has one 'l' sound (indeterminately dark or light), or two 'l' sounds, dark 'l' [ɫ], and light 'l' [l]. However, we might also say that English has more 'l' sounds than this – vastly more if we like – on the basis, for example, of degree of darkness. Thus, the final 'l' of 'pill', 'pall' and 'pull' is in all cases dark. However, the 'l' of 'pall' is darker than that of 'pill',

and the 'l' of 'pull' is darker than that of 'pall' (as Janet Watson has pointed out to me). The three 'l's could thus be recognised as three distinct phonetic images – and thus by extension three distinct allophones in English – under a fairly delicate phonetic analysis. Detailed phonetic research suggests that there is no reason to regard dark [ɫ] and light [l] as categorially distinct phonetic entities in English, the general darkness or lightness of the 'l' varying non-discretely and predictably as a factor of its specific phonetic environment (Sproat and Fujimura 1993; cf. also Dickins 1998: 422).

The analysis of phonetic images – and, thus, by extension phonetic forms, phonetes and allophones – is thus ultimately 'arbitrary', using the term 'arbitrary' in the specifically Saussurean sense, i.e. that it could (and can) be done differently (Saussure [1916] 1983: 67-68). This is not to claim that phonetic analysis is random: it has to be not only accurate (within reasonable tolerances), but also appropriate to the task in hand. Thus, if we are interested in capturing fine phonetic differences, we have to employ a phonetic analysis which recognises a large number of different categories.

The crucial notion in phonetic analysis is what I earlier termed the 'set-forming criterion', notated as a in extended axiomatic functionalism. In establishing phonetic images (also, by extension, phonetic forms, phonetes and allophones), this set-forming criterion, a, is 'arbitrary'.

There is, however, another set-forming criterion, d, which is used for establishing phonetes, allophones, and phonological entities (phonemes), etc. This set-forming criterion is non-arbitrary, since it employs a consistent principle, which has already been discussed: namely, that a putative phonological entity (phoneme, etc.) really is a phonological entity if and only if it 'yields' a signum (grammatical) difference somewhere in the overall system of the language. This principle allows us to say that the difference between dark 'l' and light 'l' in English is not phonological (no English grammatical entities – words, etc. – are distinguished by this difference), but that the difference between 'p' and 'b' is phonological in English (many English grammatical entities – words, etc. – are distinguished by this difference, e.g. 'bin' and 'pin').
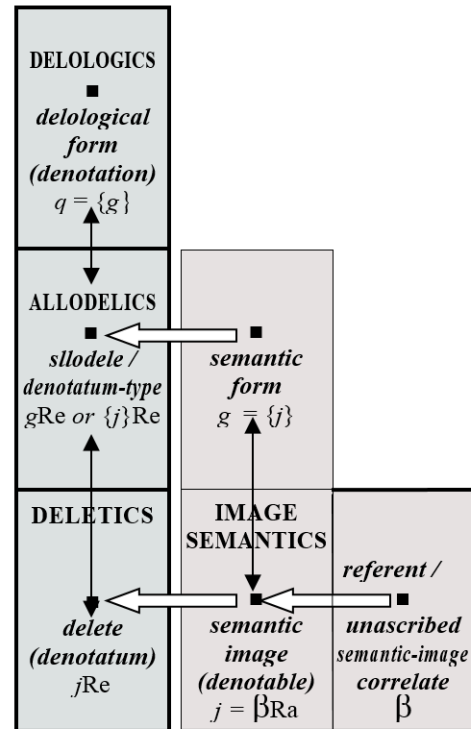
It should be noted that it is the *potential* for a sound difference to make a difference to grammatical identity (signum identity) which is the criterion for phonological difference. This does not necessarily mean that such a sound difference will make a difference in every case. Phonological differences do not make a difference to grammatical identity (signum identity) in the case of allomorphs, such as /ˈgærɑːʒ/ and /ˈgærɪdʒ/ in British English (Section 9), involving the phonological difference /ɑː/ vs. /ɪ/. The second point is that sound differences which 'express' phonological identity do not in practice occur at all possible points in a language.

Fundamental linguistic identity in extended axiomatic functionalism relies on the deployment of a non-arbitrary set-forming criterion – whether in phonology, grammar (signum-level), or (abstract) semantics – a criterion known technically as *distinctive function*. Distinctive function is striking because it gives rise to the minimum number of entities needed to describe a system: only entities which are needed are established as existing. Thus, we do not need more than one /l/ phoneme to describe the phonological system of English, but we do need both a /p/ and a /b/. The employment of distinctive function as a set-forming criterion is thus intended to allow for the simplest possible analysis of the given language.

16. Relationship between general semantics and delology

Having considered general phonetics (covering the entities unascribed phonetic-image correlate, phonetic image, and phonetic form) as well as phonologics/phonology (covering the entities phonological entity/form, allophone and phonete) in Figure 10, I turn now to the corresponding notions in relation to semantics, as represented in Figure 11.

Figure 11

The left-hand column in Figure 11 can be compared to Figure 7, which distinguishes in its right-hand column between abstract semantics and concrete semantics. 'Delologics' in Figure 11 can be equated with 'abstract semantics' in Figure 7, while 'deletics' (Figure 11) can be equated with 'concrete semantics' (Figure 7). The vertical entities in Figure 11 are all related by mutual implication, while the horizontal ones are related by transformation.

Just as a phonete is a phonetic image i brought into a relationship R with a phonological distinctive function d – i.e iRd (Figure 10), so a delete/denotatum is a semantic image / denotable j brought into a relationship R with a delological distinctive function e, i.e. jRe (Figure 11). Delete/denotatum thus provides a model for an individual unascribed semantic-image correlate / referent β, which is both ascribed to a general category a, and considered as a realisation (in fact an individual instantiation) of a delological form / denotation (i.e. an 'abstract semantic' entity), i.e. further ascribed to a semantic distinctive function category e.

To give a practical example, we can think of an unascribed semantic-image correlate / referent (a 'propertiless' model for an entity in the 'world'), i.e. a β, that we can (reasonably) ascribe to the category, i.e. R, of 'civil engineer', i.e. an a. We thus have a semantic image / denotable, i.e. a j, 'civil engineer'. We can, however, further relate this semantic image / denotable to the meaningful aspect of something said, for example the delological ('abstract

semantic') entity 'engineer' (= 'person who makes engines, structures, or systems': Oxford English Dictionary Online), giving a delete, i.e. jRe, 'civil engineer' instantiating the delological form / denotation 'engineer'.

We can then generalise away from an individual instance of 'civil engineer', a delete/denotatum instantiating the delological form / denotation 'engineer', to give an allodele/denotatum-type 'civil engineer' (paralleling allophone, in Figure 10). Thus, we can, for the sake of argument, conceive of there being three types of engineer 'civil engineer', 'electrical engineer', and 'chemical engineer'. Just as [ɫ] and [l] can be analysed as allophones of the phoneme /l/ in English, so [*civil engineer*], [*electrical engineer*] and [*chemical engineer*] can be analysed as allodeles/denotatum-types of the delological form / denotation /*engineer*/ in English. (I have used square brackets to mark allodeles/denotatum-types, paralleling the use of square brackets to mark allophones, and slant brackets to mark delological forms / denotations (thus /*engineer*/) paralleling the use of slant brackets to mark phonological forms/entities.)

Just as an allophone can be defined as a set of phonetic images, i.e. $\{i\}$, phonetic image being i, so an allodele/denotatum-type can be defined as a set of semantic images / denotables, $\{j\}$, semantic image / denotable being j. Alternatively, just as an allophone can also be defined as a phonetic form f, brought into a relationship R with a phonological set-forming criterion d, i.e. allophone can be defined as fRd, so allodele/denotatum type can be defined as a semantic form g, brought into a relationship with a delological ('abstract semantic') set-defining criterion e, i.e. allodele/denotatum-type can be defined as gRe.

It is useful here to consider why the *referent+ascription* model (*unascribed semantic-image correlate+set-forming-criterion* model) is particularly useful in describing 'meanable entities'. Consider the following:

(1)   The surgeon is the goalkeeper.

