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Symbolisation for extended axiomatic functionalism[1]

Abstract

This article presents a set of symbols for the linguistic, and semiotic, theory of extended axiomatic functionalism. Section 2 provides a visual representation for one of the two components of the theory, the signum ontology, plus the ancillary areas of general phonetics and general semantics. Section 3 presents the proposed symbols for the signum ontology and ancillary areas. Sections 4-4.5 provide exemplification: Section 4.1 for general-phonetic notions, Section 4.2 for general-semantic notions, Section 4.3 for morphontic (non-meaning-related) only notions, Section 4.4 for semantic (meaning-related) only notions, and Section 4.5 for both morphontic and semantic notions. Sections 5-5.5 consider the principles adopted in drawing up these symbols, as follows: retention of existing linguistic symbols (Section 5.1), use of identical symbols for morphontics and semantics, and plain vs. italic text (Section 5.2),

[1] I thank Barry Heselwood and two anonymous reviewers for Linguistica Online for reading draft versions of this article and making very useful comments on it. These have considerably helped improve the final version. At various points in this final version of the article, I address comments made by the two Linguistica Online reviewers on the earlier draft which they read, referring to them, where appropriate, as Reviewer 1 and Reviewer 2.

degree of abstraction (Section 5.3) – instantiation, i.e. direct model for speech events (level 1) (Section 5.3.1), immediate generalisation from speech events (level 2) (Section 5.3.2), secondary generalisation from speech events (level 3) (Section 5.3.3), and signum level (level 4) (Section 5.3.4), and degree of peripherality or centrality (Section 5.4).

Section 6 provides a representation of (i) the second of the two components of extended axiomatic functionalism, the system ontology, and (ii) the overall theory, comprising the signum ontology and the system ontology (plus ancillary areas of general semantics and general phonetics). Section 6.1 considers the proposed symbols for the system ontology. Section 6.2 discusses issues involved in choosing appropriate symbols of the system ontology. Section 7 considers ways in which the symbols for both the signum ontology and system ontology can be simplified. Section 8 compares the symbols proposed in this article with those proposed by Mulder for 'standard axiomatic functionalism'.

Keywords
Axiomatic functionalism; extended axiomatic functionalism; standard axiomatic functionalism; symbols; symbolisation; ontology; signum ontology; system ontology

1. Introduction

This article proposes and justifies a proposed symbolisation – by which I simply mean a set of symbols – for notions and entities in extended axiomatic functionalism. Extended axiomatic functionalism comprises two components, i.e. two ontologies, where an ontology is a "set of entities presupposed by a theory" (Collins English Dictionary)". These two components are i. the signum ontology, together with two ancillary areas, general phonetics and general semantics; and ii. the system ontology. I will deal with the signum ontology and the ancillary areas of general phonetics and general semantics, and the symbolisations for notions and entities within this, and then move on to the system ontology. At the end of the article, I will compare this symbolisation with that proposed by Mulder for the standard version of axiomatic functionalism.[2]

Both the extended version of axiomatic functionalism (extended axiomatic functionalism) presented here, and the standard version – 'standard axiomatic functionalism' developed by Mulder and Hervey – are general semiotic as well as linguistic theories (for formal statements of both theories, see Dickins 2009; and Mulder and Hervey 2009). In extended axiomatic functionalism, in talking about semiotics generally (i.e. non-linguistic semiotic systems), *cen-* is used instead of *phon-* (Dickins 2009; 11, Def. 0b), and *log-* is used instead of *lex-* (Dickins 2009; 11, Def. 0b), while *del-* is used for both linguistic and non-linguistic semiotic systems. For written languages (as opposed to spoken languages) as semiotic systems, *graph-* is used instead of *phon-* (Dickins 2009; 11, Def. 0c). The symbols presented in this article can be used equally for natural language (spoken and written) and non-linguistic semiotic systems.

All the notions expressed by the symbols proposed in this article can also be expressed in other, existing, ways in extended axiomatic functionalism. These other ways are, however, less concise than those proposed in this article, in most having the character of definitions; i.e. they involve combinations – sometimes extremely complex – of more than one, already previously defined, symbol. The symbols proposed in this article, by contrast, are all fairly

[2] Reviewer 1 has pointed out that this symbolisation is purely representational, i.e. there is a one-one conventional relation between entity and symbol; there are no axioms or rules of deduction, so it is not a calculus.

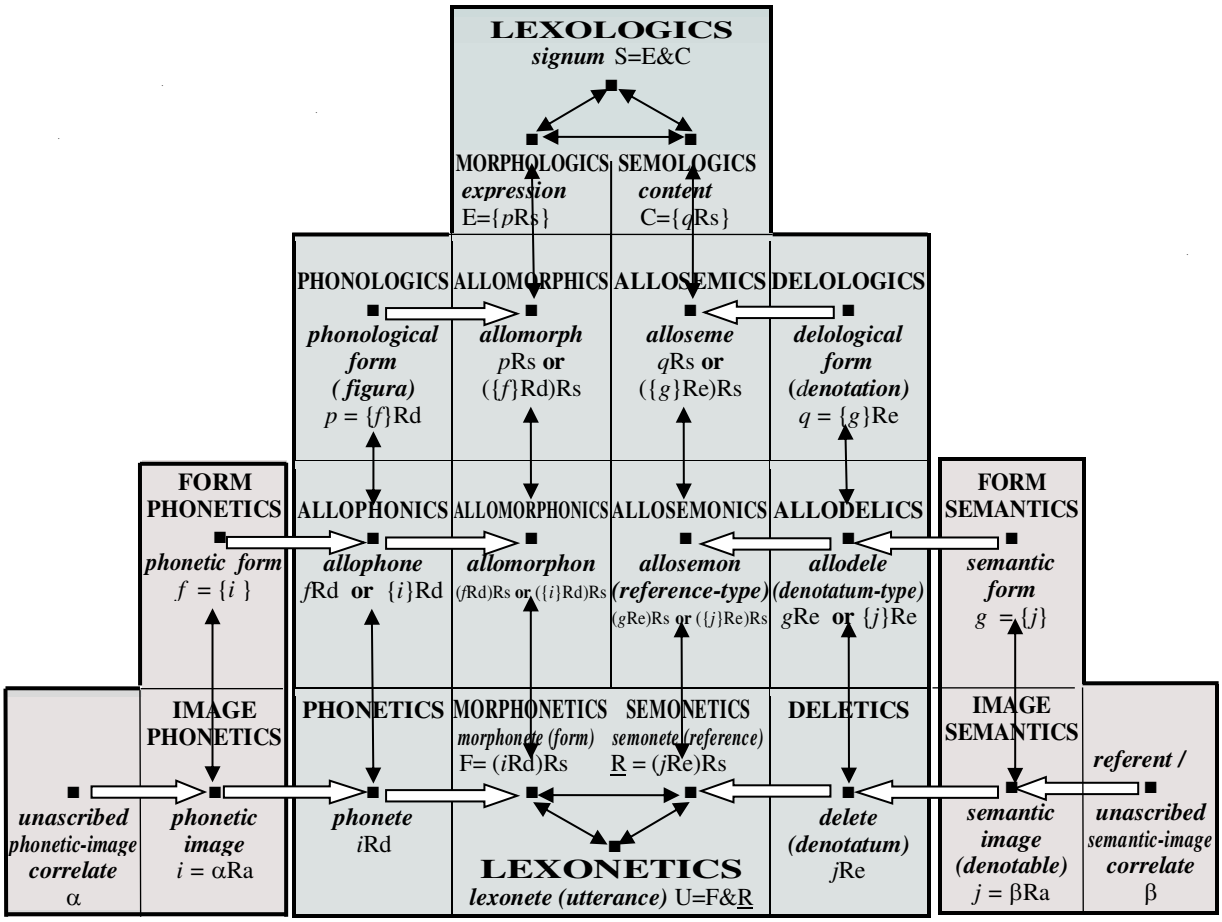
simple. They are intended to be used in linguistic descriptions, for the purposes of clarity and precision, allowing (and requiring) the writer to state precisely what kind of entity they are referring to, and communicating this to the reader. As Reviewer 2 has pointed out to me, symbolisations involving combinations of previously defined symbols are also definitions – for *i*Rd for 'phonete', *f*Rd or {*i*}Rd for 'allophone' and {*f*}Rd for phonogical form / figure (all in the 'phonologics' column in Figure 1).[3] Simple symbols with which these are equated, e.g. *p* in the formula *p* = {*f*}Rd (Figure 1) are symbols but not definitions. Reviewer 1 points out that speed in physics is symbolized as *v*, but defined as *d* / *t* (distance divided by time); i.e. the former provides only a graphic symbol, while the latter states its relations to other physical notions.

