

‘CORRESPONDENCE’ IN OPTIMALITY THEORY: A REPRESENTATIONAL VIEW

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ABSTRACT: Smolensky et al. 2006 characterize the relation between levels of the grammar in Optimality Theory as one of ‘correspondence’, sometimes explicitly in the sense of Jackendoff (1997, 2003a,b). We suggest that the vagueness of ‘correspondence’, together with an implicit equation of ‘correspondence’ and ‘resemblance’, leads to a reconstruction of a very traditional view of the lexicon and the sound/meaning relation, which, following Chomsky, we refer to as the ‘Double Interface Property’ approach to language. This approach, we believe, is problematic, not only on its own terms, but also with respect to its implications for the architecture of OT. We argue that it undermines one of the unique characteristics of Optimality Theory, its radical distinction between *structures* and *relations*, to the point (we suspect) where the two are in actual fact incompatible. In previous work (e.g., Burton-Roberts 2000; Burton-Roberts & Poole 2006a,b), we have discussed the *Representational Hypothesis*, in which the relation between ‘sound’ and ‘meaning’ is characterized by the notion *m-representation*. M-representation is in part motivated by the sortal distinctness between the content of phonological features and the content of semantic features, and, as such, we believe that this concept finds a natural home within the architecture of OT. There are also various important respects in which analyses within the RH find parallels within OT, particularly with respect to the interaction of violable rules, parallels which encouraged us to compare the two.

KEYWORDS: correspondence; Saussurean arbitrariness; Representational Hypothesis.

1. INTRODUCTION

Our goal in this paper is to consider certain architectural (and conceptual) questions concerning structural descriptions within Optimality Theory. Smolensky et al. (2006: 460) describe structural descriptions within OT as having the form (I, E, \mathfrak{R}) , where I is an interpretation, E is an expression and \mathfrak{R} is the relation between them. The architecture of the

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grammar then (as we understand it) consists of a series of structural descriptions which relate linguistic levels, as illustrated by the (simplified) picture in Figure 1.²

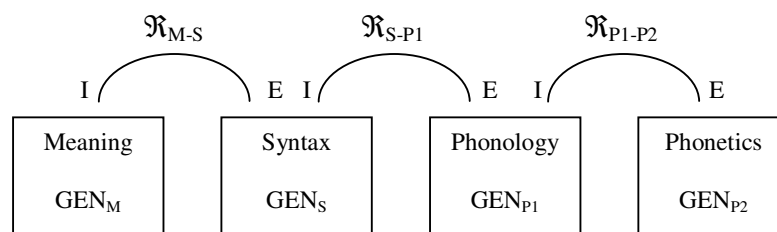


Figure 1: The Architecture of the grammar in Optimality Theory

Assuming for expository purposes that the structural descriptions are implemented serially, a given Meaning is put into a relation with a particular Syntactic form by the relation \mathfrak{R}_{M-S} . That particular Syntactic form is related to a series of linearly ordered underlying representations by \mathfrak{R}_{S-P1} .³ Then the individual underlying representations are put into a relation with individual phonetic representations by \mathfrak{R}_{P1-P2} .⁴

The relation \mathfrak{R} between interpretations and expressions is usually taken to be one of ‘correspondence’, sometimes explicitly in the sense of Jackendoff (1997; 2003a,b).⁵ However, we suggest that the vague notion ‘correspondence’, as more specifically conceived of within OT, is in actual fact an unsatisfactory characterization of the relation between *I* and *E* in several respects, and crucially undermines the radical (and, we believe, entirely correct) separation that OT makes between the products of GEN at various levels and the constraints which relate them (\mathfrak{R}).

In previous work (e.g., Burton-Roberts 2000; Burton-Roberts & Poole 2006a,b), we have proposed the *Representational Hypothesis*, in which the relation between ‘sound’ and ‘meaning’ is characterized by the notion *m-representation*.⁶ On this view, speakers produce acoustic phenomena in aid of representing, in a very traditional sense of the word, the products of their cognitive activity. M-representation, we suggest, is not only clearer and more explicit, but also embraces the radical distinction (and relations) between utterable expressions and such cognitive activity. Some such distinction, we believe lies at the core of

² Figure 1 puts aside for illustrative convenience a possible relation \mathfrak{R} between Meaning and Phonology, for example. See, e.g., Vogel (2004; 2007).

³ This assumes that Syntactic representations do not possess linear order, but see below for much discussion.

⁴ The temporal characterization of this is, as is standard, merely a *façon de parler*, and is not intended to claim that this is a processing model. Rather, the above is intended as a characterization of speakers’ knowledge.

⁵ See especially Vogel (2004; 2007).

⁶ We discuss the use of scare quotes around ‘sound’ and ‘meaning’ (and further explain ‘m-representation’) below.

Optimality Theory. Furthermore, as we will discuss, m-representation is a conventional, non-natural relation. As such, we expect (and find) that m-representational conventions can be overridden, leading to competition among violable conventions in way very reminiscent of OT.

2. SOUND/MEANING RELATIONS – A ‘DOUBLE-INTERFACE’ PICTURE

The chief concern regarding ‘correspondence’ as a characterization of the relation between interpretations and expressions is that, in our view, it covertly introduces into Optimality Theory a very traditional view of the ‘sound/meaning relation’, a view accepted by Chomsky which he refers to as the ‘double-interface property’ (DIP) of language.⁷ We have argued in previous work that the DIP approach has profoundly problematic consequences. More importantly for our present purposes, the DIP approach to language is strikingly at odds with one of the characteristic features of structural descriptions in OT – the radical separation between GEN and the constraints embodied in \mathfrak{K} – to the point of possibly being actually incompatible with it.

In Section 2.1, we first set out the DIP approach to language and review criticisms advanced in previous work, particularly Burton-Roberts & Poole (2006b). In Section 2.2 we argue that, contrary to the radical alternative that would seem to be suggested by the architecture of OT, OT in fact does implicitly retain these traditional DIP assumptions. In Section 2.3 we suggest that a key reason for this lies in the way that ‘correspondence’ is conceived of within OT.