In 1 (which might be said in the context of a discussion of the members of a hospital-staff football team), the referent (unascribed semantic-image correlate) of both 'surgeon' and 'goalkeeper' is the same – i.e. these two words refer to the same 'entity'. This 'entity' might be correctly referred to in any number of other ways: 'man', 'employee', 'father', 'drunkard', 'genius' (assuming these all to be reasonable). 'Surgeon' and 'goalkeeper' in 'The surgeon is the goalkeeper' do not therefore mean different (have different meanings) on the basis of their referents / unascribed semantic-image correlates (or rather single referent / unascribed semantic-image correlate). Rather, they mean different because they ascribe the 'entity' in question to different types, i.e. sets: in the first case to the set of surgeons, and in the second to the set of goalkeepers. For more detailed discussion of the notions referent / unascribed semantic-image correlate and ascription, see Dickins (1998: 105–117 – though the notions, as discussed there, are less well integrated into the overall model of extended axiomatic functionalism than they are in this article). The *referent+ascription* model thus separates out two quite distinct aspects of meaning: what is referred to, and the way in which it is being referred to.

Just as a phonological entity, i.e. phonological form (roughly), p in Figure 10 is a set of allophones, i.e. $p=\{f\}$Rd, so an 'abstract semantic' entity – or what is termed in Figure 11 a 'delological form' / 'denotation' – q is a set of allodeles/denotatum-types, i.e. $q=\{g\}$Re.

Thus, taking the delological form / denotation /*engineer*/ as an example, we might deem this to have three allodeles/denotatum-types [*civil engineer*], [*electrical engineer*] and [*chemical engineer*]. The number of allodeles/denotatum-types a delological form / denotation is deemed to have is a function of the number of categories, a, which we establish for semantic images and, by extension, semantic forms – just as the number of allophones a phonological form/entity is deemed to have is a function of the number of categories a we establish for phonetic images and, by extension, phonetic forms (as discussed above). The decision about how many categories to establish for phonetic/semantic images and, by extension, phonetic/semantic forms is ultimately arbitrary (though it needs also to be appropriate to the degree of precision which we need, or want, for our analysis).

17. Grammatical difference and delological identity

I argued above (Section 15) that the criterion of existence for a phonological entity (phoneme, etc.) is whether somewhere in the system it reflects a difference in signum/grammatical identity. It might appear that the same criterion can be adopted for establishing delological/denotational identity. Unfortunately, this is not the case.

Thus, it might appear that if the meaning-distinction between 'civil engineer', 'electrical engineer' and 'chemical engineer' somewhere in the system makes a difference to signum/grammatical identity, then the word (signum) 'engineer' (= 'person who makes engines, structures, or systems': Oxford English Dictionary Online) corresponds to three distinct delological/denotational forms/entities 'civil engineer', 'electrical engineer' and 'chemical engineer', i.e. there are three separate, contrasting senses (delological/denotative forms/entities) involved in relation to 'engineer'. That this is not the case seems evident from the fact that in describing a person as an 'engineer', we may be simultaneously saying that he/she is both a civil and an electrical engineer (or a civil and a chemical engineer, or a civil and an electrical and a chemical engineer, etc.) without any of the semantic manipulation (simultaneous double-meaning) involved in what is known as zeugma. (For more discussion of this issue, see Dickins 2014b; Section 4). That is to say, 'engineer' (= 'person who makes engines, structures, or systems') involves only one sense (delological form / denotation).

This difference between phonology and delology in relation to signum/grammatical identity goes back to a fundamental difference between sound (or equivalent written marks in writing, etc.) and meaning. Sounds (or equivalents in writing) are immediate in relation to language: speech, in an obvious sense, consists directly of sounds. Meaning (i.e. what is meant), by contrast, is 'mediate': in an obvious sense it is not part of language, but something which language 'points to'.

Consider the following example, of speech sounds: 1. [p] i.e., in this context, any kind of 'p' whether aspirated or unaspirated; 2. [pʰ] i.e. aspirated 'p'; and 3. [p⁼] i.e. unaspirated [p]. The set of all examples of [p] (i.e. 'p', whether aspirated or not) properly includes the set of all examples of [pʰ] (aspirated 'p') and the set of all examples of [p⁼] (unaspirated 'p'). It is – normally at least – impossible, for practical reasons of the 'immediacy' of phonetic realisations for a language to have a phoneme whose realisations exactly properly include those

of two other phonemes where these occur in the same contexts.[4] In this light, consider the relevant practical consequences of positing a phoneme /þ/ in English whose realisations exactly covered (properly included) the realisations of both /b/and /p/. Take now the case of a phonetic image [p], which we wished to analyse in relation to phonological identity – i.e. as a phonete. We would never know whether a [p] was in fact the realisation of the putative phoneme /þ/ or the phoneme /p/. Both analyses would seem to be equally valid.

Of course, the fundamental problem with this example is that the phoneme /þ/ should never have been posited in the first place. It is unnecessary for the description of English – and should not therefore be proposed on the grounds of making our analysis of English more complex than it needs to be. However, this example also illustrates another general point: that 'super-phonemes' of the putative English /þ/ type both introduce an unnecessary analytical complication, and are impossible to operate with coherently.[5]

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[4] Cf. however, the archiphoneme (e.g. Dickins 2007: 14–15; Dickins 2009, Def. 7a[4]), which 'corresponds' to two (or more) more basic phonemes, but does not occur in the same contexts as these phonemes; an archiphoneme may have realisations which exactly properly include its two 'constituent' phonemes.

[5] There is, however, one type of situation where a 'super-phoneme' analysis might be not only be possible but unavoidable. Let us start with a real situation which occurs in American English. In most dialects of American English, /d/ and /t/ are normally both realised intervocalically with a medial flap (or *median tap* in the IPA system) [ɾ]. Thus pairs like 'ladder' and 'latter' are typically pronounced identically. In careful speech, however, the former will have a [d] and the latter a [t] (as noted in Port and O'Dell 1985: 465; cf. discussion in Dickins 2007: 15–16). The phonological distinction between /d/ and /t/ in this intervocalic context in English is demonstrated by the fact that there are realisations (pronunciations) of 'ladder' (those with an intervocalic [d]) which cannot also be realisations of 'latter', and realisations (pronunciations) of 'latter' (those with an intervocalic [t]) which cannot also be realisations of 'ladder'. Where there is a medial [ɾ], this may be a realisation of either /d/ or /t/.

Consider now, however, a situation in which there was a third American English word (in addition to 'ladder' and 'latter'). We can represent this third imaginary word graphically as 'laðđer' (and assign it a sense, if we like, e.g. 'baby vampire bat'). Let us imagine that the phonological entity represented by 'đđ' in the middle of this word can be realised as either [d], [t] or [ɾ]. We might initially try to analyse 'laðđer' as having two allomorphs (i.e. two variant phonological forms; Section 9), one with an intervocalic /d/ and the other with an intervocalic /t/. This analysis would, however, fall down when we came to consider realisations of 'laðđer' having intervocalic [ɾ] (which would, in fact, be the great majority of its realisations given the dominance of [ɾ] as the realisation of both intervocalic /d/ and intervocalic /t/). Where the phonological entity 'đ' in 'laðđer' was realised as [ɾ], it would be impossible to say whether the phoneme which it realised was /d/ or /t/– whether we deemed the phoneme in question to be /d/ or /t/ would be entirely arbitrary.

Arbitrary analyses are unacceptable in a scientific approach (which extended axiomatic functionalism seeks to be) and are therefore to be eliminated if at all possible (where they cannot be eliminated, this shows that the overall approach, i.e. theory, is not scientific in these respects). Accordingly, we need another, non-arbitrary, analysis. This can be achieved by analysing the 'đ' in 'laðđer' as a single super-phoneme, which subsumes both /d/ and /t/. Thus, if for the sake of argument, we analyse /d/ as comprising the distinctive features (also known as phonids in extended axiomatic functionalism) /alveolar, stop, lenis/, and /t/ as comprising the distinctive features /alveolar, stop, fortis/, we can analyse 'đ' as a third phoneme /đ/ comprising only the distinctive features /alveolar, stop/ and having the realisations (allophones) [d], [t] and [ɾ] – i.e. the full range of realisations of intervocalic /d/ and /t/. This 'super-phoneme' would be like an archiphoneme (cf. Dickins 2007: 14-15, for a discussion of the archiphoneme in extended axiomatic functionalism) in that it involves 'annulment' of an opposition (in the case of the /đ/ in 'laðđer', 'annulment' of the opposition 'fortis' vs. 'lenis'). However, the 'super-phoneme' would also be different from an archiphoneme in that the archiphoneme only occurs in contexts where the two (or more) basic phonemes which 'constitute' it do not occur, whereas the

The 'mediacy' of semantics, by contrast, means that the same principles do not apply. Take the example of 'sibling', 'brother' and 'sister' (in the basic 'family-relation' senses in all cases). Let us take it that the delological form / denotation of 'sibling' exactly properly includes those of both 'brother' and 'sister'. By analogy with the situation in phonology and its realisations, this would lead us to say that 'sibling' corresponds to (has) two contrasting senses – i.e. relates to two delological forms / denotations: 1. 'brother'; and 2. 'sister'. This, however, is not right: 'sibling' does not correspond to two contrasting senses. Rather it corresponds to a single sense, covering the full range of both 'brother' and 'sister'. Thus in delology, unlike in phonology, there are cases (in fact many cases) in which one delological form/entity / denotation properly includes another.