2. Signum ontology

Figure 1 provides a visual representation of the signum ontology of extended axiomatic functionalism, as well as the ancillary areas of general phonetics and general semantics.

[3] In Dickins (1998: 134), I proposed 'phonotics' as a cover term for 'phonetics', 'allophonics' and 'phonologics' (cf. Dickins 2009: 35, Def. F3f); cf. also 'morphotics' (Dickins 1998: 134; Dickins 2009: 42, Def. F1b1a2), 'semotics' (Dickins 1998: 135; Dickins 2009: 43, Def. F1b2a), and 'delotics' (Dickins 1998: 135; Dickins 2009: 45, Def. F4.1).

Figure 1
Extended axiomatic functionalism: signum ontology, plus general phonetics and general semantics



GENERAL PHONETICS **SIGNUM ONTOLOGY** GENERAL SEMANTICS
MORPHONTICS SEMANTICS

3. Proposed symbols for extended axiomatic functionalism

Figures 2-6 provide a list of proposed symbols for the major notions in the signum ontology and the ancillary areas of general phonetics and general semantics. These figures use for their illustrative examples, the English word ‘egg’. The material in figures 2-6 will be discussed in more detail in sections 4-4.5.

Figure 2
General-phonetic notions

Name	Symbolisation of theoretical notion	Symbolisation for descriptive entity	Symbolisation of example of descriptive entity
unascribed phonetic-image correlate	α	α *and* $^{i, ii, iii, iv}$, etc.	α^{i}
phonetic image	$\alpha R\{^{i...n}\}$ *or* *i*	‹ ›*	‹ɛg›*
phonetic form	*f or* {*i*}	[ ]*	[ɛg]*

Figure 3
General-semantic notions

Name	Symbolisation of theoretical notion	Symbolisation for descriptive entity	Symbolisation of example of descriptive entity
unascribed semantic image-correlate / referent	β	β *and* $^{i, ii, iii, iv}$, etc.	β^{i}
semantic image	$\beta R\{^{i...n}\}$ *or j*	‹ ›*	‹*oval or round reproductive body ...*›*
semantic form	*g or* {*j*}	[ ]*	[*oval or round reproductive body ...*]*

Figure 4
Morphontic (non-meaning-related) only notions

Name	Symbolisation of theoretical notion	Symbolisation for descriptive entity	Symbolisation of example of descriptive entity
phonete	*i*Rd	‹ ›	‹ɛg›
morphonete	F *or* (*i*Rd)Rs	‹‹ ››	‹‹ɛg››
allophone	*f*Rd	[ ]	[ɛg]
allomorphon	(*f*Rd)Rs *or* {(*i*Rd)Rs}	[[ ]]	[[ɛg]]
phonological form / figura	*p or {f}Rd*	/ /^{SIG} *or* / / (see Section 4.2)	/ɛg/
allomorph	*p*Rs *or* {({*f*}Rd)Rs}	// //	//ɛg//
expression	E *or*{*p*Rs}	{{ }}^{E}	{{egg}}^{E}

Figure 5
Semantic (meaning-related) only notions

Name	Symbolisation of theoretical notion	Symbolisation for descriptive entity	Symbolisation of example of descriptive entity
delete/denotable	*j*Re	‹ ›	e.g. ‹*oval or round reproductive body ...*›
semonete/reference	R *or* (*j*Re)Rs	‹‹ ››	‹‹*oval or round reproductive body ...*››
allodele / denotatum-type	*g*Rr	[ ]	[*oval or round reproductive body ...*]
allosemon / reference-type	(*g*Re)Rs *or* {(*j*Re)Rs}	[[ ]]	[[*oval or round reproductive body ...*]]
delological form / denotation	*q or* {*g*}Re	/ /SIG *or* / / (see Section 4.2)	/*oval or round reproductive body .../*
alloseme	*q*Rs *or* {({*f*}Re)Rs}	// //	//*oval or round reproductive body ...*//
content	C *or* {*q*Rs}	⦃ ⦄C	⦃*egg*⦄C

Figure 6
Both morphontic (non-meaning-related) and semantic (meaning-related) notions

Name	Symbolisation of theoretical notion	Symbolisation for descriptive entity	Symbolisation of example of descriptive entity
lexonete/utterance	U *or* (*i*Rd)Rs & (*j*Re)Rs	‹‹ ››SIG	‹‹egg››SIG
signum	S *or* E&C *or* {*p*Rs}&{*q*Rs}	⦃ ⦄SIG	⦃egg⦄SIG

4. Exemplification

The notions of the signum ontology and the ancillary areas of general phonetics and general semantics are described in detail in Dickins (2009 and 2016). Readers unfamiliar with the theory are advised to read Dickins (2016) in particular before carrying on with this article. What follows is a brief discussion of the notions of general phonetics, general semantics and the system ontology. These are presented in the order in which they are given in figures 2-6. The notions of the signum ontology and the ancillary areas of general phonetics and general semantics can be illustrated on the basis of the English word (as a kind of signum) 'egg', which has a single allomorph of phonological form /ɛg/ and which has various senses (allosemes), such the one having the delological form / denotation /*oval or round reproductive body laid by the females of birds, reptiles , fishes , insects, and some other animals, consisting of a developing embryo , its food store, and sometimes jelly or albumen ,*

all surrounded by an outer shell or membrane/ (Collins English Dictionary); for the purpose of convenience of representation in this article, this can be shortened to */oval or round reproductive body .../*. For the representation of delological form / denotation as */oval or round reproductive body .../*, see Section 4.1 below.