2.1 THE DIP APPROACH TO LANGUAGE

The idea that language ‘relates sound and meaning’ goes back to at least the work of Aristotle. In this section, we outline the standard generative approach to the relation between sound and meaning: the ‘double-interface property’ (DIP) approach to language. The DIP approach to language rests on the central assumption that lexical items (and all expressions projected from them) are ‘double-interface objects’. That is, they are objects which literally contain both phonological features (interpretable at the PF-interface) and semantic features (interpretable at the LF-interface). DIP objects entail a *realizational* approach to phonology

⁷ So called because, in the Chomskyan generative tradition, the computational system explicitly relates two interfaces: Logical Form on the one hand and Phonetic Form on the other.

and thereby to the phonetic phenomena produced in speech. On this realizational approach, word order is a causal epiphenomenon of syntactic structure. The function of an expression's phonology, on this view, is to allow for the 'realization' – the external manifestation ('externalisation') – in linear time, of that expression in pronounced sound. Overall, then, the view is that the computation generates double-interface objects, i.e., objects that are both semantically interpretable and pronounceable in real time. Both DIP objects in themselves and the realizational approach to phonology that they entail, we suggest, are problematic.

2.1.1 DIP OBJECTS AND A 'MERELOGICAL' ACCOUNT OF 'THE SOUND/MEANING RELATION'

Under a DIP conception of the lexicon, lexical items are constituted by *both* features interpretable at the PF-interface (phonological features, or p-features) *and* features interpretable at the LF-interface (semantic features). This conjunction of phonological features and semantic features within a single object traces its roots (in the modern period) to the work of Saussure, and is the reconstruction of the idea that language involves "sound with a meaning" (Chomsky 1995: 2).

For example, the relationship between the concept CAT and the sound [kæt] is reconstructed by attributing to lexical items both phonological features and semantic features, and the combination is necessarily selected as a unit from the lexicon and projected onto ever larger expressions. In selecting and merging an expression, then, the syntax necessarily imports semantic and phonological features into the syntax. Essentially, then, the relation between phonology and semantics (and thus the 'sound meaning relation') is achieved *mereologically*, treating phonological features and semantic features as constitutive *parts* (or, as Chomsky (2000: 9) also says, 'aspects') of syntactic expressions.

Now it is generally recognised that the 'relation between sound and meaning' in language is a locus of Saussurean arbitrariness. While the existence of Saussurean arbitrariness is universally acknowledged, what is less often noted is its *metaphysical necessity*. This necessity arises because phonological features and semantic features are grounded in elements which are sortally distinct, in the sense of Thomason 1972. Phonological features, on the one hand, are grounded in the mental representation of sound; in other words, they have phonetic content.⁸ Semantic features and their structure, by contrast, are grounded in conceptual content and, ultimately, thought. The respective contents, and thus

⁸ Modulo, e.g., Postal (1968) and Hale & Reiss (2000), among others.

grounding, of phonology and semantics are therefore radically (indeed sortally) distinct. This is why, for example, linguistically relevant acoustic disturbances require parsing (and why parsing is fallible). Parsing is a matter of relating what *lacks* syntactico-semantic structure (namely, acoustic disturbances) with something which *does*, on the assumption that the speaker has produced the acoustic events with the intention of representing some aspect of her thought.⁹

But this, we suggest, raises serious doubts regarding the coherence of lexical items, as traditionally understood within a DIP approach to language. Given the sortal distinctness between the content of ‘sounds’ and the content of ‘meanings’, no object could possibly actually be constituted by the conjunction of both sets of properties. The content of phonology and the content of semantics make them interpretable in sortally distinct ways. But this is precisely what is suggested by traditional DIP lexical items. We take this, effectively, as a *reductio* argument against the mereological account of the so-called ‘sound/meaning relation’. It seems to us impossible *both* to subscribe to a mereological (part ~ part) account of the relation between phonology and semantics *and* at the same time acknowledge the arbitrariness of the relation between them, given that the arbitrariness has its roots in the sortal incompatibility (mutual uninterpretability) of phonological content and semantic content. Furthermore, what the mereological account does is engage in the reification of a relation. In other words, it treats what is in reality just a *relation* between distinct and necessarily separate things (phonology and semantics) as constituting an *object*, a double-interface object in which the two are combined as parts of a whole.¹⁰

2.1.2 WORD ORDER

A second problem introduced by DIP assumptions has to do with the locus and nature of word order. Word order, we argue, is undeniably a phonetic phenomenon. Like other undeniably phonetic phenomena produced by speakers, word order concerns a linear succession of *temporal* events. However, one of the consequences of a DIP approach to language, in which relevant phonetic phenomena are determined by the phonological features

⁹ Though not explicitly characterized in this fashion, we believe this sortal distinctness is at the heart of, for example, Jackendoff’s claims regarding the ‘formal incoherence’ of ‘mixed’ representations (1997: 83; 2003b: 660) and the claim within Chomskyan generative grammar that phonological features and syntactico-semantics are mutually uninterpretable (and therefore that phonological features need to be ‘stripped out’ prior to LF).

¹⁰ We of course do not deny that there is a *relation* between phonology and semantics. What we do deny is the claim that the relation is or could be mereological. This then requires an alternative conception of the relation, which we discuss in Section 3 below.

of syntactic expressions, is that an undeniably phonetic property – temporal sequence - is wrongly ‘pushed back’ into the syntax, given the realizational view that holds that the gross distribution of phonological features is a function of/determined by syntax.

Consider the role played by the syntactic computation with respect to word order. As discussed in the previous section, under a DIP approach to language, the lexicon is the locus of sound-meaning correspondences at the ‘word’ level. However, the syntax, since it plays a mediating role between sound and meaning on the DIP conception, is crucial to the enterprise of *projecting* sound-meaning correspondence compositionally onto larger units. This happens ‘literally’ in frameworks, such as standard Chomskyan generative approaches, where phonological features actually enter and are pied-piped within the syntactic computation, but is also true wherever syntax has this mediating role, as we discuss below.