This leads to a more fundamental question. If the criterion of 'making a difference to signum / grammatical identity somewhere in the system' which applies to phonology does not apply to delology, how do we determine in delology what are separate delological entities / denotations? The easiest way to approach this question is to consider a single word (as a signum / grammatical entity) in relation to putatively distinct delological forms / denotations. Our starting point is the same as in phonology (cf. the discussion of English dark 'l' and light 'l' as putatively different phonemes, above): that we do not establish entities unless we need them, on the basis that the fewer entities we establish, the simpler our analysis, simpler analyses being preferred in all cases (all other things being equal) to more complex ones. This principle also operates, of course, in establishing signa / grammatical entities.

The most basic criterion for establishing (i.e. being required to establish) delological difference is contrastivity in the same context. To take a practical example, consider the word / signum 'do' in English. As discussed in Dickins (1998: 221–222), 'do' in 'I want to do my hair' can be used to mean, among other things, 'I want to wash my hair', or 'I want to dry my hair', or 'I want to comb my hair'. Does this mean that 'do' corresponds to (has) three distinct delological forms / denotations? The answer is 'no', for the principle reason that there is no contrastivity between the meanings of 'do' – 'wash', 'dry' and 'comb'. This is clear from the fact that 'I want to do my hair' could mean simultaneously, 'I want to wash and dry my hair', 'I want to wash, dry, and comb my hair', or any other combination involving these three. It could equally cover many other things, and combinations of other things.

By contrast the signum (word) 'garage' in the meanings 1. "Building, either private or public, intended for the storage and shelter of motor vehicles while not in use"; and 2. "Commercial establishment that sells petrol, oil, and similar […]", does seem to illustrate contrastivity in the same – or at least a very close – context. Thus, an utterance such as "The council banned him from using his garage as a garage", i.e. *the council banned him from using his building […] intended for the storage and shelter of motor vehicles while not in use as a commercial establishment that sells petrol, oil, and similar products* seems a reasonable utterance in a way that "I did [i.e. combed] my hair, but I didn't do [i.e. wash] it" does not. Thus, it seems reasonable to say that the senses of garage 1. "Building, either private or public, intended for the storage and shelter of motor vehicles while not in use"; and 2. "Commercial establishment that sells petrol, oil, and similar products […]" are allosemes (cf. Section 8).

'superphoneme' would occur in the same context in which the two (or more) basic phonemes which 'constitute' it also occur.

Whether or not 'superphonemes' in fact occur in natural language is a matter for empirical investigation. The point being made here is that logically they could occur.

The question of what constitute different senses (delological forms / denotations) is, in fact, notoriously tricky. Cruse (1986: 58–72) is particularly good on the issue. I have tried to address some of the more involved problems from an extended axiomatic-functionalist perspective in Dickins (1998: 198–225).

18. Determining signum identity and difference

As has been seen (Section 9), extended axiomatic-functionalism allows for both allomorphy (one signum / grammatical entity, more than one phonological form) and allosemy (polysemy) (one signum / grammatical entity, more than one delological form / denotation). Thus, 'garage' in British has the allomorphs /gærɑːʒ/ and /ˈgærɪdʒ/, and the allosemes (amongst others): 1. "Building, either private or public, intended for the storage and shelter of motor vehicles while not in use"; and 2. "Commercial establishment that sells petrol, oil, and similar products and freq. also undertakes the repair and servicing of motor vehicles". As the example of 'garage' illustrates a single signum (in this case, word) may have both allomorphs and allosemes.

Conversely, identity of phonological form or delological form /denotation is not a guarantor of shared signum identity. Thus (as discussed in Section 9), /bɪn/ = 'receptacle' and /bɪn/ = past participle of verb 'to be' two different signa (they are homomorphs), while the abstract semantic entity (meaning, sense), CH_2O (as a chemical formula) realises the signa (grammatical entities) 'methanal' and 'formaldehyde'; methanal' and 'formaldehyde' are homosemes.

Allomorphy, allosemy (polysemy), homomorphy and homosemy are all intuitively sensible notions: not only do speakers regard 'garage' as one word regardless of how it is pronounced or what it means. They also regard 'bin' and 'been' as different words even when they are both pronounced /bɪn/, and 'methanal' and 'formaldehyde' as different words, even though they both share the same sense.
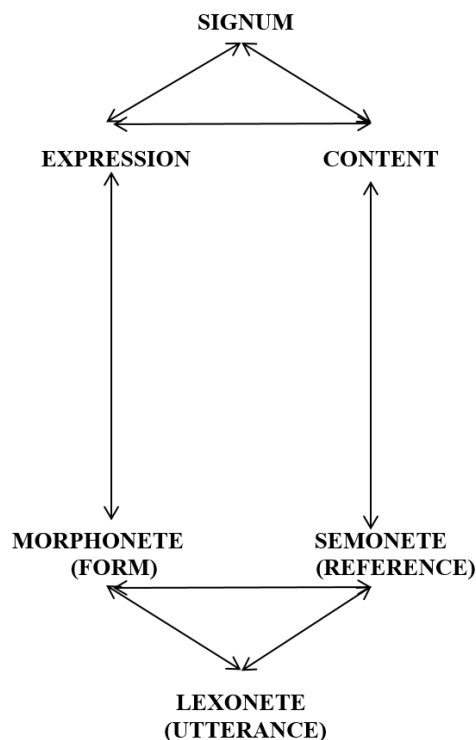
Analytical problems occur, however, in drawing the boundary between allosemy (polysemy) and homomorphy on the one hand, and between allomorphy and homosemy, particularly where there is phonological or delological (denotational) identity between two forms. Consider the following case of phonological identity. How can we be sure whether *crane*, and the associated meanings (1) large long-necked, long-legged wading bird of the family Gruidae, and (2) a device for lifting and moving heavy objects (definitions from Collins English Dictionary) involves two senses of one word (signum), i.e. allosemy (polysemy), or two distinct words (signa) which have the same phonological form (homomorphy)? Similarly, when there are two phonologically distinct – but similar – forms sharing an identical sense (delological form /denotation) how can we be sure whether we have a single signum (allomorphy), or two signa (homosemy)? I will not pursue these issues here. I have, however, discussed them at length in Dickins (1998: 195–198, 247–151, and elsewhere), where I argue that: 1. Allowing allomorphy and allosemy (polysemy) – also homomorphy and homosemy – introduces a non-scientific element into extended axiomatic functionalism; 2. However, not to accept them would yield a theory which was not only grossly counter-intuitive in respect of language-users' views of language, but would also run counter to the 'everyday metalanguage' which we use to describe language, and which is therefore, also, something

which a complete linguistic analysis would need to account for (Dickins 1998: 197). Accordingly, while eliminating allomorphy and allosemy (polysemy) – also homomorphy and homosemy – would apparently render the theory more scientific, this would be at an unacceptable cost in terms of its overall adequacy in allowing for acceptable descriptions of languages.

19. Lexonete (utterance) as biunity of morphonete (form) and semonete (reference)

In Figure 5, I presented a signum as a biunity of expression and content, while in Figure 6 and Figure 7, I presented the notion of utterance. Paralleling the signum, an utterance (in this technical sense) – also termed in extended axiomatic-functionalism a lexonete – can be presented as a biunity of a morphonete (also termed a *form*) and a semonete (also termed a *reference*), as in Figure 12.