4.1 General-phonetic notions

Unascribed phonetic-image correlate

As a theoretical notion, unascribed phonetic-image correlate is symbolised as α (Figure 1, Figure 2). As a descriptive entity, an unascribed phonetic image-correlate can be symbolised as α^{i}, α^{ii}, α^{iii}, α^{iv}, etc, a complete set of unascribed phonetic image-correlates being symbolised as $\alpha^{\{i\ldots n\}}$ (Figure 2). 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" (see discussion of 'Peircean first' in relation to unascribed semantic-image correlate / referent, Section 4.2; also Dickins 2016: 17). Thus, if I utter a sound at 11.43 am on June 25, 2014 in room 4.05 in the Michael Sadler Building, University of Leeds, England, and note this as existing, this is an unascribed phonetic-image correlate.[4]

Phonetic image

As a theoretical notion, 'phonetic image' is symbolised as *i* and can be analysed as αRa (Figure 1, Figure 2), where a is an arbitrary set-forming criterion (for discussion of the difference between arbitrary and non-arbitrary set-forming criteria, see Dickins 2016: 15, 23, 26, 36, 37). As a descriptive entity, a phonetic image is symbolised using ‹ ›$^{☆}$, an example of a phonetic image being ‹εg›$^{☆}$ (Figure 2). "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" (Dickins 2016: 17). "It does not bear any relationship to a phonological entity / figura.[5] Thus, if I utter the sound 'εg' 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 the phonetic image ‹εg›$^{☆}$ (cf. Dickins 2016: 21). See also Dickins (2009: 35, Def. 22) for a formal definition.

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[4] Reviewer 2 has questioned whether unascribed phonetic- and semantic-image correlates can be symbolized at all, on the grounds that if they are symbolized, they are assigned to some reality, be it only a particular graphic symbol, i.e. they gain some properties by this. I am not sure this is right, since the symbol stands *for* something, rather than representing or being a property of that thing. However, if it is right, I suggest this is better regarded as a paradox rather than a contradiction, i.e. something which we are better to live with as an 'irritant', rather than considering it to introduce an insoluble problem. Accordingly, we could think of the symbol as something which is there, but which ideally, if it were possible to symbolise without having a symbol, would not be there.

[5] In this article, and elsewhere (e.g. Dickins 2020), I have taken 'figura' and 'phonological form' to mean the same in relation to natural language. In fact, all the terminologically non-integrated terms in Figure 1 – 'utterance', 'form', 'reference', 'denotatum', 'denotable', 'referent', 'reference-type', 'denotatum-type', 'denotation', 'expression' and 'content', as well as 'figura' – can be used of both non-linguistic as well as linguistic semiotic systems. (There is a further issue, of whether 'figura' is to be taken to mean the same as 'cenological form' – i.e. phonological form, in relation to natural spoken language. This falls outside the scope of this article, but would need, ultimately, to be resolved; cf. Dickins 2009: 15, Def. 2b; 15, Def. 2b1; 15; Def. 2b1d; 35, Def. 23; and other definitions in which 'figura' and 'cenological form' occur.)

Phonetic form
As a theoretical entity, phonetic form is symbolised as *f* and can be analysed (defined) as {*i*} (Figure 1, Figure 2). As a descriptive entity, a phonetic form is symbolised using [ ]*, an example of a phonetic form being [ɛg]* (Figure 2). A phonetic form is a generalisation "from phonetic image to the entire set of phonetic images which are deemed identical apart from their time-space individuality (specificity) […]". Phonetic 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 [ɛg]*, as a general notion, rather than simply a speech sound ‹ɛg›* which was uttered in a particular place at a particular time (cf. Dickins 2016: 17). See also Dickins (2009: 35, Def. 22a) for a formal definition.

4.2 General-semantic notions

Unascribed semantic-image correlate / referent
As a theoretical notion, an unascribed semantic-image correlate / referent is symbolised using β (Figure 1, Figure 4). As a descriptive entity, an unascribed semantic image-correlate / referent can be symbolised as β^{i}, β^{ii}, β^{iii}, β^{iv}, etc, the complete set being symbolised as $\beta^{\{i\ldots n\}}$ (Figure 4). An unascribed semantic-image correlate / referent is "a model for a 'propertiless meanable entity'; all that it involves is its mere existence. Unascribed semantic-image correlate / 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)" (Dickins 2016: 15). An example of an unascribed semantic-image correlate / referent is a model for an egg (oval or round reproductive body …) without being ascribed to the category of egg (or any other category) (cf. Dickins 2016: 16).

Semantic image / denotable
As a theoretical notion, semantic image / denotable is symbolised as *j* and can be analysed as βRa (Figure 1, Figure 3), where a is an arbitrary set-forming criterion (for discussion of the difference between arbitrary and non-arbitrary set-forming criteria, see Dickins 2016: 15, 23, 26, 36, 37). As a descriptive entity, an example of a semantic image / denotable is ‹*oval or round reproductive body …*›* (Figure 4). Note that the same angle brackets, ‹ and ›, are used for semantic image / denotable as for phonetic image. The difference between them is marked by the fact that in the case of phonetic image, the element within these brackets is in plain font, while in the case of semantic image / denotable, it is in italics. The same distinction between the use of plain font and italics is made for all entities in general phonetics and general semantics (plain font for general-phonetic entities, italics for general-semantic entities), and also all entities within the morphontics and semantics of the signum ontology (plain font for morphontic entities, italics for semantic entities).[6]

A semantic image / denotable is a model for a 'propertied' meanable entity, i.e. it is a meanable entity which is ascribed to (belongs to) a category (set) of meaningful entities. Thus, while a referent (in a particular case) is a model for an oval or round reproductive body … without being ascribed to the category of oval or round reproductive body … (or any other category), a semantic image (in a particular case) is a model for an oval or round reproductive body … which

[6] Reviewer 2 has noted that given the very frequent use of italics in general writing, the fact that these are the only way in which semantic are distinguished from morphontic entities might prove problematic for readers, and perhaps even writers. I hope that this is not the case. However, it would need to be tested through the practical use of this symbolisation and consideration of reader reactions.

is ascribed to the category of 'oval or round reproductive body …'. Semantic image / denotable does not bear any relationship to a delological entity / denotation (cf. Dickins 2016: 16). See also Dickins (2009: 35, Def. 23b) for a formal definition.

Semantic form
As a theoretical notion, semantic form is symbolised as *g* and can be analysed as {*j*} (Figure 1, Figure 3). As a descriptive entity, a semantic form is symbolised using [ ]*, an example of a semantic form being [*oval or round reproductive body ...*]* (Figure 3). A semantic form is a generalisation from semantic image to the entire set of semantic images which are deemed to belong to the same category (set) (cf. Dickins 2016: 17). Semantic form provides the basic general model which allows us to describe 'meanable' entities not simply as individuals, but as more abstract generalised notions – e.g. [*oval or round reproductive body ...*]*, as a general notion, rather than simply a particular specific ‹*oval or round reproductive body ...*›* (cf. Dickins 2016: 15). See also Dickins (2009: 36, Def. 23b1) for a formal definition.

4.3 Morphontic (non-meaning-related) only notions

Phonete
As a theoretical notion, phonete is symbolised as *i*Rd (Figure 1, Figure 4). As a descriptive entity, a phonete is symbolised using ‹ ›, an example of a phonete being ‹ɛg›, as an instantiation (individual realisation) of the phonological form / figura /ɛg/) (Figure 1, Figure 3). A phonete is a phonetic image *i* (or αRa) brought into a relationship R with a phonological distinctive function d, i.e. phonological entity / phono in the system ontology (see Section 6) (cf. Dickins 2016: 22). See also Dickins (2009: 45, Def. F3d) for a formal definition.

Morphonete/form
As a theoretical notion, morphonete/form is symbolised as F, and can be analysed as (*i*Rd)Rs (Figure 1, Figure 4). As a descriptive entity, a morphonete/form is symbolised using ‹‹ ››^{E}, an example of a morphonete/form being ‹‹ɛg››^{E}, as 'simultaneously' an instantiation (individual realisation) of the phonological form / figura /ɛg/ and the signum {|egg|}^{SIG}) (Figure 4). A morphonete/form is a phonete *i*Rd brought into a relationship R with a grammatical distinctive function, i.e. grammatical entity / lexo in the system ontology (see Section 6) (cf. Dickins 2016: 33). See also Dickins (2009: 43, Def. F1b1a4) for a formal definition.