Phonology thus bears a ‘realizational’ relationship to syntax on this view. In other words, the gross distribution of phonological features (word order) is *determined by* the syntactic computation, reflecting the hierarchical distribution of bundles of semantic and formal features. Empirically, occurrence at PF is taken as evidence of syntactic occurrence and linear order at PF as evidence of operations having applied in the syntax.¹¹

Consider by way of illustration a ‘default’ analysis of (1).

- (1) John bought yesterday a book about linguistics which weighed six pounds.

A book about linguistics which weighed six pounds is the direct object of *bought*, but does not appear in PF immediately following the verb, which is the linear position in which English canonically realizes the syntactic relation object-of-a-verb. One concludes from this fact that the different linear position of *a book about linguistics which weighed six pounds* in PF is the realizational epiphenomenon of a syntactic operation which relates it to some other syntactic position (whether derivationally, by movement, or representationally, by chain-formation).

In effect, then, the DIP assumption takes the correlation of linear order and hierarchical structure to be, in some sense, natural. Linear order is, in Pierce’s terms, an indexical sign of hierarchical structure, just as smoke is an indexical sign of fire. It is necessarily (exhaustively) determined by hierarchical structure. It is a caused epiphenomenon of hierarchical structure.

¹¹ Modulo some limited cases analyzed in terms of PF-movement. In fact, we believe that the need to invoke PF movement constitutes tacit acknowledgement that the ‘realizational’ view of phonology necessitated by the DIP approach is fundamentally problematic. (For, in cases where such movement is appealed to, syntax itself is no longer the determinant of word order.)

However, this view of linear order creates a similar problem to the one discussed above with respect to DIP objects: the illicit conflation of things which are separate. Temporal, linear phenomena – properties of acoustic events – are wrongly claimed to a part of the computation that does not, and cannot, possess these properties. Syntactic phenomena in and of themselves simply do not possess linear order. The head-complement relation, for example, is a syntactic relation, and it crucially is defined and holds *irrespective of linear order*. This would suggest that, contrary to the picture entailed by a DIP approach, linear order is not a natural epiphenomenon of hierarchical structure.¹²

This illicit conflation between properties of syntax and properties of phonology creates serious ‘engineering’ issues. Given the conflation inherent in the DIP approach, the syntactic computation is forced to ‘serve two masters’ (PF and LF). Reconciling the conflicting demands calls for considerable engineering to get the range of facts right. In other words, if linear order is essentially an epiphenomenal artifact of the syntactic computation, one is committed to positing a syntactic derivation which gives rise to the attested orders. Since linear order has no status in syntax, though, this must be achieved without making reference to such orders. The order must be made to fall out (as a realizational theorem) from considerations that are order-independent. This is radically illustrated by Kayne’s (1994) *Linear Correspondence Axiom*, and analyses inspired by it, and we suspect that some of the problems created by it are at the root of much of the Minimalist discussion regarding optionality and ‘PF-movement’.¹³

2.2 DOES OT REFLECT A DIP APPROACH TO LANGUAGE?

The architecture of structural descriptions in Optimality Theory appears to offer a radical alternative to the mereological DIP approach to the relation between sound and meaning. For example, consider the syntax/phonology interface. The relation between syntax and phonology within OT is *precisely that* – a relation between distinct and separate objects. Given Figure 1 above, a syntactic structure is a product of a particular GEN (GEN_S). A phonological structure, similarly, is the product of another, independent, particular GEN (GEN_P). Mediating between the two are the constraints, which determine which precise

¹² This, again, is not to say that there is, or can be, no lawful relationship between linear order and hierarchical order. In contrast to the head/complement order, *John likes Mary* and *Mary likes John* contain the same elements in a different linear order, but this is a case where the different linear orders in fact relate to different syntaxes. (See also footnote 10 and Section 3 below.)

¹³ See Burton-Roberts & Poole (2006a,b) for discussion of ‘engineering problems’ in the context of a specific phenomenon: Stylistic Fronting in Icelandic. (See also footnote 11 regarding ‘PF-movement’.)

product of GEN_{P1} is the optimal one, given a particular input from GEN_S (i.e., a specific syntactic tree). Nothing in this picture, architecturally, requires that there be a lexicon of double-interface objects, elements which literally contain features relevant for the phonology in addition to features relating to meaning.

One might instead implement the approach to the lexicon suggested by Jackendoff (2003a,b), for example, in which lexical items are themselves (very specific kinds of) interface (correspondence) rules, an alternative that would seem to be more in keeping with the radical architecture of OT.¹⁴ However, notice that, given the architectural picture in Figure 1 above, a certain redundancy inevitably arises. The lawful maintenance of the relationship between, e.g., CAT and [kæt], needs to be effected by multiple constraints: one constraint in \mathfrak{R}_{M-S} which ensures that CAT corresponds to [N cat], a second constraint in \mathfrak{R}_{S-P1} which ensures that [N cat] corresponds to /cat/ and a third in \mathfrak{R}_{P1-P2} which ensures that /cat/ corresponds to [kæt]. The first two in particular, we suggest, are an indication that DIP objects are being covertly reconstructed, and we suspect that this is because Syntax is still conceived of as playing a mediating role between semantics and phonology.¹⁵

Furthermore, there are various other indications that the potentially radical alternative given by the architecture of OT is being undermined by an implicit reconstruction of traditional double-interface assumptions. Smolensky et al., for example, note (2006: 460) that “the job of grammar is to link linguistic forms and *their* meanings” [emphasis ours – GP/NBR]. This becomes somewhat more explicit later (479) when they claim that “the minimal meaningful units of language – morphemes – are stored in a mental lexicon, including their sound structure”. Morphemes traditionally embody the conjunction of phonological and semantic properties (see for overview discussion Beard 1995, among others).

This covert reconstruction of DIP objects presents a particular problem in Optimality Theory, we suggest. If, as Smolensky et al. claim, linguistic forms *have* semantic content (have ‘meaning’ in their terms), then the idea of *linking* a linguistic form to its semantic content (its meaning) seems at best unnecessary and at worst incoherent. Semantic content, on the DIP view, simply *is* a property that the element has. There is at least no need for and at most no sense in the claim that there is a link between the two. It seems on a par with talking about linking (and claiming to *need* to link) a shirt to its colour or size. But the core definition of structural descriptions within Optimality Theory is that different levels *are* linked by the

¹⁴ But see Burton-Roberts & Poole (2006b) for some criticisms of Jackendoff’s implementation.