Figure 12
Signum as biunity of expression and content, and lexonete (utterance) as biunity of morphonete and semonete
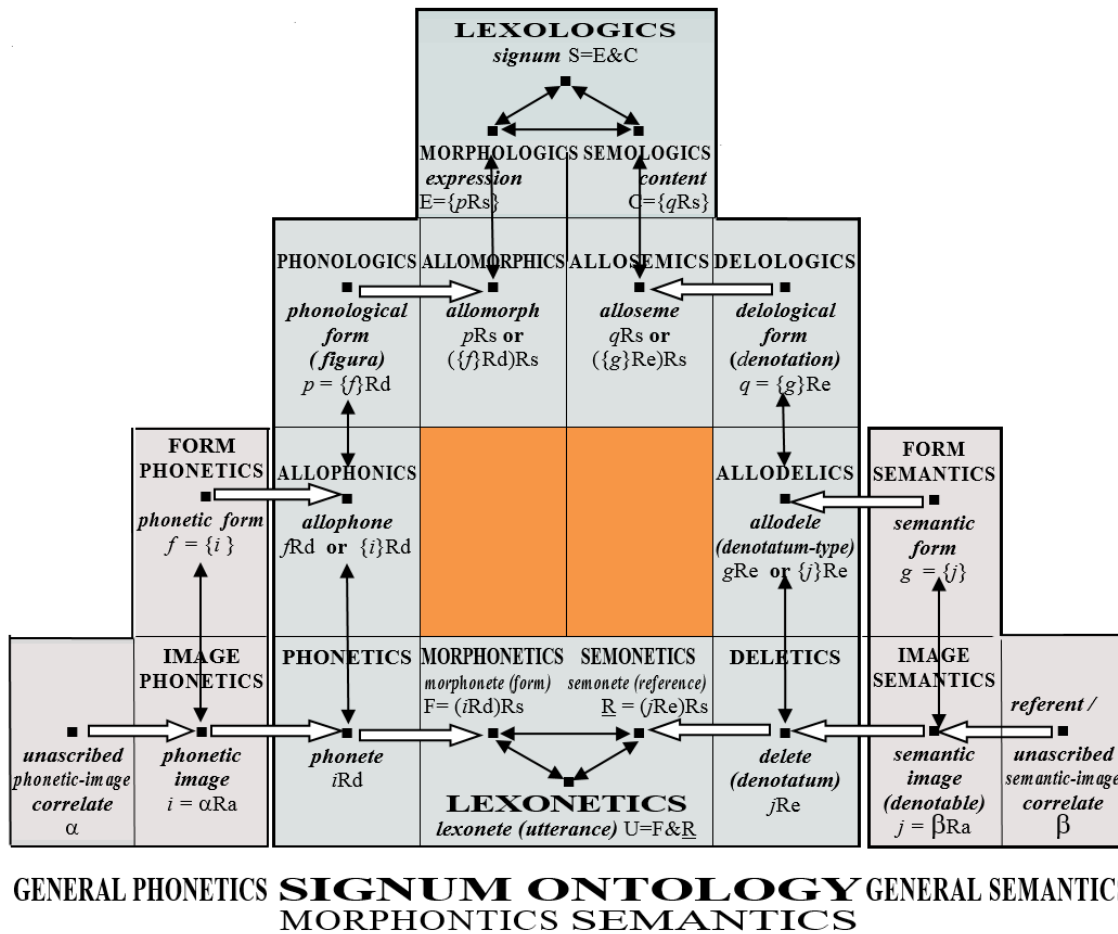

As in previous diagrams, the double-headed arrows indicate mutual implication. Thus not only do morphonete/form and expression imply one another, as do semonete/reference and content (and in fact lexonete/utterance and signum, though this is not shown on the figure), but so do all the entities in the lexonete/utterance–morphonete/form–semonete/reference triangle, and all the entities in the signum-expression-content triangle. I will discuss in more

detail in the next section the notions lexonete (utterance), morphonete (form), and semonete (utterance).

20. Towards a complete signum ontology

Consider Figure 13. It is largely a combination of figures which have been previously presented in this paper. Thus general phonetics was presented in Figure 9 and general semantics in Figure 8. The cells covering the areas of enquiry of phonologics, allophonics and phonetics are added to general phonetics in Figure 10, and the cells covering the areas of enquiry of delologics, allodelics and deletics are added to general semantics in Figure 11. The cell covering signum, expression and content is presented in Figure 5, and the cell covering lexonete (utterance), morphonete (form), and semonete (reference) is added in Figure 12. Cells covering allomorph and alloseme are presented in a simplified 'precursor' version of the theory in Figure 7.

Figure 13
Virtually complete signum ontology

Here, I will look in more detail at the notions found in the central cells of Figure 13, i.e. giving the area(s) of enquiry first identified in each cell first, followed by the names of no-

tions relating to these areas of enquiry in brackets: (i) lexologics, morphologics and semologics (signum, expression, content), (ii) allomorphics (allomorph), (iii) allosemics (alloseme), and (iv) lexonetics, morphonetics and semonetics (lexonete/utterance, morphonete/form and semonete/reference).

I shall begin with a consideration of allomorph and alloseme. These have already been discussed in outline in Section 8. An example of allomorphs given there was the two phonologically different forms (realisations) in British English of the word (signum) 'garage', /ˈgærɑːʒ/ and /ˈgærɪdʒ/. It was seen in Section 15 that the 'change' from a phonetic form to an allophone (also from a phonetic image to a phonete) is achieved, through *transformation*, by bringing allophone into a relationship with the phonological set-forming criterion, or what is more technically known as phonological distinctive function.

Similarly, the 'change' from a phonological form to an allomorph is achieved also, through transformation, by the bringing of the phonological form into a relationship with a set-forming distinctive function. But in this case, the distinctive function is grammatical (i.e. that of the signum). Phonological form is symbolised as p or as $\{f\}$Rd, bringing-into-a-relationship-with (transformation) as R, and grammatical distinctive function as s. An allomorph is accordingly defined as pRs, or as $(\{f\}$Rd)Rs.

Turning now to the alloseme, an example of allosemes given first in Section 5, was the two senses of 'garage': 1. "Building, either private or public, intended for the storage and shelter of motor vehicles while not in use"; and 2. "Commercial establishment that sells petrol, oil, and similar products […]". As was seen in Section 16, the 'change' from a semantic form to an allodele / denotatum-type (also from a semantic image /denotable to a delete / denotatum) is achieved by bringing allodele / denotatum-type into a relationship with the delological set-forming criterion (transformation), or what is more technically known as delological distinctive function.

Similarly, the 'change' from a delological form /denotation to an alloseme is achieved also by the bringing of the delological form /denotation into a relationship with a set-forming distinctive function (transformation). But in this case, the distinctive function is grammatical (i.e. that of the signum). Delological form /denotation is symbolised as q or as $\{g\}$Re, bringing-into-a-relationship with (transformation) as R, and grammatical distinctive function as s. An alloseme is accordingly defined as qRs, or as $(\{g\}$Re)Rs.

Having considered allomorph and alloseme, we can look 'upwards' to signum / grammatical entity, expression and content in Figure 13, and 'downwards' to lexonete/utterance, morphonete/form and semonete/reference. Just as a phonological form/entity is a set of allophones, and a delological form /denotation is a set of allodeles/denotatum-types, so an expression is a set of allomorphs, and a content is a set of allosemes. Expression is symbolised as E and defined as $\{p\}$Rs (i.e. E=$\{p\}$Rs), while content is symbolised as C and defined as $\{q\}$Rs (i.e. C=$\{q\}$Rs). Thus the expression of the signum $\{garage\}$ in British English is a set consisting of its two allomorphs /ˈgærɑːʒ/ and /ˈgærɪdʒ/. Similarly the content of the signum 'garage' in British English is the set of all its allosemes, two which are "Building, either private or public, intended for the storage and shelter of motor vehicles while not in use"; and "Commercial establishment that sells petrol, oil, and similar products […]". As already noted (Section 6), signum / grammatical entity, S, is a biunity of expression and content, i.e. S=E&C.