Allophone
As a theoretical notion, allophone can be analysed as *f*Rd or {*i*}Rd (Figure 1, Figure 4). As a descriptive entity, an allophone is symbolised using [ ], an example of an allophone being [ɛg], as the immediately generalised realisation of a phonological form / figura /ɛg/ (Figure 4). An allophone is a set of phonetes (a set whose members can each be analysed as *i*Rd) which are identical except for their time-space individuality (specificity) (Dickins 2016: 21). An allophone is also a phonetic form *f*, brought into a relationship with a phonological distinctive function d, i.e. with a phonological entity / phono in the system ontology (see Section 6). See also Dickins (2009: 35, Def. 23a1) for a formal definition.

Allomorphon
As a theoretical notion, allomorphon can be analysed as (*f*Rd)Rs or as ({*i*}Rd)Rs (Figure 1, Figure 4). As a descriptive entity, an allomorphon is symbolised using [[ ]], an example of an

allomorphon being [[ɛg]], as 'simultaneously' the immediately generalised realisation of the phonological form / figura /ɛg/ and the signum ⦃egg⦄^{SIG} (Figure 4). An allomorphon is a set of morphonetes/forms which are deemed identical except for their time-space individuality (specificity). An allomorphon is also an allophone *f*Rd, brought into a relationship with a lexological distinctive function s, i.e. with a lexo / lexological entity in the system ontology (cf. Dickins 2016: 34). See also Dickins (2009: 37, Def. 24b1e) for a formal definition.

Phonological form / figura
As a theoretical notion, a phonological form / figura is symbolised as *p*, or can be analysed analytically as {*f*}Rd (Figure 1, Figure 4). As a descriptive entity, a phonological form / figura is symbolised using / /^{SIG} (or / /, see below), an example of a phonological form / figura being /ɛg/^{SIG} (Figure 3). A phonological form / figura is a set of allophones, each in a relationship with a phonological distinctive function d, i.e. with a phonological entity / phono in the system ontology (see Section 6) (cf. Dickins 2016: 32). See also Dickins (2009: 15, Def. 2b) for a formal definition.

There is a one-to-one correspondence between phonological form / figura in the signum ontology and phono / phonological entity in the system ontology, a phono / phonological entity being the d, which is the right-hand term (distinctive function) in the definition of a phonological form / figura. A particular phonological form / figura is accordingly an extensional entity to which the corresponding intensional entity is the phono / phonological entity which constitutes that phonological form / figura's right-hand term, d (cf. Dickins 2016: 39). Where it is not considered important to differentiate between a phonological form / figura, as an entity in the signum ontology, and its corresponding phono / phonological entity in the system ontology, the symbolisation / / without the following superscript ^{SIG} can simply be used.

Allomorph
As a theoretical notion, allomorph can be analysed as *p*Rs or ({*f*}Rd)Rs (Figure 1, Figure 4). As a descriptive entity, an allomorph is symbolised as // //, an example of an allomorph being //ɛg// (corresponding to the phonological form / figura /ɛg/ and as a realisation of the signum ⦃egg⦄^{SIG}) (Figure 4). An allomorph is a set of allomorphons, and a secondary generalisation, i.e. a set of sets (Section 5.3.3) of morphonetes/forms (cf. Dickins 2016: 16). See also Dickins (2009: 37, Def. 24b1a) for a formal definition.

Expression
As a theoretical notion, expression is symbolised as E, and can be analysed as {*p*Rs} (Figure 1, Figure 4). As a descriptive entity, an expression is symbolised as ⦃ ⦄^{E}, an example of an allomorph being ⦃egg⦄^{E} (Figure 3). An expression is a set of allomorphs (cf. Dickins 2016: 32). See also Dickins (2009: 36, Def. 24a) for a formal definition.

4.4 Semantic (meaning-related) only notions

Delete/denotatum
As a theoretical notion, delete/denotatum is symbolised as *j*Re (Figure 1, Figure 5). As a descriptive entity, a delete/denotatum is symbolised using ‹ ›, an example of a delete/denotatum being ‹*oval or round reproductive body ...*›, as an instantiation (individual realisation) of the delological form / denotation /*oval or round reproductive body ...*/ (Figure

5). A delete is a semantic image / denotable *j* (or βRa) brought into a relationship R with a delological distinctive function e, i.e. with a delological entity/ delo in the system ontology (see Section 6) (Dickins 2016: 24).

Semonete/reference

As a theoretical entity, semonete/reference is symbolised as R, and can be analysed as (*j*Re)Rs (Figure 1, Figure 5). As a descriptive entity, a semonete/reference is symbolised using ‹‹ ››^{C}, an example of a semonete/reference being ‹‹*oval or round reproductive body ...*››^{C} (Figure 5), as 'simultaneously' an instantiation (individual realisation) of a content {|egg|}^{C}) of the delological form / denotation */oval or round reproductive body .../* and the signum {|egg|}^{SIG}. A semonete/reference is a delete/denotatum *j*Re brought into a relationship R with a grammatical distinctive function s, i.e. with a grammatical entity / lexo in the system ontology (see Section 6) (cf. Dickins 2016: 33) (cf. Dickins 2016: 33). See also Dickins (2009: 43, Def. F1b2a5) for a formal definition.

Allodele/denotatum-type

As a theoretical notion, allodele/denotatum-type can be analysed as *g*Re or as {*j*}Re (Figure 1, Figure 5). As a descriptive entity, an allodele/denotatum-type is symbolised using [ ], an example of an allodele/denotatum-type being [*oval or round reproductive body ...*] (as the immediately generalised realisation of a delological form / denotation */oval or round reproductive body .../*) (Figure 5). An allodele/denotatum-type is a set of deletes/denotata (a set whose members can each be analysed as *j*Re) which are identical except for their individuality (cf. Dickins 2016: 21, 25). An allodele/denotatum-type is also a semantic form *g*, brought into a relationship with a delological distinctive function e, i.e. with a delological entity / delo in the system ontology (see Section 6). See also Dickins (2009: 36, Def. 23c2) for a formal definition.

Allosemon/reference-type

As a theoretical notion, allosemon/reference-type can be analysed as (*g*Re)Rs or ({*j*}Re)Rs (Figure 1, Figure 5). As a descriptive entity, an allosemon/reference-type is symbolised using [[ ]], an example of an allosemon/reference being [[*oval or round reproductive body ...*]], as 'simultaneously' the immediately generalised realisation of the delological form / denotation */oval or round reproductive body .../* and the signum {|egg|}^{SIG}) (Figure 5). An allosemon/reference-type is a set of semonetes/references which are deemed identical except for their individuality. An allosemon/reference-type is also an allodele/denotatum-type *g*Re, brought into a relationship with a lexological distinctive function s, i.e. with a lexo in the system ontology (cf. Dickins 2016: 38). See also Dickins (2009: 38, Def. 24c1e) for a formal definition.

Delological form / denotation

As a theoretical notion, delological form / denotation is symbolised as *q*, and can analysed as {*g*}Re (Figure 1, Figure 5). As a descriptive entity, a delological form / denotation is symbolised using / /^{SIG} (or / /, see below), an example of a delological form / denotation being */oval or round reproductive body .../* (Figure 3). A delological form /denotation *q* is a set of allodeles/denotatum-types, each in a relationship with a delological distinctive function e, i.e. with a delological entity / delo in the system ontology (see Section 6) (cf. Dickins 2016: 32). See also Dickins (2009: 16, Def. 2c1d) for a formal definition.