¹⁵ See also the discussion of ‘faithfulness’ below.

constraints that constitute \mathfrak{R} . It would seem that, not only is it the case that the architecture of Optimality Theory is not being properly exploited, but that correspondence is being conceived of in double-interface terms that flatly contradict OT's architecture of structural descriptions.

The covert reconstruction of DIP objects seems also to be entailed by certain accounts of 'faithfulness', particularly in the context of the maintenance of lawful 'sound/meaning' connections. Consider first phonological/phonetic faithfulness, as discussed by McCarthy (2002: 199). As he notes, both [dɔg] and [kæt] compete as possible realizations of the input /kæt/. The reason why [kæt] is preferred is due to faithfulness. "the /kæt/ -> [dɔg] mapping is non-optimal because it is unfaithful and brings no compensating improvement in markedness over the faithful candidate [kæt]" (ibid). Crucially, the same account in terms of faithfulness is offered at other levels (ibid).

Likewise, the mapping from the syntactic input /the man fed the cat/ to the output [the man fed the dog] cannot be optimal unless substitution of [dog] for /cat/ brings some improvement in syntactic or morphosyntactic markedness to compensate for its unfaithfulness.

However, the two concepts of faithfulness seem radically different in the two cases. In the context of a mapping from an underlying phonological representation to a phonetic representation, one can imagine an account of faithfulness framed, for example, in terms of types and tokens. The underlying representation consists of abstract linguistic types which have spatio-temporal occurrences (i.e., tokens) in phonetic representations. Faithfulness here consists in the fact that the phonetic representation consists of tokens of and only of the given (phonological) types. Thus a token *x* of type *X* might be described as 'faithful' whereas *x* thought of as a token of type *Y* is 'unfaithful'. But this is completely different from whatever notion of faithfulness enforces lawful correspondence in the case of syntax and phonology. It cannot be understood in terms of type-token because syntactic types can by definition only have *syntactic* tokens, whereas phonological types have only phonological tokens (i.e., phonetic phenomena).

It seems to us that what one is being *faithful to* in the case of syntax/phonology faithfulness is the lexical item understood as a double-interface object. The faithfulness relation must be checked against something which possesses *both* syntactic and phonological properties. A similar issue would seem to arise with respect to syntax/'meaning' faithfulness. In other words, the underlying assumption seems to be that there are lexical items which consist in the conjunction of phonological, syntactic and semantic features (cf. the above

reference to ‘morphemes’) and we would thus seem to have a reconstruction of a DIP object lexicon.

Turning now to the question of word order, it is consistent with this covert reconstruction of DIP objects within Optimality Theory that word order is generally assumed to be a syntactic property. Smolensky & Legendre (2006: 25), for example, take word order to be a syntactic property, and in fact explicitly engage in precisely the conflation between hierarchical relations and linear order noted earlier. They claim that “[i]n syntax, the *primary* relation between parts *X* and *Y* of complex structures is not *X precedes Y* but *X is embedded within Y*.” [our emphasis on ‘primary’ – GP/NBR]. They later assert (ibid.) that “[w]ord order is certainly one aspect of syntax, but not a particularly important one.”¹⁶ Equally, Smolensky et al. (2006: 466) characterize the expression *E* of a meaning/syntax mapping as being “a *sequence* of words structured into syntactic constituents...” [our emphasis – GP/NBR] ‘Sequence’ is a linear notion, again suggesting that word order is assumed (in our view, wrongly) to be a property of syntax, and that syntax is defined over double-interface objects (objects possessed of phonological features).

Vogel (2004: 406) appears to recognize a problem when he claims that:

[t]he abstract syntactic representation does not represent linear order itself. This is only represented at P. Kayne (1994) postulates the *Linear Correspondence Axiom* which expresses, as a mapping principle, that asymmetric c-command in a syntactic representation translates into precedence.

However, under the LCA, linear order is still an epiphenomenal expression of hierarchical structure. This is in fact even more the case with the LCA than under the traditional approaches we outlined in the previous section. Under the LCA, *all* departures from a universal head-initial order are assumed to involve a syntactic operation (i.e., movement of the complement, for example). As such, this is to simply restate the claim that syntax possesses linear order. The correspondence between hierarchical order and linear order is still conceived of as a *natural* one. Linear order is caused by hierarchical structure, with variable orders necessarily being the result of variable syntax.¹⁷

¹⁶ With respect to this particular claim, if precedence is in fact a part of syntax, it can hardly be an *unimportant* part. (It is ultimately one of the *functions* of syntax under the DIP approach to language.) This apparent need for qualification, we suggest, in fact reflects an implicit unease about the conflation of hierarchical relations and linear order.

¹⁷ Kayne has in fact more recently (e.g., Kayne 2009) begun to explicitly claim that word order is a syntactic property.

2.3 ‘CORRESPONDENCE’ AS THE CULPRIT

In the previous section, we argued that Optimality Theory, despite its radical separation between independently generated linguistic structures (such as “Meaning”, “Syntax”, etc. in Figure 1) and the constraints which relate them to each other, appears albeit indirectly to reconstruct the traditional double-interface assumptions which we criticized in Section 2.1. A question arises as to why this should be. Why would an idea so at odds with the very architecture of OT be reconstructed within it?

We suggest the answer lies in the vagueness of ‘correspondence’. As an account of the relation between, e.g., syntax and phonology, ‘correspondence’ is extremely vague. In fact, it posits nothing more than a relation of some kind. For that reason, it is not actually incompatible with the (more specific) mereological DIP conception of the relation discussed above. That is to say, it is perfectly consistent with a ‘correspondence’ relation, holding between a particular set of phonological features and a particular set of syntactico-semantic features, to posit a linguistic expression X constituted by both a particular semantics X_S and a particular phonology X_P . For then X_S and X_P correspond to each other in being the co-constitutive, mereological aspects of the linguistic expression X. A related pressure favouring a DIP approach, we suspect, comes from the fact that mere ‘correspondence’ between X and Y tends to imply a symmetric relation between them.¹⁸ If X merely corresponds to Y, we have no reason not to say that Y corresponds to X. This symmetry is exactly what the mereological DIP approach to lexical items implies, where it is the symmetry of the part-part relation between semantic features and phonological features (the co-parts of the DIP lexical item).