Looking 'downwards' now to lexonete/utterance, morphonete/form and semonete/reference in Figure 13, a morphonete/form, symbolised F, can be defined as a phonete iRd brought into a relationship R with a grammatical distinctive function s. Thus: F=(iRd)Rs. Semonete/reference, symbolised <u>R</u>, can be defined as a delete/denotatum jRe brought into a relationship R with a grammatical distinctive function s. Thus: <u>R</u>=(jRe)Rs. Morphonete/form thus incorporates both phonological and grammatical distinctive function into its definition, while semonete/reference incorporates both delological and grammatical distinctive function into its definition.[6]

21. Complete signum ontology

Figure 13 has two empty cells in the middle of the diagram, marked in orange. Figure 14 (next page) fills these two cells in, to provide a complete visual representation of what is known as the signum ontology in extended axiomatic functionalism.

The two additional notions introduced in Figure 13 are allomorphon and allosemon/reference-type. I will discuss these in Section 22 and Section 23 immediately below.

22. Nature and practical use of allomorphon

The allomorphon is a set of morphonetes/forms, a morphonete/form being F or (iRd)Rs and an allomorpon therefore being ({i}Rd)Rs. An allomorphon is equally an allophone fRd, brought into a relationship (R) with a grammatical distinctive function (s); i.e. an allomorphon is equally (fRd)Rs. An allomorphon is a set of all those morphonetes/forms which are deemed identical except for their time-space individuality (specificity); i.e. not only do they have the same phonological distinctive function (d) and grammatical/signum distinctive function (s) (as set-forming criteria), but they are also ascribed to the same general-phonetic set-forming criterion (a) (i in the formula for allomorphon, $i = \alpha$Ra, involving ascription to a set-forming criterion a). The allomorphon thus makes simultaneous appeal to (i) a general-phonetic set-forming criterion a, (ii) a phonological set-forming criterion d, and (iii) a grammatical set-forming criterion s.
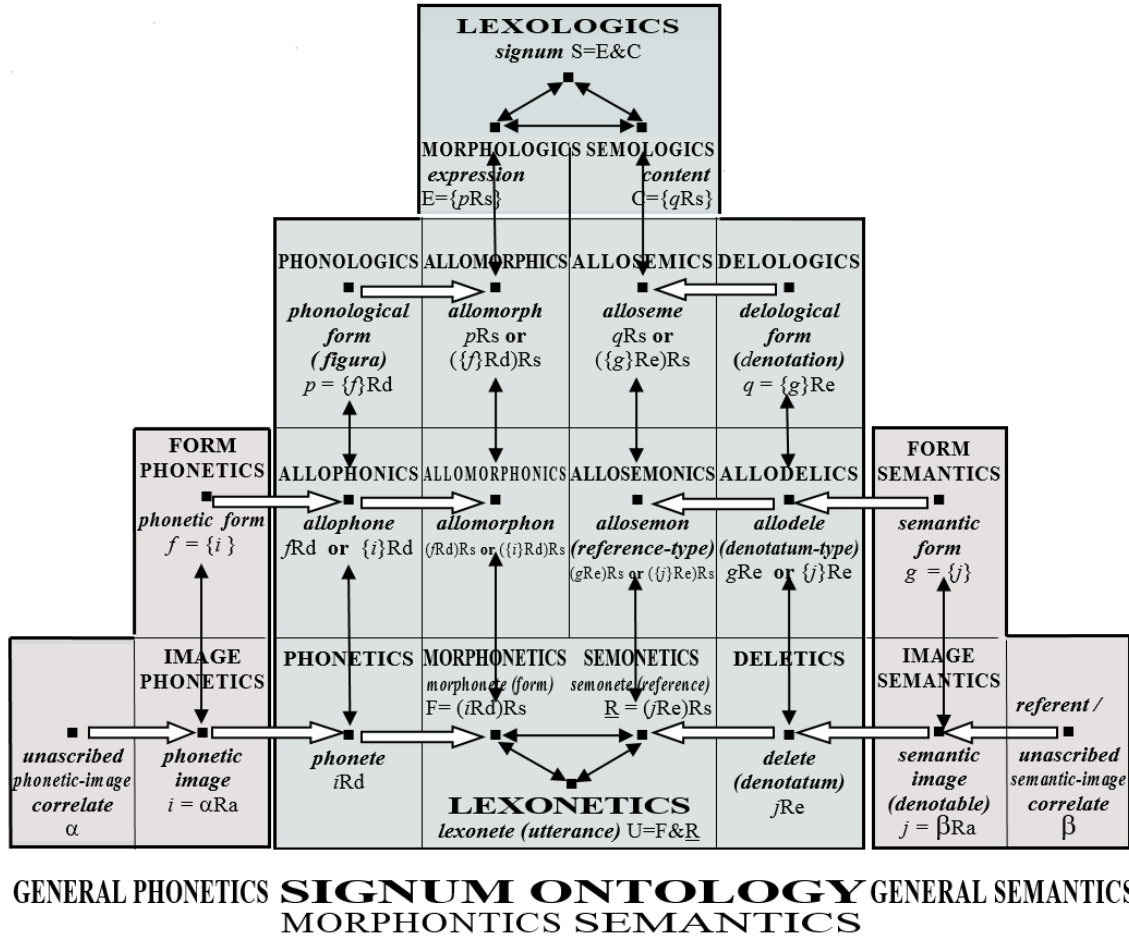
For a consideration of the practical significance of the allomorphon for linguistic analysis, we can consider what is sometimes termed 'incomplete neutralisation' (the following argument is adapted from Dickins 1998: 90–98, which also discusses numerous related examples). Incomplete neutralisation is exemplified by pairs in German such as (i) *Rad* 'wheel,

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[6] Two other complex notions which can be derived from more basic notions in the theory are what are termed in extended axiomatic functionalism 'morphete' and 'semete' (Dickins 1998: 131, 132; Dickins 2009: Def. F1b^{1a0}, Def. F1b^{2a0}. A morphete is a '[phonetic] image […] in its capacity of having the particular distinctive function […] appropriate to a particular signum […]' (Dickins 2009, Def. F1b^{1a0}), i.e. it is a phonetic image brought directly in relation to the set-forming criterion of a particular signum. Morphete is defined as iRs. When Hervey talks about a 'form' he means roughly what I have here termed a 'morphete' (cf. Mulder and Hervey 2009, Def. F1b1a), but when Mulder uses the term 'form' he typically means what I have here termed a morphonete. A semete is a 'semantic image […] in its capacity of having the particular distinctive function appropriate to a particular signum' (Dickins 2009, Def. F1b^{2a0}), i.e. it is a semantic image / denotable brought directly in relation to the set-forming criterion of a particular signum. Semete is defined as jRs.

bicycle' and *Rat* 'advice'; (ii) *Bund* 'association, group', and *bunt* 'colourful'; and (iii) *seid* '[you] (familiar pl.) are' and *seit* 'since'. Traditionally there is said to be no opposition between final 'd' and final 't' in forms like this in German; the voiced/voiceless opposition is said to be neutralised and the resulting entity is described as an archiphoneme (cf. Dickins 2009, Def. 7a4b; Mulder and Hervey 2009: 441, Def. 7a4b).

Figure 14
Signum ontology

Phonological neutralisation in axiomatic functionalism involves there being in a given context no extensional phonetic difference in the (phonetic) realisations of two putatively distinct forms. Thus, *Rad* and *Rat* involve neutralisation of the /d/~/t/ opposition if and only if (i) every realisation of *Rad* can also be a realisation of *Rat*, and (ii) every realisation of *Rat* can also be a realisation of *Rad*. The view that there is no extensional difference in the realisations of *Rad/Rat* and the other similar pairs investigated in terms of incomplete neutralisation is borne out by careful analyses of the data (e.g. Port and Crawford 1989). However, it is the case that:

> Pairs like *Bund* "association, group" and *bunt* "colourful" have long been said to be homophonous ..., yet the words <u>tend</u> to retain a small difference in certain phonetic parameters (Port and Crawford 1989: 258; underlining mine).

If this is correct, and all we are dealing with in cases of incomplete neutralisation is a tendency for the one form to be pronounced in one way, and the other form in the other way, the phenomenon does not in axiomatic-functionalist terms involve phonological difference between the two members of the pair. That is to say, this is a case of neutralisation, despite superficial evidence to the contrary.