There is a one-to-one correspondence between delological form / denotation in the signum ontology and delo / delological entity in the system ontology, a delo / delological entity being the e, which is the right-hand term (distinctive function) in the definition of a delological form / denotation. A particular delological form / denotation is accordingly an extensional entity to which the corresponding intensional entity is the delo / delological entity which constitutes that delological form / denotation's right-hand term, e (cf. Dickins 2016: 39). Where is it not considered important to differentiate between a delological form / denotation, as an entity in the signum ontology, and its corresponding delo / delological entity in the system ontology, the symbolisation / / without the following superscript ^{SIG} can simply be used.

Alloseme
As a theoretical notion, alloseme can be analysed as *q*Rs or ({*g*}Re)Rs (Figure 1, Figure 5). As a descriptive entity, an alloseme is symbolised using // //, an example of an alloseme being *//oval or round reproductive body ...//* (corresponding to the delological form / denotation */oval or round reproductive body .../* and as a realisation of the signum ⦃egg⦄^{SIG}) (Figure 5). An alloseme is a set of allosemons, and a secondary generalisation, i.e. a set of sets (Section 5.3.3) of semonetes/references (cf. Dickins 2016: 14). See also Dickins (2009: 37, Def. 24c1a) for a formal definition.

Content
As a theoretical notion, content is symbolised as C and can be analysed as {*q*Rs} (Figure 1, Figure 5). As a descriptive entity, a content is symbolised as ⦃ ⦄^{C}, an example of a content being ⦃*egg*⦄^{C} (Figure 5). A content is a set of allosemes (cf. Dickins 2016: 32). See also Dickins (2009: 37, Def. 24b) for a formal definition. Note that while elsewhere for semantic (content-side) entities relating to the signum ⦃egg⦄^{SIG}, I have used '*oval or round reproductive body ...*', with the content itself, i.e. the semantic 'aspect' of ⦃egg⦄^{SIG} (the signum), I have used the form '*egg*' (i.e. in ⦃*egg*⦄^{C}). The reason for this is that, while all the realisational semantic notions (alloseme, allosemon/reference-type, semonete/reference, delological form / denotation, allodele/denotatum-type, and delete/denotatum) bear a clear relation to the semantic 'area' '*oval or round reproductive body ...*', a content, as an 'aspect' of a signum does not really do so.

4.5 Both morphontic (non-meaning-related) and semantic (meaning-related) notions

Lexonete/utterance
As a theoretical entity, a lexonete/utterance is symbolised as U and can be analysed as F&R (Figure 1, Figure 6). As a descriptive entity a lexonete/utterance is symbolised using ‹‹ ››^{SIG}, an example of a lexonete/utterance being ‹‹ɛg››^{SIG} (Figure 4). A lexonete/utterance is a conjunction (biunity) of a morphonete and a semonete (cf. Dickins 2016: 28). See also Dickins (2009: 42, Def. F1b0b) for a formal definition.

Signum
As a theoretical notion, signum is symbolised as S, and can be analysed as E&C, i.e. the conjunction of an expression and a content (Figure 1, Figure 6). As a descriptive entity, a signum is symbolised as ⦃ ⦄^{SIG} (or ⦃ ⦄, see below), an example of signum being ⦃egg⦄^{SIG} (Figure 6) (cf. Dickins 2016: 8, etc.). See also Dickins (2009: 13, Def. 2a1) for a formal definition.

There is a one-to-one correspondence between signum in the signum ontology and lexo / lexological entity in the system ontology, a lexo / lexological entity being the s, which is the right-hand term (distinctive function) s in the definition of a signum. A particular signum is accordingly an extensional entity to which the corresponding intensional entity is the lexo / lexological entity which constitutes that signum's right-hand term, s (cf. Dickins 2016: 39). Where is it not considered important to differentiate between a signum, as an entity in the signum ontology, and its corresponding lexo / lexological entity in the system ontology, the symbolisation {⟦ ⟧} without the following superscript ^{SIG} can simply be used.

5. General principles

The following general principles have been used in drawing up the symbols in Section 3.

5.1 Retention of existing linguistic symbols

Where a well-established symbol already exists in linguistics (regardless of the precise definition in other approaches), e.g. [ ] for allophone, and / / for phonological entity, this has been retained within this symbology.

One exception is { }, which is fairly commonly used for 'morpheme' in other linguistic approaches. Since { } is used for 'set/class' in extended axiomatic functionalism, the use of { } for morpheme (or other types of signa) has been avoided here. I have, however, used {⟦ ⟧}, which is reminiscent of the morpheme symbol { } for signa, expressions and contents, a morpheme being a type of these.

5.2 Use of identical symbols for morphontics (expression side) and semantics (content side), and plain vs. italic text

The number of symbols has been minimised by using the same symbols for both morphontic (expression-side) and semantic (content-side) notions. Thus both an allophone and an allodele / denotatum-type are symbolised by [ ], and both a phonological form / figura and delological form / denotation are symbolised by / /. In order to distinguish morphontic (expression-side) entities from semantic (content-side) entities, morphontic entities are represented in plain text, using IPA, or other appropriate, symbols, e.g. [ɛg] as an example of an allophone, or /ɛg/ as an example of a phonological form / figura. Semantic entities, by contrast are represented in italics, e.g. [*oval or round reproductive body ...*] as an example of an allodele / denotatum-type, and */oval or round reproductive body .../* as an example of a delological form / denotation.

5.3 Degree of abstraction

A central criterion in the use of symbols is the degree of abstraction of the entity in question from linguistic reality, according to the four following levels.

5.3.1 Instantiation: i.e. direct model for speech events (level 1)

The entities at this level are:

unascribed phonetic-image correlate
phonetic image
phonete
morphonete/form
semonete/reference

delete/denotatum
semantic image/denotable
unascribed semantic-image correlate

The symbolisations of all entities at this level involve angle brackets ‹ and ›. The difference between the use of single angle brackets, ‹ and ›, and double angle brackets ‹‹ and ›› will be discussed in Section 5.4.

5.3.2 Immediate generalisation (sets) from speech events (level 2)
The entities at this level are:

phonetic form
allophone
allomorphon
allosemon/reference-type
allodele/denotatum-type
semantic form

The symbolisations of all entities at this level involve square brackets [ ]. The difference between the use of single square brackets, [and], and double square brackets, [[and]], will be discussed in Section 5.4.

5.3.3 Secondary generalisation (set of sets) from speech events (level 3)
The entities at this level are:

phonological form / figura
allomorph
alloseme
delological form / denotation

The symbolisations of all entities at this level involve forward-slanted brackets / /. The difference between the use of forward-slanted brackets, / and /, and double forward-slanted brackets, // and //, will be discussed in Section 5.4.

5.3.4 Tertiary generalisation (set of sets of sets) from speech events: signum level (level 4)
The entities at this level are:

signum
expression
content

The symbolisations of all entities at this level involve the ‘fancy’ brackets, ⦃ and ⦄.

5.4 Degree of peripherality or centrality
The symbols used also reflect their degree of peripherality or centrality to linguistics. Apart from the most basic notions, unascribed phonetic-image correlate, and unascribed semantic-image correlate, symbols in the areas ancillary to the signum ontology, i.e. the symbols in

general phonetics and general semantics, are all enclosed within a pair of single brackets, either ‹ › or [ ], with a superscript white star ✯ after them.