As mentioned, OT’s appeal to ‘correspondence’ seems to derive from Jackendoff, and exactly the same problem arises in the case of Jackendoff’s own Parallel Architecture proposal. The Parallel Architecture proposal was motivated by the idea that the respective contents of its three modules (phonology, syntax, semantics) are so radically distinct as to be incommensurable. (Hence, as noted in footnote 9 above, representations that ‘mix’ those contents are said to be ‘formally incoherent’.) Each module, it is claimed, is informationally encapsulated: there is nothing intrinsic to any module that serves to link it with any other. The modules are related only *extrinsically* (by ‘correspondence rules’ external to the modules themselves).

¹⁸ Though it does not entail it, as we discuss in the next section.

Now, as far as phonology is concerned, we entirely agree that the content of phonology is incommensurable with the content of syntax and semantics: they are in our terms, sortally distinct (and this is the source of Saussurean arbitrariness). However, the informational encapsulation that is claimed for the three modules of the Parallel Architecture is undermined by the fact that, for Jackendoff, ‘correspondence’ appears essentially to mean ‘being one and the same’. Consider the following remarks by Jackendoff (1997: 28) on the subject of syntax/phonology correspondence:

If syntactic constituent X_1 corresponds to phonological constituent Y_1 , and syntactic constituent X_2 corresponds to phonological constituent Y_2 , then the linear order of X_1 and X_2 preferably corresponds to the linear order of Y_1 and Y_2 .

Indeed, Jackendoff (2003b: 659) writes “for the most part syntax has the linear order of phonology but the embedding structure of semantics”.

Thus, the lawfulness of the ‘correspondence’ relation is enforced by the fact that *both* syntax *and* phonology have linear order. But then it is not clear what work is being done by the notion ‘correspondence’ or even why such a notion is necessary at all. As mentioned in the previous section, it seems at best unnecessary (if even coherent) to put something into correspondence with one of its very own properties. And this is even more odd if there are thought to be explicit rules (as in Jackendoff) or constraints (within OT) that *effect* the correspondence.¹⁹

The problem is reflected by Jackendoff’s (2003a: 224) characterization of an interface (the locus of correspondence) as “a kind of partial homology”. Homology rests on similarity. To the extent that ‘correspondence’ makes a crucial appeal to similarity, a separate interface rule that effects such correspondence is surely redundant. Similarities between X and Y rest upon properties *intrinsic* to X and to Y. It is a natural phenomenon, in the sense discussed above.

We suspect that these issues arise because, on close inspection, ‘correspondence’ actually means something rather more specific: correspondence in virtue of *resemblance*, although this is never explicitly spelled out. This is, in many respects, perfectly natural and unsurprising. Correspondences are easiest to find/establish where there is a relation of resemblance. For example, putting a series of realist paintings into correspondence with the

¹⁹ What sense there is seems to hinge on the word ‘preferably’, but that suggests that the ‘correspondence’ relation is actually trivial, and the (few?) interesting cases crucially involve *non*-correspondence. See Burton-Roberts & Poole (2006b: 624) for further discussion.

objects that inspired them is trivial. A similar exercise with a series of abstract expressionist paintings would be more difficult, and perhaps impossible.

But (implicitly) thinking of correspondences in terms of resemblance, and therefore searching for resemblances, is precisely what encourages the conflation of properties between the two things between which correspondences are sought. This is illustrated most clearly by the discussion of word order above. Linear order is undeniably a property of acoustic, temporal events. But the implicit equation of ‘correspondence’ and ‘resemblance’ means that one is tempted to the view, in some cases explicitly, that linear order is also a property of mental, hierarchical syntactic structures. Even in analyses which explicitly acknowledge the distinction between acoustic events and hierarchical structures, linear order is still nevertheless regarded as a natural epiphenomenon, caused by hierarchical structure.

This conflation represents a substantial undermining, on our view, of one of the most characteristic and innovative aspects of OT’s architecture. As mentioned above, the architecture of structural descriptions in OT emphasizes the modularity and the distinctness of the two domains being related by the correspondence rules. But, effectively, correspondence-as-resemblance merges what should be separated and trivializes the correspondence relation, perhaps to the point of being actually incompatible with the architecture of OT.

3. THE REPRESENTATIONAL HYPOTHESIS AND ‘CORRESPONDENCE’

In this section, we outline the Representational Hypothesis (RH), which offers an alternate account of ‘the sound-meaning relation’: m-representation (see, among others, Burton-Roberts (2000); Burton-Roberts & Poole (2006a,b)). The notion of m-representation is in part motivated by the sortal distinctness between the content of phonological features and the content of semantic features. As such, we believe that this concept finds a natural home within the architecture of OT, and there are various important respects in which analyses within the RH find parallels within OT, parallels which encouraged us to compare the two. We introduce ‘m-representation’ in Section 3.1 and the conventional (rather than natural) relation between hierarchical structure and linear order in Section 3.2. Section 3.3 discusses an example and highlights the similarities and differences between the Representational Hypothesis and Optimality Theory.

3.1 M-REPRESENTATION: AN INTRODUCTION

The core idea of the Representational Hypothesis is that speakers produce phonetic (or other perceptual) phenomena in aid of *representing* the objects defined by a generative computation. The RH has its source in the intuitive and entirely unoriginal idea that speakers utter sounds as a way of representing, and thus communicating, their thoughts. However, the picture that emerges once this idea is developed contrasts sharply with the traditional DIP approach to language.

One major point of divergence concerns what we mean by ‘representation’. Within the RH, ‘representation’ is intended to emphasise not just the *relation* but also the *distinction* between a representation ($R[x]$) and what-it-is-a-representation-of ($[x]$). This contrasts with the usual (non-relational) understanding of ‘representation’ in modern linguistics, in which representations are not representations *of* anything. The syntactic representation, for example, simply constitutes the syntax. We refer to this sense of ‘representation’ as ‘c-representation’, where ‘c’ is intended as a mnemonic for ‘constitutive’, and also for ‘Chomsky’, who is particularly explicit about the non-relational nature of ‘representation’ in generative grammar (see, for example, Chomsky 2000: 159).