Taking this analysis to be correct, the relevant allomorphs of *Bund* and *bunt* in the case of incomplete neutralisation are homomorphs (i.e. they share the same phonological form); therefore we only have one phonological form here to talk about. This means that we cannot investigate incomplete neutralisational phenomena purely in terms of allophones and representative sets of the phonetes which are the members of these allophones, as might initially be thought. At the same time we cannot simply investigate these phenomena purely in terms of the signa (words) involved. If we were to do this, we would introduce consideration of all realisations of *Bund* and *bunt*, *Rad* and *Rat*, etc. In the case of *Rad*, for instance, these would include the dative singular form *Rade*; this is unambiguously differentiated from all realisations of *Rat* (which has a dative singular form *Rate*). This would mean that we were not investigating the same range of phenomena we were originally interested in, and we would correspondingly achieve results which were irrelevant to the original area of investigation.

What is needed is a means of controlling the range of phenomena in phonological terms, and thus ultimately in general phonetic terms, and at the same time differentiating cases such as *Rad* and *Rat* in terms of their signum (word) identity. That is to say, we need simultaneously to identify the phenomena in question phonetically, phonologically and grammatically. As already discussed in this section, this is what the notions morphonete/form, allomorphon, and allomorph do. In particular, the notions form and allomorphon provide coherent models for the investigation of the relative frequencies of different individual phonetic realisations of phonologically identical realisations of *Rad* and *Rat*. By looking at representative samples of data we are able to determine the relative sizes of the different 'morphonete-sets' / 'form-sets' which make up the allomorphons in question.

The following provides a simple illustration of the kind of procedure which I have in mind. In order to simplify the presentation, I will take an imaginary example, but one which is analogous to *Rad/Rat* for illustration. Let us suppose a language which has two signa (words), which we may call *Signum-A* and *Signum-B*, each signum having an allomorph of one particular phonological form (i.e. the two signa share a homomorph). We may call this phonological form $/\chi/$. Let us assume that we can divide the phonetic range of the allophonic realisations of $/\chi/$ into six. That is to say, we have arbitrarily – but let us also assume appropriately (cf. the discussion of 'arbitrary' in Section 15) – established six allophones for the entire phonological form $/\chi/$ taken as a whole. These allophones by definition correspond to six different phonetic forms, which are themselves arbitrary but also appropriate. Let us call these allophones $[\chi^1]$, $[\chi^2]$, $[\chi^3]$, $[\chi^4]$, $[\chi^5]$ and $[\chi^6]$ (the corresponding phonetic forms we might symbolise as $]\chi^1[$, $]\chi^2[$, $]\chi^3[$, $]\chi^4[$, $]\chi^5[$ and $]\chi^6[$). Let us now assume we have a sample of fifty individual realisations each (perhaps artificially elicited in a phonetics laboratory) of the signa *Signum-A* and *Signum-B*. Each one of these realisations, considered simultaneously both as a realisation of a signum and as a realisation of a phonological form, will be a morphonete/form (an instance of a particular allomorphon), which will have a phonete (an instance of a particular allophone) – which will itself have a phonetic image (an instance of a particular phonetic form). The form of each utterance of *Signum-A* and *Signum-B* can

thus be simply related to a particular allophone of the phonological form /χ/. Let us suppose that of the fifty utterances of *Signum-A*, 17 relate to the allophone [χ^1] (i.e. they have the phonete which instantiates the allophone [χ^1]), 6 relate to the allophone [χ^2], 7 relate to the allophone [χ^3], 8 relate to the allophone [χ^4], 4 relate to the allophone [χ^5], and 8 relate to the allophone [χ^6]. Let us also suppose that of the fifty utterances of *Signum-B*, 7 relate to the allophone [χ^1], 7 relate to the allophone [χ^2], 4 relate to the allophone [χ^3], 12 relate to the allophone [χ^4], 14 relate to the allophone [χ^5], and 6 relate to the allophone [χ^6]. This situation can be tabulated as in Figure 15.

Given the results which are presented here, one could reasonably claim that *Signum-A* has a *canonical allomorphon* (cf. Dickins 1998: 255; i.e. a 'focal' allomorphon) which has the allophone (or allophonic form) [χ^1]; 17 out of 50 utterances of *Signum-A* have a form which has a phonete which instantiates the allophone [χ^1]. *Signum-B*, on the other hand, has a canonical allomorphon which has the allophone (or allophonic form) [χ^5]; 14 out of 50 utterances of *Signum-B* have a form which has a phonete which instantiates the allophone [$\chi\alpha^5$].

Figure 15
Descriptive procedure for the analysis of incomplete neutralisation

Allophone of phonotagm /α/	Number of utterances of *Signum-A* and *Signum-B* relating to ('having') particular allophone (from total of 50 each)
[χ^1]	*Signum-A*= 17 utterances *Signum-B*= 7 utterances
[χ^2]	*Signum-A*= 6 utterances *Signum-B*= 7 utterances
[χ^3]	*Signum-A*= 7 utterances *Signum-B*= 4 utterances
[χ^4]	*Signum-A*= 8 utterances *Signum-B*= 12 utterances
[χ^5]	*Signum-A*= 4 utterances *Signum-B*= 14 utterances
[χ^6]	*Signum-A*= 8 utterances *Signum-B*= 6 utterances

Given the ultimately arbitrary nature of phonetic analyses, this would not be the only way in which one could divide the phonetic continuum. It would be possible to establish many more than six phonetic forms for the relevant phonetic range, and therefore many more than six potential allophones and allomorphons (cf. the discussion of dark and light 'l'; Section 15). It would also be possible to set up secondary (also tertiary, etc.) foci; for *Signum-B* the realisation [χ^4] with 12 utterances might be considered a secondary canonical (focal) realisation (for further discussion of this issue, see Dickins 1998: 97).

23. Nature and practical use of allosemon/reference-type

Having considered the nature and practical use of the allomorphon in Section 22 above, I turn now to the nature and practical use of the allosemon/reference-type. The allosemon/reference-type is a set of semonetes/references, a semonete/reference being R̲ or (*j*Re)Rs and an allosemon/reference-type therefore being ({*j*}Re)Rs. An allosemon/reference-type is equally an allodele/denotatum-type *j*Re, brought into a relationship (R) with a grammatical distinctive function (s); i.e. an allosemon/reference-type is equally (*j*Re)Rs. An allo-semon/reference-type is a set of all those semonetes/references which are deemed identical except for their time-space individuality (specificity); i.e. not only do they have same delological distinctive function (e) and grammatical/signum distinctive function (s) (as set-forming criteria), but they are also ascribed to the same general-semantic set-forming criterion (a) (*j* in the formula for allosemon/reference-type, *j* = βRa, involving ascription to a set-forming criterion a). The allosemon thus makes simultaneous appeal to a general-semantic set-forming criterion a, a delological set-forming criterion e, and a grammatical set-forming criterion s.

For a brief consideration of the practical significance of the allosemon/reference-type for linguistic analysis, we can consider what is sometimes termed 'imperfect synonymy' (the following argument is adapted from Dickins 1998: 117-125, which also discusses a number of related examples; cf. also Dickins 2014b). As will be seen, imperfect synonymy is the semantic ('content-side') analogue of the morphontic ('expression-side') phenomenon of incomplete neutralisation (Section 22). Consider the following

> […] the two verbs *vernielen* and *vernietigen* "to destroy, bring to nought" in nineteenth-century Dutch […] appear to have referred to exactly the same range of situations and exhibited identical selection restrictions, even in the writings of one and the same author. Were these two words, then, "perfect synonyms"? Geeraerts [1988] argues they were not. Differences emerged when the frequencies of different senses were compared, *vernietigen* being used predominantly in an abstract sense, while *vernielen* referred predominantly to an act of physical destruction. Remarks in contemporary handbooks of good usage also pointed to a difference in the conceptual centres of the two words (Taylor 1989: 56).

In this light, consider the following, both of which can be translated into English as 'The conflict destroyed the village':

(2)   *De strijd heeft het dorp vernield.*
(3)   *De strijd heeft het dorp vernietigd.*

Example 2 with a form of *vernielen* would tend to mean that the village was physically destroyed, while example 3 with a form of *vernietigen* would tend to mean that the village was destroyed as a community. Thus, if 3 were taken by a reader in a given instance to mean that the village was destroyed as a community, the writer might object that this was not what he/she meant. It might even be the case that the utterance was true under the "physical destruction" interpretation (as, let us say, intended by the writer), but untrue under the "destruction as a community" interpretation (as misinterpreted by the reader).