The symbols in the peripheral columns within the signum ontology, where the entities relate only to either distinctive function in phonology (d) or distinctive function in delology (e) are enclosed in a pair of single brackets: either ‹ ›, [ ] or / /.

The symbols in the central columns of the signum ontology, where the entities relate to distinctive function in lexology (s) and also either to distinctive function in (d) or distinctive function in delology (e), are enclosed in a pair of double brackets: either ‹‹ ››, [[ ]] or // //.

6. System ontology

As noted in Section 1, extended axiomatic functionalism has two theoretical components, the signum ontology (plus ancillary areas of general phonetics and general semantics) and the system ontology. The system ontology can be represented as in Figure 7.

Figure 7
System ontology

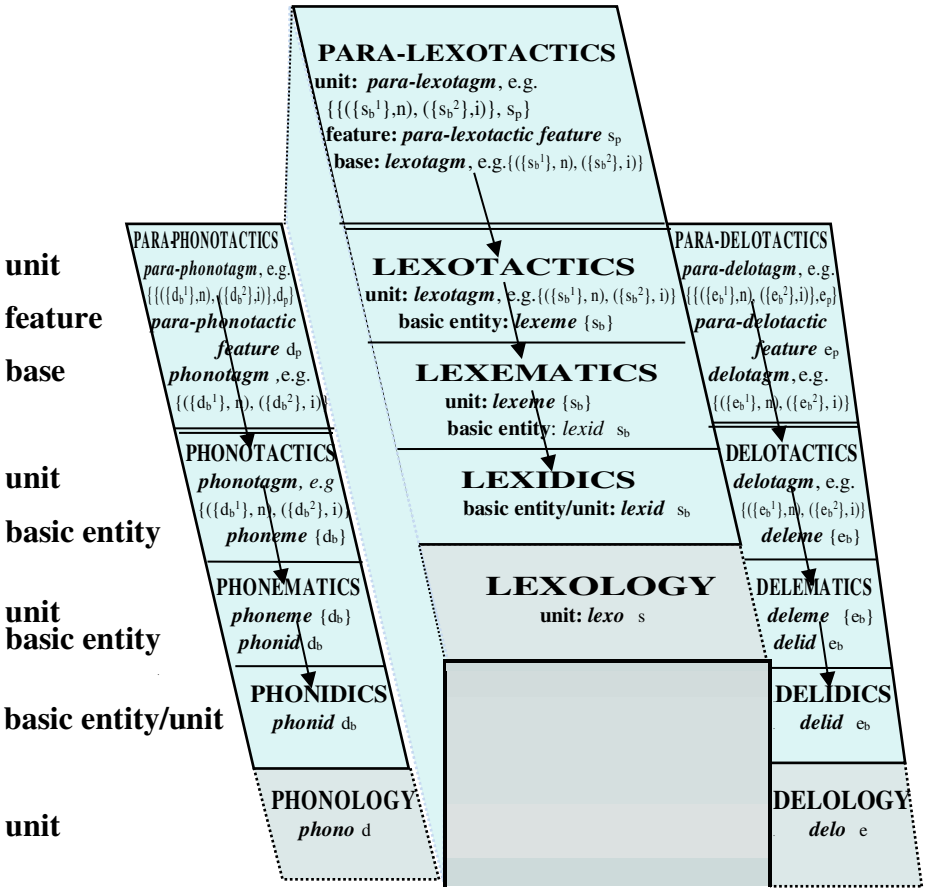
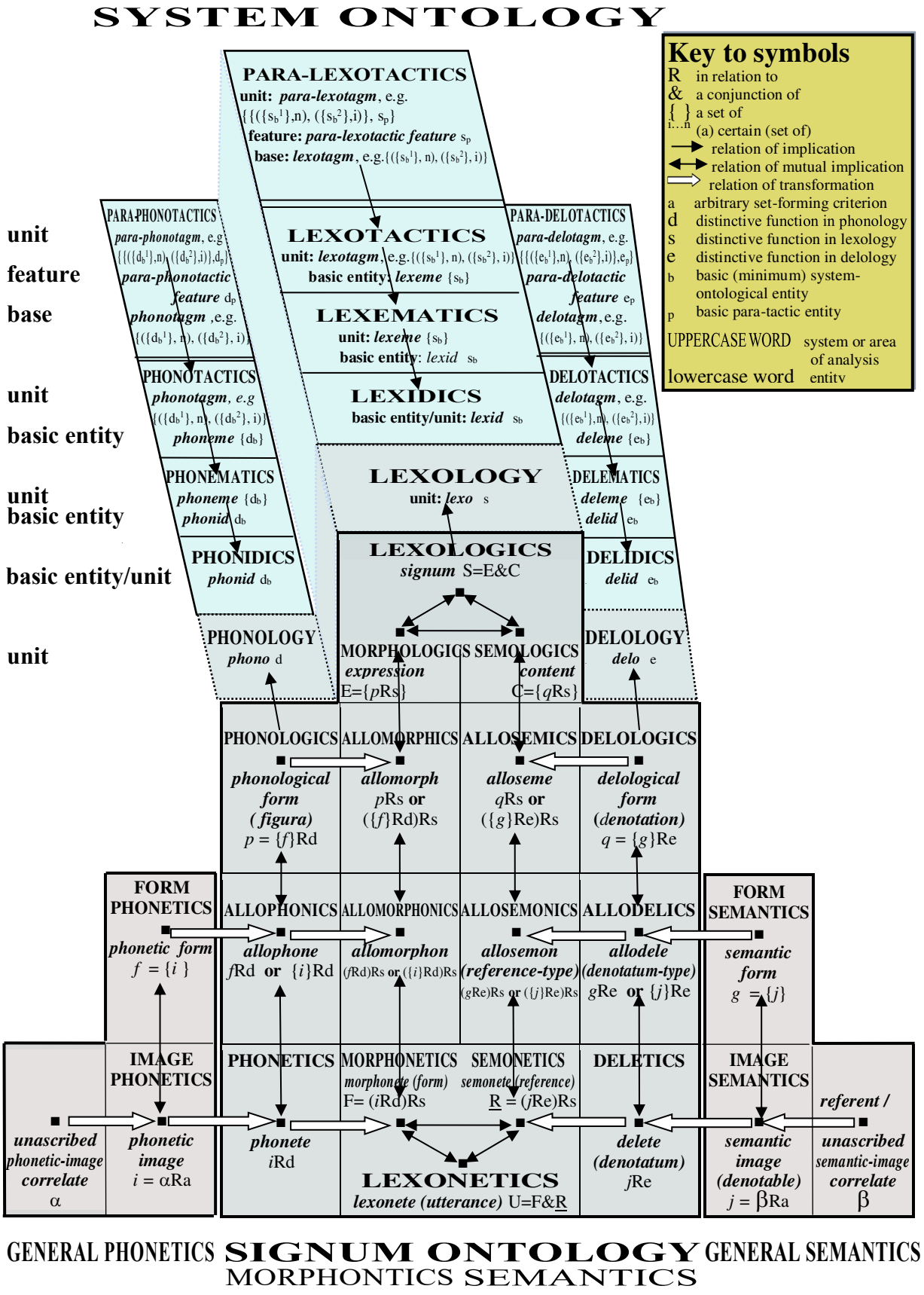


Figure 8 shows the entire theory of extended axiomatic functionalism: the signum ontology (plus general phonetics and general semantics) and the system ontology.