By contrast, we refer to ‘representation’ within the RH as ‘m-representation’. ‘M’ is intended as a mnemonic for ‘Magritte’, in honour of his painting *La Traison des Images*, in which a painting of a smoker’s pipe is accompanied by the warning ‘ceci n’est pas une pipe’ (‘This is not a pipe’). This warning underscores the distinction between x (an actual smoker’s pipe) and *the representation of x* (paint on a canvas). More generally, it is a reminder that a sign itself is not, and does not include, what it is a sign of (cf. Peirce’s (1933: 136) observation that a sign must be *other than* its object). Burton-Roberts (in preparation) summarizes the Magrittean moral with the formula “ $R(x) \neq x$ ”.

Given the purely relational character of m-representation and the distinction (and separateness) of $R(x)$ and (x) , the RH is consistent with the sortal distinction between the (phonetic) content/grounding of phonological features and the (conceptual) content/grounding of semantics. Acoustic phenomena have temporal and thus linear properties, among others. Syntactico-semantic structural descriptions do not. Returning to the example discussed in the previous section, the head-complement relation is a purely hierarchical structural property, a property that phonetic phenomena lack. This, again, is the metaphysical core of Saussurian arbitrariness. The claim of the RH is that the non-hierarchical linearities of speech stand in a relation of *m-representation* to non-linear hierarchies generated by a computation.

Acoustic phenomena are thus m-representationally targeted at syntactic structural descriptions, providing access across the sortal gulf between them. Speaker-hearers do not produce or hear the (wholly mind-internal) objects manipulated/generated by the computation. What they produce and hear are perceptual m-representations of such objects. M-representation therefore distinguishes, and also explains the relation between, the sortally distinct production-by-speakers (a behavioural notion) and generation-by-the-computation (non-behavioural).

Thus, it is a conceptual impossibility for properties interpretable at the articulatory-perceptual interface (e.g., phonological features) to be present in the syntax. (Nor can they later be ‘inserted’ into syntactic (c-)representations, as in, say, Distributed Morphology.) To assume otherwise (a) constitutes a sortal (i.e., category) mistake and (b) conflates/confuses the m- representation with what it m-represents. It conflates *what* is m-represented with *how* it is physically represented. It is therefore also conceptually impossible under the RH for word order to be anything other than a property of acoustic phenomena produced in aid of m-representing generated expressions.

3.2 M-REPRESENTATION AND ‘CONVENTIONS’

Though the ‘m’ in ‘m-representation’ is intended to remind the reader of Magritte’s painting, it cannot be the case that ‘m-representation’ is precisely the relation exemplified by that painting. The ‘representation’ relation in *La Traison des Images* depends on a *resemblance* between the representation and what it is a representation of. (It is ‘iconic’ in the sense of Peirce.) However, given the radical incommensurability of acoustic phenomena and syntactico-semantic structures, there is no sense in which a relation of resemblance can obtain between them. Rather, the relation between acoustic phenomena and structural descriptions must be governed by *convention* (in the same way that the ratio of a circle’s circumference to its diameter is conventionally represented graphically as ‘ π ’, or that musical pitches are conventionally represented by notes on a staff). In Peirce’s terms, the relation is symbolic.

The RH thus does reconstruct a notion of ‘correspondence’ – if ‘correspondence’ is taken to mean no more than ‘relation’. But notice that once the distinction between iconic and conventional representation is made, it provides an entirely different and much more specific way of thinking about it. One is no longer drawn into thinking of correspondence in terms of resemblance, in the way discussed in Section 2.3 above, with the attendant postulation of conceptually questionable objects (objects that have syntax/semantics and yet are such as to

be physically utterable) and conflation of properties between levels. Furthermore, *representation* makes clear that the correspondence is asymmetric. Acoustic disturbances are physical m-representations of syntactico-semantic structures, not the reverse. Representational correspondence-by-convention, we suggest, serves as a reminder of the fundamental distinctness (and, in this case, radical incommensurability) of the two things that one is attempting to put into correspondence, a fact acknowledged when we acknowledge Saussurean arbitrariness.²⁰

More specifically, what acoustic disturbances are put into *representational* correspondence with is a conceptual-intensional system which Burton-Roberts & Poole (2006b) identify as the Language of Thought (LOT), somewhat in the sense of Fodor 1975. LOT does not contain phonological features, nor is it ‘realized’ or ‘spelled-out’ in phonetic phenomena. The RH keeps separate the functions and properties which, on the DIP view, are conflated. LOT is the locus of syntactico-semantic properties such as hierarchy, scope, semantic relations, etc., while phonology is the locus of word order and other linear/temporal/acoustic properties. What the DIP conception of language does, by contrast, is take facts about the syntax of conceptual structures in LOT and combines them (within a DIP object) with facts about the temporal succession of speech events (and the phonology that underlies that).

This representational view therefore provides an account of ‘meaning’ that reveals a certain incoherence in the expression ‘the sound-meaning relation/correspondence’. For the RH, meaning is not a *property* of anything; meaning is a *relation* - one in which one of the *relata* is a syntactically structured conceptual object generated by LOT (something that could be entertained as a thought, the object of a propositional attitude). Although we generally talk of things (e.g., words) as ‘having meaning’, the RH holds that the meaning consists the relation of that thing (in the mental life of an individual) to the semantic content of a thought. Thus, to speak of ‘sound/meaning’ correspondences is, strictly speaking, to treat the relation as one of the terms of the relation (as one of the *relata*). ‘Meaning’ is the relationship between sound and something else. That ‘something else’ is a semantic content. To say that the sound [kaet] *means* CAT is to say that there is a relation (meaning) between the sound and the semantic content.

²⁰ In being asymmetric, m-representation is similar to Saussure’s *signifiant/signifié* relation. However, the RH rejects Saussure’s contention that the two are *parts* of a whole called ‘the sign’ (effectively the DIP assumption). Rather than the mereological combination of *signifiant* and *signifié*, the sign is, by contrast, the *significant* itself (see Burton-Roberts 2000; in preparation for discussion).