Under an extended axiomatic-functionalist approach, there is a perfect parallel between incomplete neutralization (e.g. *Rad* and *Rat*; Section 22) and imperfect synonymy. *Vernielen* and *vernietigen* (in the appropriate allosemes/'senses') correspond to a single delological form/denotation (there is no difference in the range of the semantic images/denotables to which they can refer). At the same time *vernielen* has a tendency to mean not merely to destroy but to destroy physically, while *vernietigen* tends to mean not merely to destroy, but to destroy in an abstract sense. Since we have only a single delological form/denotation we cannot investigate differences in tendencies to mean purely in 'sub-denotational' terms - i.e. in terms of deletes/denotata and allodeles/denotatum-types. This parallels the way in which we cannot investigate differences in pronunciation tendencies between *Rad* and *Rat* purely in 'sub-phonological' terms – i.e. in terms of allophones and phonetes. Rather, we need both the analysis of *vernielen* and *vernietigen* as different signa (words) plus the analysis of their correspondence to a single delological form/denotation, just as we need the analysis of *Rad* and *Rat* as different signa (words) plus the analysis of the 'correspondence' of the relevant allomorph in each case to a single phonological form. That is to say, just as the notions morphonete/form and allomorphon allow us to investigate the differing 'tendencies to sound' of *Rad* and *Rat*, so the notions semonete/reference and allosemon/reference-type allow us to investigate the differing 'tendencies to mean' of *vernielen* and *vernietigen*.
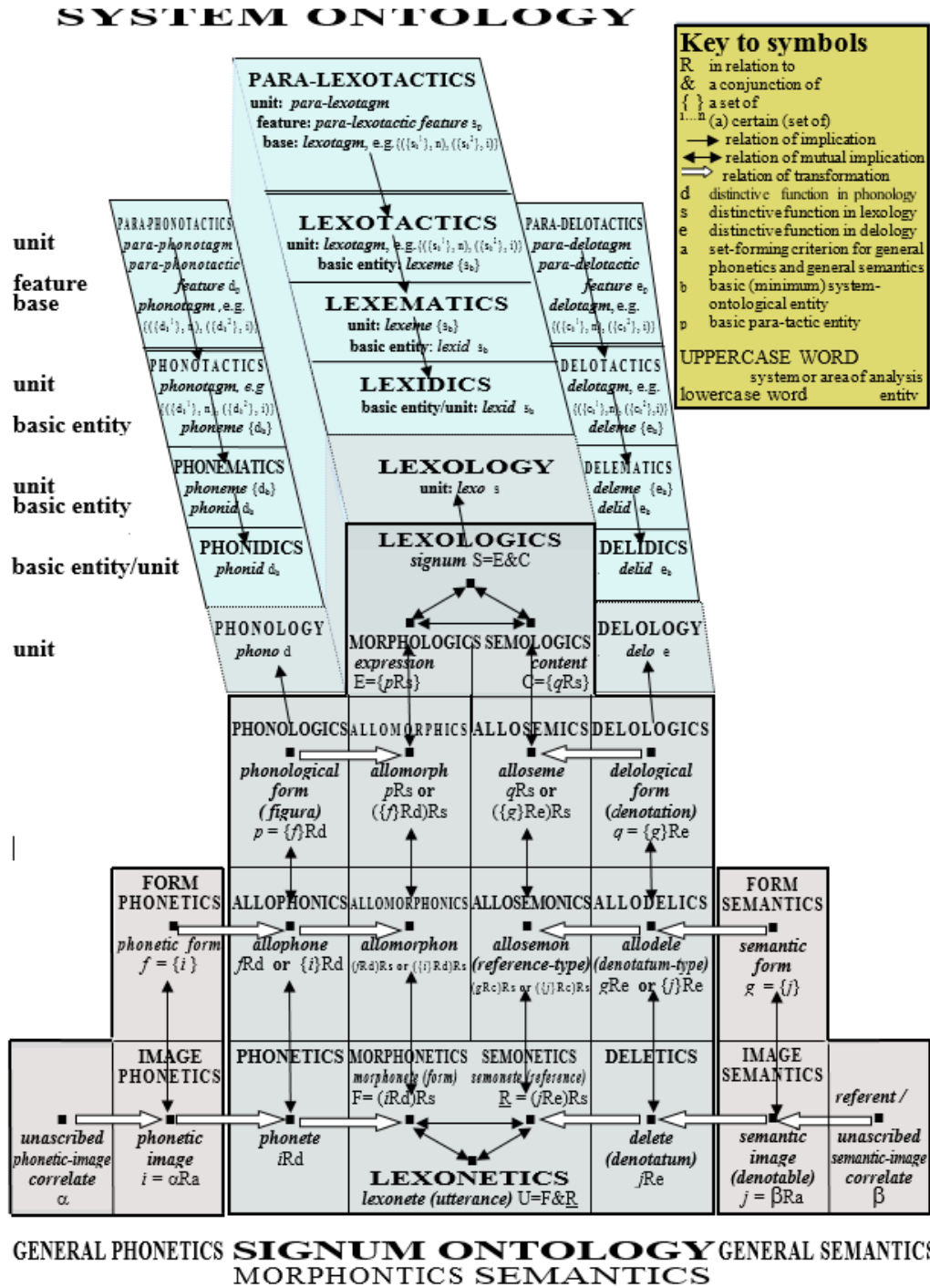
Vernielen and *vernietigen* in nineteenth century written Dutch seem clear examples of synonyms, as defined by extended axiomatic functionalism, i.e. two signa (words) which have the same /delological form/denotation (cf. Dickins 2009, Def. 28 formal definition of synonym). However, they are not 'perfect synonyms', in the sense that this term is used by Taylor, since they have differing 'focal reference-types' – or what can be referred to in an extended axiomatic-functionalist context as differing *canonical allosemons* (cf. Dickins 1998: 256).

In semantics (the 'content side' of the signum) the notions delete/denotatum, allodele/de-notatum-type, and delological form/denotation allow us to investigate denotational aspects of meaning; the notions semonete/reference and allosemon/reference-type, on the other hand, allow us to investigate at least some aspects of what are traditionally called connotational aspects of meaning. Correspondingly, in morphontics (the 'expression side' of the signum) the notions phonological form, allophone, and phonete allow us to investigate what Michael Lamb (personal communication) has proposed be called *figurational* aspects of "sounding" (to borrow a Hallidayan term) – i.e. the way realisations of signa are pronounced in a general sense. That is to say these notions allow us to investigate the organisation and realisations of *figurae* (= phonological forms; cf. Section 14); the notions allomorph, allo-morphon and morphonete/form, on the other hand, allow us to investigate what Lamb has proposed be called *configurational* aspects of 'sounding'.

24. Signum ontology and system ontology

As noted in Section 1, extended axiomatic functionalism has two components: the signum ontology, which has been the focus of this paper, and the system ontology. Figure 16 (next page) presents a view which I have put forward in Dickins (2009) of the relationship between these two components.

Figure 16
Extended axiomatic functionalism: linguistics (signum ontology and system ontology)

The crucial point to note here about the system ontology – i.e. phonology, lexology and delology – is that the entities involved are purely intensional. Thus, entities in phonology – phonos – are all d (or a combination of 'd's); entities in lexology are all s (or a combination of 's's); and entities in delology are all e (or a combination of 'e's). Thus, while the signum ontology is built up by relating the basic notions/entities unascribed phonetic-image corre-

late and unascribed semantic-image correlate (referent) progressively to different set-forming criteria – a, d, e, and s (together with the more direct use of the notion of sets), the system ontology makes use solely of the linguistic set-forming criteria – d, e, and s.