Figure 8
Extended axiomatic functionalism: signum ontology (plus general phonetics and general semantics) and system ontology



6.1 Proposed symbols for system ontology

The notions of the system ontology are described in detail in Dickins (2014 and 2016). Readers unfamiliar with the theory are advised to read Dickins (2014) in particular before carrying on with this article. As noted under the definitions in Figures 4 and 5 above, the entities in the system ontology – i.e. phonos / phonological entities, lexos / lexological entities, and delos / delological entities – are purely distinctive function (d, s and e). The system ontology comprises three sub-systems: phonology, lexology, and delology. For more detailed discussion of the system ontology, see Dickins 2009, 2014, and 2020).

Figure 9 re-presents the symbolisation for system-ontological entities already given in Figures 7 and 8, and provides a symbolisation for examples of phono, lexo and delo.

Figure 9
Notions in system-ontology (phonology, lexology and delology)

	Name	Symbolisation of theoretical notion	Symbolisation of example of descriptive entity
phonology	**phono (i.e. any phonological entity)**	d	/ɛg/^{SYS}
	phonid	d_b	**See Section 6.2**
	phoneme	$\{d_b\}$	
	phonotagm	e.g. $\{(\{d_b^1\}, n), (\{d_b^2\}, i)\}$	
	para-phonotactic feature	d_p	
	para-phonotagm	e.g. $\{\{(\{d_b^1\},n), (\{d_b^2\},i)\},d_p\}$	
lexology	**lexo (i.e. any lexological entity)**	s	⦃egg⦄^{SYS}
	lexid	s_b	**See Section 6.2**
	lexeme	$\{s_b\}$	
	lexotagm	e.g. $\{(\{s_b^1\}, n), (\{s_b^2\}, i)\}$	
	para-lexotactic feature	s_p	
	para-lexotagm	e.g. $\{\{(\{s_b^1\},n), (\{s_b^2\},i)\},s_p\}$	
delology	**delo (i.e. any delological entity)**	e	*/oval or round reproductive body ... /*^{SYS}
	delid	e_b	**See Section 6.2**
	deleme	$\{e_b\}$	
	delotagm	e.g. $\{(\{e_b^1\}, n), (\{e_b^2\}, i)\}$	
	para-delotactic feature	e_p	
	para-delotagm	e.g. $\{\{(\{e_b^1\},n), (\{e_b^2\},i)\},e_p\}$	

6.2 Discussion of symbols for system ontology

In Figure 9, I have provided symbolisations for examples of a phono (i.e. any phonological entity – phonid, phoneme, phonotagm, or para-phonotagm), lexo (i.e. any lexological entity – lexid, lexeme, lexotagm, or para-lexotagm), and delo (i.e. any delological entity – delid, deleme, delotagm, or para-delotagm). These can be illustrated by /ɛg/^{SYS} as an example of a phono (more specifically a phonotagm), ⦃egg⦄^{SYS} as an example of a lexo (more specifically a lexeme), and */oval or round reproductive body ... /* ^{SYS} as a delo (more specifically a delid, assuming this sense to be not further analysable delologically).

Just as slant brackets with plain text between them are used to symbolise phonological forms / figurae in the signum ontology, so slant brackets with plain text between them are used to symbolise phonos / phonological entities in the system ontology. Similarly, just as slant brackets with italic text between them are used to symbolise delological forms / denotations in the signum ontology, so slant brackets with italic text between them are used to symbolise delos / delological entities in the system ontology. Finally, just as fancy brackets with plain text between them are used to symbolise signa in the signa in the signum ontology, so fancy brackets with plain text between them are used to signify lexos / lexological entities in the system ontology.

Further, just as the symbolisation of phonological forms / figura, signa, and delological forms / denotations in the signum ontology involves a final superscript ^{SIG} (i.e. 'signum ontology) (Section 3), so a contrasting superscript ^{SYS} (i.e. 'system ontology') is used finally in the symbolisations for phonos / phonological entities, lexos / lexological entities and delos / delological entities in the system ontology. This allows for a clear and consistent differentiation between signum-ontological and system-ontological entities. Thus, /ɛg/^{SIG} is unambiguously a phonological form / figura (in the signum ontology), while the corresponding /ɛg/^{SYS} is unambiguously a phono / phonological entity (in fact a phonotagm) (in the system ontology).

Using relevant elements of the symbolisation in the 'symbolisation of theoretical notion' column, it would also be possible to construct more specific symbolisations for examples of specific descriptive entities (phonids, phonemes, phonotagms, and para-phonotagms; lexids, lexemes, lexotagms, and para-lexotagms; and delids, delemes, delotagms, and para-delotagms). Thus, using the subscript $_b$, which symbolises the notion 'phonid' in the 'symbolisation of theoretical notion' column', we could symbolise the phonid (corresponding to what is traditionally termed a 'distinctive feature' in phonology) 'voiced' in Sudanese Arabic as /voiced/$_b^{SYS}$. Similarly, we could symbolise the phoneme 'p' in English as /{p}/$_b^{SYS}$ (using the { $_b$}, from the 'symbolisation of theoretical notion' column), and the phonotagm 'ɛg' in English as /{({ɛ}, n), ({g}, i)}/^{SYS} (using the symbolisation {({ }, n), ({}, i)} from the 'symbolisation of theoretical notion' column).

Similarly, to take examples from lexology and delology, we could symbolise the lexeme 'egg' in English as ⦃{egg}⦄$_b^{SYS}$ (using the { $_b$} elements from the 'symbolisation of theoretical notion' column), and the deleme (assuming this in, in fact a deleme) 'oval or round reproductive body …' as */oval or round reproductive body .../*$_b^{SYS}$ (using the / /$_b$ elements from the 'symbolisation of theoretical notion' column).

This approach, however, would give rise to very cumbersome symbolisations, as can be seen, for example, of the symbolisation of the English phonotagm /{({ɛ}, n), ({g}, i)}/^{SYS}. Such symbolisations would also be unlikely, in practice, to add anything of value to existing, simpler alternative symbolisations. Thus, given a situation, within a piece of academic writing, in which we know that we are talking about the phonotactic analysis of 'ɛg', it is sufficient to use the simpler symbolisation {({ ɛ}, n), ({g}, i)}, merely using standard set-theoretical and relational notation, rather than th more complex /{({ɛ}, n), ({g}, i)}/^{SYS}, with an additional ^{SYS} at the end and slant brackets at the beginning and immediately before the ^{SYS}, together with standard set-theoretical and relational notation.

7. Simplified symbolisation covering system ontology and signum ontology

A further simplification is achieved by the fact that in many cases (perhaps almost all cases), there will be no need to distinguish between an entity in the system ontology and its corresponding entity in the signum ontology. In such cases, the final final ^{SYS} (signifying a system-ontological entity) or ^{SIG} (signifying a signum-ontological entity) can simply be dropped. This would give, for example, /ɛg/, meaning either the phonological form / figura /ɛg/^{SIG} in the signum ontology, or the corresponding phono / phonological entity /ɛg/^{SYS} in the system ontology (or even, in some cases, both the signum-ontological phonological form / figura /ɛg/^{SIG} and the corresponding system-ontological phono / phonological form /ɛg/^{SYS}, assuming these can be coherently talked about together in a particular context).