Thus the RH sees speech sounds as *signs* of expressions generated by the computation. They are symbolic, representational signs. This implies that the relation is established by representational convention/rule. This representational view contrasts radically with the realizational view implied by DIP. Insofar as the latter *can* be interpreted as viewing speech sounds as signs of a generative computation, the DIP treats them as natural/indexical (and thus not representational) signs, much as smoke is a natural/indexical sign of fire, a caused epiphenomenon of fire.²¹ As non-natural signs, the RH expects variation in the relation between speech sounds and syntactico-semantic structures, and the ability of the conventions which govern the relation to be overridden (as in the example of Heavy NP Shift in (1) above).

Interestingly, the richer (representational) conception of phonology required by the RH, which we refer to as \mathfrak{R} -phonology (following Poole & Burton-Roberts (2004) and Burton-Roberts & Poole (2006a,b)), in fact has some resonances with ideas within Optimality Theory. For example, the Richness of the Base hypothesis falls out as a matter of conceptual necessity. There are not and cannot be any language-specific aspects to the Language of Thought. All language-specific characteristics *must* reside within the conventions which relate LOT to the m-representational acoustic disturbances. Since the conventions dictate what counts as a well-formed m-representational phonetic string (in a given language) it is reasonable to think of the conventions/rules as phonologically constituted. The claim of the RH, then, is that particular languages are the locus of phonology; they are (\mathfrak{R} -)phonological systems. Thus, the relation between the syntactic-semantic and the phonological is parallel to (and indeed the same as) the relation between the innate generative system (LOT) and particular languages.

Individual languages, on our view, are phonologically constituted systems of conventions for phonetic representation of the universal LOT. Since the ways in which individual languages acoustically m-represent LOT vary (the variability being an inevitable concomitant of Saussurian arbitrariness), individual languages will have different, though potentially partially overlapping, sets of conventions. For example, Icelandic shares with English a default convention for the m-representation of the head-complement relation (discussed in the next section) by which the m-representation of a head ($\mathfrak{R}[H]$) immediately precedes (rather than follows) the m-representation of the complement which it selects ($\mathfrak{R}[C]$).

²¹ Cf. Chomsky's (1995: 221-2) discussion of 'displacement', which speaks of 'objects' which then 'appear in the sensory output'.

3.3 AN EXAMPLE

We were made to think about the architecture of OT in the light of the RH by the fact that, in trying to articulate the considerations that had to be taken into account in defining what counts as a well formed (English) m-representation, we found ourselves positing rules (conventions) that could be overridden by others. There seemed to be competition among conventions, in short - a competition reminiscent of OT. By way of illustrating this, we now outline an RH account, discussed briefly in Burton-Roberts & Poole (2006b: fn. 40), of an example which was brought to our attention by discussion in Cormack & Smith (1999; 2000):

(2) You can't often bribe officials these days.

Consider first the relative scope among certain elements of (2). Cormack & Smith claim, and we agree, that in (2) sentential negation has wider scope than the adverb *often*, and both have wider scope than modality:

(3) NEG > OFTEN > POSS

Under traditional assumptions concerning scope, relative scope reflects asymmetric hierarchical relations at the level of Logical Form. Furthermore, asymmetric hierarchical relations are in turn reflected in linear precedence in English. However, this conjunction of assumptions is seemingly not adhered to in the linear order of the relevant items.

(4) can > n't > often

Both sentential negation and the adverb have wider scope than would be expected, given the linear order of (4). The analysis of the 'mismatch' exhibited by (2) from the perspective of the RH crucially involves violability, and so has clear resonances with Optimality Theory.

Poole & Burton-Roberts (2004) introduce two precedence conventions which govern the linear order of m-representations ($\mathfrak{R}[x]$). Default Precedence Convention 1 is the RH analogue to the head-parameter within Chomskyan generative grammar:

(5) Default Precedence Convention 1

Symmetric c-command between a Head (H) and its Complement (C) is m-represented by the m-representation-of-H - \Re [H] - being adjacent to and preceding the m-representation-of-C - \Re [C].

Note crucially, however, that it is not H and C which are linearly ordered. (The Language of Thought has no linear order.) It is only their physical m-representations which, of necessity, have order. (Other languages, such as Japanese or Turkish, have a variant of the convention in (5), in which \Re [H] *follows* \Re [C].) Default Precedence Convention 2 concerns *asymmetric* c-command, and is the RH analogue to the familiar relationship between asymmetric c-command and linear order:

(6) Default Precedence Convention 2

Asymmetric c-command between elements *X* and *Y* is to be m-represented by \Re [X] preceding \Re [Y].

Given (5) and (6), just as under traditional assumptions, the linear order exhibited in (2)/(4) is not the expected one given the scope relations in (3). However, these conventions, insofar as they are merely default conventions, may be overridden as they are explicitly non-natural/non-indexical relations in the sense discussed above.

But before coming to what motivates the departure from (5) and (6), notice that there is another sentence, synonymous with (2), in which POSS is represented by the adjective *possible*.

(7) It is *not often possible* to bribe officials these days.

In (7), in contrast to (2), we see that the hierarchical scope relations of LOT, among at least NEG, the adverb and POSS, *are* represented in a way that conforms to (5) and (6). *Not* precedes *often*, which precedes *possible*. However, even here, we see that there are conventions which are overridden. Assuming that external arguments are hierarchically superior to complements (*possible* being the complement in this case), and that *to bribe*

officials m-represents the external argument, the sentence that most fully conforms to both conventions is in fact (8):²²

(8) To bribe officials is not often possible these days.

(8) is optimal in conforming to (5) and (6). (7), by contrast, is not. However, (7) does conform to what appears to be a pressure in English to delay ‘heavy subjects’.^{23, 24}

(9) Delay Heavy Subjects

‘Heavy subjects’ should be m-representationally delayed in time/order. (A subject that is the representation of a propositional form functioning as an argument in a higher proposition (i.e., a clausal subject) is a heavy subject.)