Figure 17
Extended axiomatic functionalism: linguistics (signum ontology and revised system ontology)
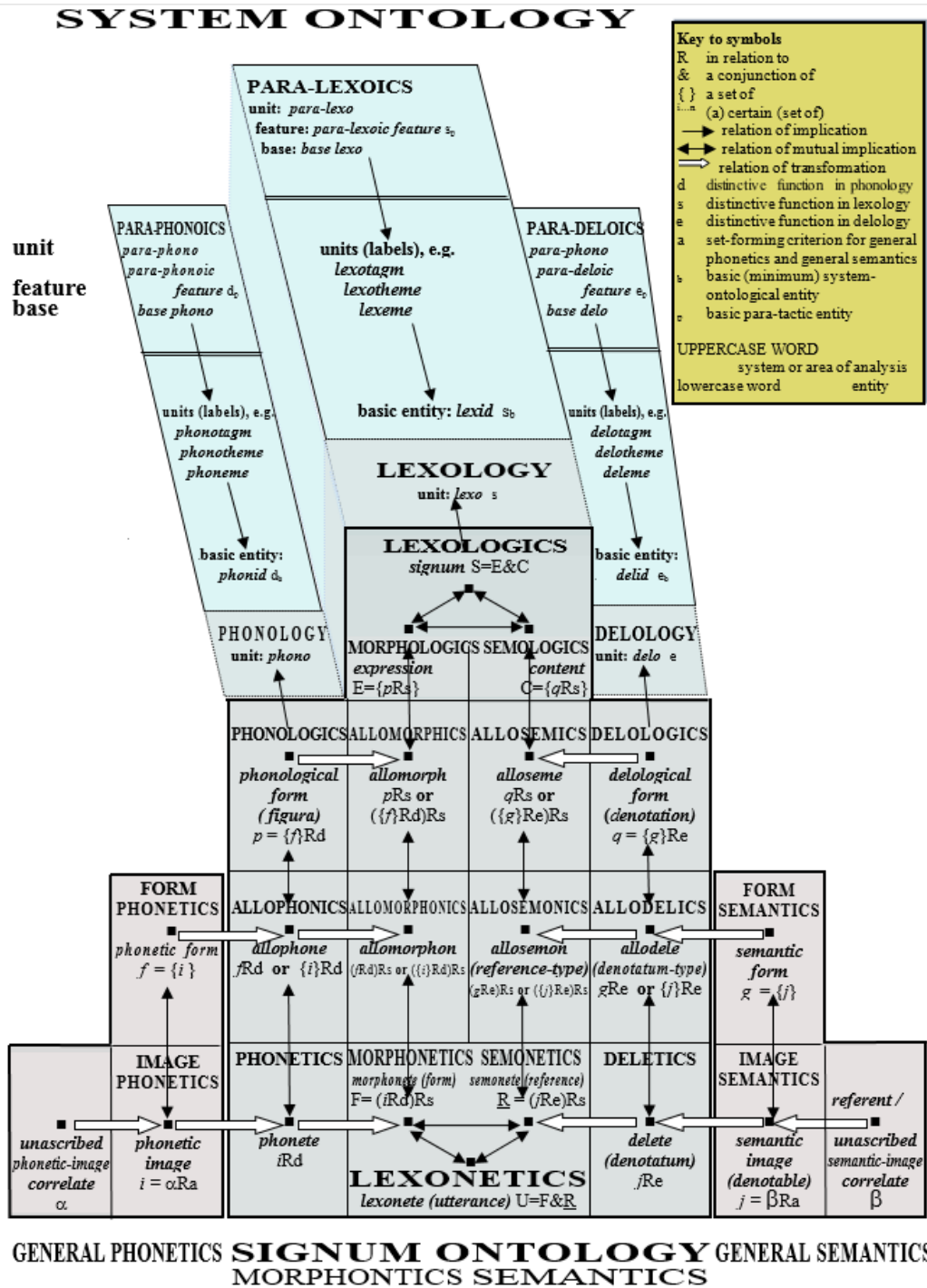
Figure 16 makes plain why terms like 'phonologics', 'lexologics' and 'delologics' are used in the signum ontology (cf. Section 14). These are terms in the signum ontology, corresponding respectively to 'phonology', 'lexology' and 'delology' in the system ontology. Within the signum ontology the suffix *-ics* is used for all 'areas of analysis' ('image phonetics', 'form phonetics', 'phonetics', 'allophonics', 'phonologics', etc.). The terms 'phonological form' (also 'figura') and 'delological form' are used for entities in the signum ontology. 'Phonological entity' (also 'phono') and 'delological entity' (also 'delo') are correspondingly used for entities in the signum ontology. 'Signum' is used in the signum ontology, while 'lexo' is the most appropriate term for entities in the system ontology.

I have elsewhere (Dickins 2014a) proposed that the version of system ontology given in Figure 16 is both unnecessarily complex, and logically not really sustainable. In its place, I propose a system ontology of the kind represented in Figure 17 (previous page; see Dickins 2014a for further discussion).

25. Theoretical parsimony and signum ontology

The model presented in Figure 17 (also Figure 16) looks like it involves the following basic notions:

1. α – unanalysed phonetic-image correlate
2. β – unascribed semantic-image correlate / referent
3. d – phonological distinctive function
4. e – delological distinctive function
5. s – grammatical / signum distinction function
6. a – set-forming criterion which is not distinctive function (phonological, grammatical or delological)
7. Member-to-set relationship
8. R – bringing into a relationship with
9. Ordering relation

The only notion which has not been discussed in this paper is that of ordering relation. This is a feature of the system ontology, rather than the signum ontology (for discussion, see Dickins 2014a). In fact, the number of basic notions can be significantly reduced from the nine notions given in the list above. Firstly, there is in reality no difference between unascribed phonetic-image correlate and unascribed semantic-image correlate / referent. This should be clear given that unascribed phonetic-image correlate is just an irreducibly primitive model for a sound-event: such a sound-event could just as easily, however, be something referred to (an unascribed semantic-image correlate / referent) as a feature of 'form'. (Thus, the IPA as a semiotic system, for example, has as its unascribed semantic-image correlates / referents speech sounds.) Given that this is the case, unascribed phonetic-image correlates are simply a subset of unascribed semantic-image correlates. As noted earlier (Section 9) the latter look like Peircean firsts. We can, accordingly, use the term 'first' to refer to both an unascribed phonetic-image correlate and an unascribed semantic-image correlate / referent.

It is also possible to reduce the notions *phonological distinctive function* d, *delological distinctive function* e, *grammatical / signum distinctive function* s, and *set-forming criterion which is not distinctive function* a. We can start from the fact that all these four notions are set-forming criteria. We can then consider that the theory has two basic aspects – the morphontic (involving 'formal' features – from the most abstract to the most concrete) and the semantic (involving 'meaning' features – from the most abstract to the most concrete).

We can cross-classify the notions 'morphontic' and 'semantic' in relation to the notion of a set-forming criterion, as in Figure 18.

Figure 18
Morphontic and semantic in relation to set-forming criterion

	Morphontic	**ø**
Semantic	s	e
ø	d	a

Figure 18 demonstrates that only 3 notions – semantic, morphontic and set-forming criterion (this last implied but not shown in Figure 18) – are needed to generate the following four notions: (i) *phonological distinctive function* d, which can be analysed as the application of the notion set-forming criterion in relation to morphontics only; (ii) *semantic distinctive function* e, which can be analysed as the application of the notion set-forming criterion in semantics only; (iii) *grammatical / signum distinctive function* s, which can be analysed as the application of the notion set-forming criterion to morphontics and semantics simultaneously (a signum / grammatical entity S, for example, has both a morphontic aspect, its expression E, and a semantic aspect, its content C); and finally (iv) *set-forming criterion which is not distinctive function* a, i.e. set-forming criterion which has neither a morphontic nor a semantic aspect (and is not therefore properly speaking part of the signum ontology).

The notion set-forming criterion also implies the notion set: we therefore regard 'set' and 'set-forming criterion' as related (if strictly speaking distinct notions). This, then, gives the following revised reduced list of basic notions (of which 2 and 3 are intimately related) for the entire theory (signum ontology plus system ontology):

1.   First
2.   Set-forming criterion
3.   Member-to-set relationship
4.   Morphontic
5.   Semantic
6.   R – bringing into a relationship with
7.   Ordering relation

26. Conclusion

In this paper, I have attempted to progressively develop a model for linguistic analysis, leading eventually to the signum ontology of extended axiomatic functionalism, and the presentation of this together with the other component of extended axiomatic functionalism, the system ontology. Making use of a very small number of basic notions which are repeatedly applied, I have developed an ultimately complex signum ontology, which I have tried to show is able to provide insightful and rigorous analyses of central features of language which cannot be adequately treated by less coherently structured models.

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