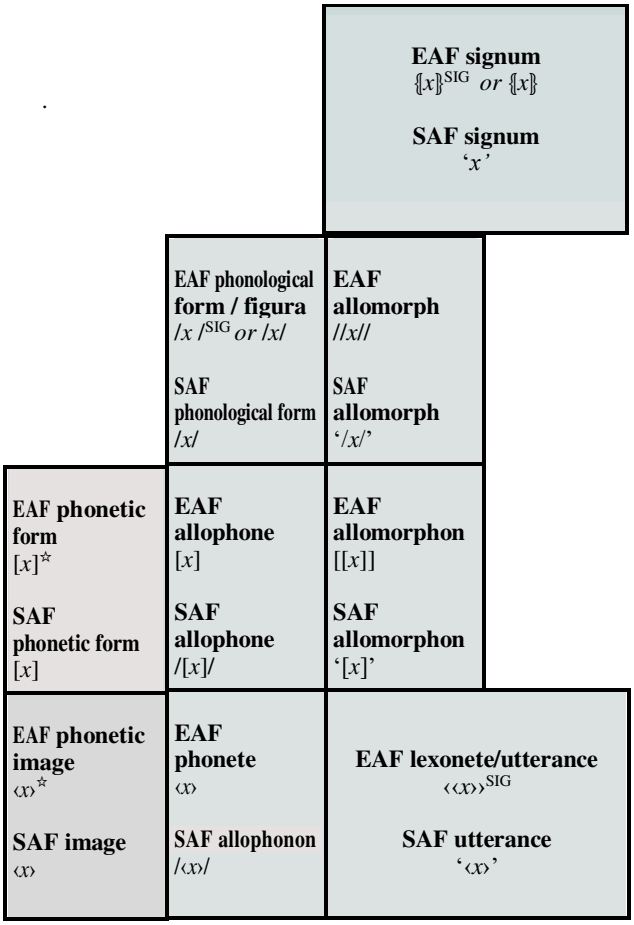
Correspondingly, in relation to lexology / the signum level, the non-necessity of using superscript ^{SYS} and ^{SIG}, would mean that in appropriate contexts, ⦃egg⦄ could be used to symbolise either (⦃egg⦄^{SYS} as a lexo / lexological entity (in fact. probably a lexeme) in the system onology, or ⦃egg⦄^{SIG} as signum in the signum ontology (or even, if appropriate, both at the same time).

8. Comparison with Mulder's symbolisation for standard axiomatic functionalism

Figure 10 below compares the symbolisation for notions in extended axiomatic functionalism ('EAF' in Figure 10), as already discussed in this article with that given by Mulder for 'standard axiomatic functionalism' ('SAF' in Figure 10), i.e. the standard version of axiomatic functionalism developed by Mulder and Hervey (in Mulder 1989: 304). Figure 10 conforms to the overall shape of the signum ontology as given in Figure 1, but only includes those entities in the signum ontology of extended axiomatic functionalism for which there are equivalents in standard axiomatic functionalism and for which Mulder (1989: 304) provides symbols. In Figure 10, *x* is used within brackets, etc. to mean 'any entity'.

Figure 10

Comparison between proposed symbolisation for extended axiomatic functionalism and Mulder's symbolisation for standard axiomatic functionalism



Almost all notions have the same name in standard axiomatic as their correspondents in extended axiomatic functionalism. The only exceptions are standard axiomatic-functionalist 'image', which is termed 'phonetic image' in extended axiomatic functionalism, and standard axiomatic-functionalist 'phonete', which is termed 'allophonon' in standard axiomatic functionalism. 'Utterance' is used in both standard and extended axiomatic functionalism, but the latter also has the synonym 'lexonete'. 'Figura', which is a synonym of 'phonological form' in extended axiomatic functionalism is a feature of the system ontology in standard axiomatic functionalism, and is therefore not included in Figure 10 (cf. Mulder and Hervey 2009: 3, Def. 2b, Def. 2b1).

The logic behind Mulder's proposed symbolisation for standard axiomatic functionalism is clear. Entities which directly model speech events (what I have termed in Section 5.3.1 'instantiations'; or 'level 1' entities) – i.e. images, allophonons and utterances – are symbolised using angle brackets ‹ ›. Entities which involve what I have termed 'immediate generalisations from speech events', also 'level 2' entities (Section 5.3.2) – phonetic forms, allophones and allomorphons – are symbolised using square brackets [ ]. Entities which

involve what I have termed ‘secondary’ generalisations (i.e. sets of sets) from speech events’, also ‘level 3’ entities (Section 5.3.3) – phonological forms and allomorphs – are symbolised using slant brackets. Entities which involve what I have termed ‘tertiary’ generalisations, also ‘level 4’ entities (i.e. sets of sets of sets), i.e. entities at the signum level (Section 5.3.4) are symbolised using single inverted commas: ‘ and ’.

Entities in standard axiomatic functionalism belonging to what I have termed ‘general phonetics’ (Figure 1) – i.e. images and phonetic forms – are symbolised using a single pair of brackets. Entities falling under the ‘phonological form’ column (what is termed in extended axiomatic functionalism ‘phonotics’; Dickins 2009: 45, Def. F3f) – i.e. phonological form, allophone and allophonon – are symbolised using slant brackets / /. Thus, the symbol for a phonological form involves only slant brackets, it being both a secondary generalisation (set of sets) from speech events and falling under the ‘phonological form’ column. The symbol for an allophone involves slant brackets and square brackets (inside the slant brackets), since it is an immediate generalisation from speech events and falls under the ‘phonological form’ column. The symbol for an allophonon involves slant brackets and angle brackets (inside the slant brackets), since it is an instantiation of a speech event and falls under the ‘phonological form’ column.

Entities falling under the ‘signum’ column (what is termed in extended axiomatic functionalism ‘lexotics’; Dickins 2009: 42. Def. F1b0d) – i.e. signum, allomorph, allomorphon and utterance – are symbolised using single inverted commas: ‘ and ’. Thus, the symbol for a signum involves only a single pair of single inverted commas, a signum being both a signum-level entity (level 4 entity) and falling under the ‘signum’ column. The symbol for an allomorph involves single inverted commas and slant brackets (inside the single inverted commas), since it is a level 3 entity and falls under the ‘signum’ column. The symbol for an allomorphon involves single inverted commas and square brackets (inside the single inverted commas), since it is an immediate generalisation from speech events (level 2 entity) and falls under the ‘signum column. The symbol for an utterance involves single inverted commas and angle brackets (inside the single inverted commas), since it is an instantiation of a speech event (level 1 entity) and falls under the ‘signum’ column.

In terms of ‘systemic consistency’ of symbolisation, there seems little to choose between Mulder’s symbolisation for standard axiomatic functionalism and the current proposed symbolisation for extended axiomatic functionalism – indeed Mulder’s system might perhaps be considered slightly more elegant and transparent. There are, however, a number of reasons why I think the symbolisation which I have proposed is better than that put forward by Mulder.

One of the principles which I identified for symbolisation (Section 5.1) was retention of existing linguistic symbols. As noted, this is achieved in the proposed symbolisation for extended axiomatic functionalism through the use of [x] for an allophone. In standard axiomatic functionalism, by contrast, an allophone is symbolised using the novel form /[*x*]/.

A further feature which I think is problematic in the symbolisation put forward by Mulder is the use of single inverted commas (‘ and ’) to symbolise a signum. Single inverted commas are used so frequently in general English writing (where they have a number of specific senses) that their use for symbolisation within a particular linguistic theory seems better

avoided, and might, indeed, prove confusing in particular contexts. These problems are avoided in the use of {{*x*}}, etc. in the symbolisation for extended axiomatic functionalism.

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