But (7) conforms to the pressure in (9) at the cost of including a non-representational element (the expletive *it*); that is, an element of the representation which does not correspond to anything in LOT. We assume that, like dependency-related Faithfulness constraints within OT, this is also not favoured.

(10) Minimize non-representational elements

Representations which contain elements which do not correspond to anything in LOT are dispreferred.

The inclusion of *it* is necessitated by the delay, given a (familiar) convention of English concerning the representation of subjects:

(11) English Subject Convention

²² (7) and (8) underline one respect in which (we assume) the RH differs from Optimality Theory. Since (7) and (8) are both licit m-representations of the same formula of the Language of Thought, they are competitors. Since both (7) and (8) are grammatical, we assume that they could not be competitors in OT, unless an analysis in terms of constraint ties were proposed. Insofar as, on the OT conception, the linear orders derive from different syntactic trees, this seems unproblematic. This does, though, potentially raise questions about the precise content of ‘Meaning’ in Figure 1, since presumably two Meaning ‘inputs’ are required in order to produce the two output syntactic trees, again unless an analysis in terms of constraint ties were contemplated.

²³ Thus, ‘subject’ here is a representational notion. Formulae of the Language of Thought do not have subjects.

²⁴ We refer to (9) and (10) below as ‘pressures’ rather than ‘conventions’ based on an intuition that they differ in some respect from (5) and (6), but we believe that nothing in the discussion hinges on it. Distinguishing the two empirically could well be difficult, given that conventions, like constraints in OT, can be overridden.

M-representations of propositions which contain an m-representation of tense must contain a pre-verbal subject.

Given these conventions and pressures, (7) and (8) are, in their different ways, equally optimal and thus both are possible/acceptable m-representations of the relevant LOT formula.²⁵

Returning now to (2), the important distinction between (2) and (7) lies in the representation of modality. Both *possible* and *can* are sanctioned m-representations of the predicate POSS. *Possible* is an m-representation of just that predicate. *Can*, by contrast, is a combined m-representation of both POSS and (present) tense. In other words, it is a verb.

The licensing of *can* as an m-representation of POSS follows from (and is only possible because of) the speaker's stylistic choice to m-represent arbitrary reference by *you*. Crucially, this choice is a way of satisfying (11) while conforming to (10) without having to succumb to the pressure in (9). But given m-representation of POSS by *can*, a convention governing the m-representation of sentential negation becomes relevant:²⁶

(12) Convention on wide-scope negation

Wide-scope (as opposed to constituent) negation is m-represented as a contractible clitic on \mathfrak{R} [PRES/PAST].

In the case of (2), \mathfrak{R} [PRES/PAST] is *can*, with the application of (12) yielding *can't*.

With respect to the linear position of [can't], we assume with Cormack & Smith that the relevant conceptual-intentional properties m-represented by [can't] are structured as in (13):

(13) [PRES [NEG [POSS]]]

In other words, tense has scope over negation which has scope over POSS. Given this, the linear order in (2), with *can't* placed immediately after the subject *you*, is consistent with what the Default Precedence Convention in (6) would ordain for both the m-representation of PRES and the m-representation of NEG (under the assumption that NEG is an instantiation of

²⁵ The pressure to delay 'heavy subjects', though, is strong enough, for us at least, to make (7) the more acceptable. Strength of pressure can be expected to differ from speaker to speaker.

²⁶ Unlike the conventions in (5) and (6), (12) is not itself directly concerned with the m-representation of an aspect of LOT. It is therefore not a 'strictly representational' convention.

polarity), but not for the m-representation of POSS. In this case, adherence to (6) for POSS is overridden by adherence to (12).

In summary, what we appear to have is a complex interaction between conventions and pressures. It seems that, in a given representation, not all *conventions* and *pressures* can be satisfied simultaneously, given certain *stylistic choices*. Though Optimality Theory has a different notion of candidature, and therefore does not have exactly the same issues with respect to (2), (7) and (8), (particularly with respect to stylistic choices), the interaction of violable constraints seems to us reminiscent of OT and its conception of constraints.

4. CONCLUSION

As is hopefully clear from the discussion in the previous section, OT and the RH would seem to have a number of things in common. We assume, for example, that the interested reader would have no difficulty in translating the RH analysis given above into an Optimality Theoretic one. At the heart of both the RH and OT is the interaction of language-specific conventions/constraints, some of which are violated as a consequence of adherence to other, more marked ones. And the general architecture of OT, with its distinction between objects and relations, seems to us to be a more desirable and coherent conception than the standard Chomskyan generative one, which we have criticized at greater length elsewhere.

The Representational Hypothesis emphasizes the sortal distinctness between the two domains ('sound' and 'meaning') which language attempts to relate. This requires, among other things, an explicit account of the nature of the relationship which both *distinguishes* and *relates* the two domains. M-representation, as we outlined in Section 3, underscores the sortal distinctness between phonology and semantics, explaining *why* they should be sortally distinct and what the relation is between them. Acoustic disturbances are conventionally representationally targeted at the syntactico-semantic computation of the Language of Thought.

This would seem to have a number of additional advantages as a conception of the relation \mathfrak{R} within the structural descriptions of Optimality Theory. The Richness of the Base hypothesis falls out as a conceptual necessity given the architecture of the Representational Hypothesis. Furthermore, some aspects of the RH beyond m-representation (such as the 'direct' m-representational connection between the Language of Thought and phonology, without the mediating role of an 'autonomous' syntactic computation) might address an

otherwise curious redundancy in the constraints of \mathfrak{R}_{M-S} vs \mathfrak{R}_{S-P} , as well as allowing a clearer conception of Faithfulness to be articulated.

In any case, we think that this is preferable to the conception of ‘correspondence’ within Optimality Theory. We suggested in Section 2 above that it is this conception of \mathfrak{R} , in particular the way in which it is tacitly interpreted as correspondence-by-resemblance, which leads to the covert reconstruction of a traditional DIP approach to language. The DIP approach, we suggest, is problematic, not only on its own terms, but also with respect to its implications for the architecture of OT. It undermines one of the unique characteristics of Optimality Theory, its radical distinction between *structures* and *relations*, to the point (we suspect) where the two are in actual fact incompatible.

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