ON PHASES, PHASE HEADS, AND FUNCTIONAL CATEGORIES

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1. Introduction: Three Core Functional Categories, three asymmetries

Amongst the many problems facing a minimalist theory of functional categories is the existence of a number of unexpected asymmetries characterizing the Core Functional Categories (CFCs) of Chomsky's (DbP, OP)[1] clausal skeleton. For each of the three possible pairings of the three CFCs (i.e. C, T and *v*), there is a property that defines that pair of categories to the exclusion of the third category.

Firstly, the pair of heads C and *v* cluster together as defining phases: C and *v* are argued to be phase heads, whereas T is not (MI, DbP, BEA, OP).

(1) Phase heads
 a. [+ phase]: C, *v*(*)
 b. [− phase]: T

Secondly, C and T share the property of defining Merge-sites for expletives (the 'Merge-Expl' property), whereas *v* is assumed to lack this property (i.e., there is no *v*P-Expl); see MP: 364-5, MI: 109, and section 4.4 below.

(2) <u>Merge-Expl</u>
 a. [+ Merge-Expl]: C, T
 b. [− Merge-Expl]: *v*

Finally, the remaining pair (T, *v*) defines a subset of CFCs which have a defective (i.e. φ-incomplete) counterpart: T_{def} and v_{def} are assumed to exist, whereas C_{def} does not.[2]

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[1] In the following, MP = Chomsky 1995, MI = Chomsky 2000, DbP = Chomsky 2001, BEA = Chomsky 2004, OP = Chomsky 2005.

[2] This third asymmetry is rarely noted in the literature; I have found only one other mention, in Gallego 2005: 2, fn. 3. It should also be noted that the lack of a φ-defective counterpart for C is trivial and unsurprising insofar as C is not a φ-probe at all (as in MI, DbP, where T and *v* are the locus of φ-probes and thus Case/agreement). However, it becomes nontrivial and unexpected in a system such as that put forward in OP, in which C is the locus of the φ-probe, inherited by T. Further, if Probe-Goal Agree is involved in implementing A-bar type as well as φ-/A-type relations, then any intermediate/non-*wh* C will be defective for the relevant A-bar probe; that is, C_{def} does exist in this sense. Therefore, 'defective' for our purposes should be taken to refer specifically to φ-defectiveness.

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(3) Defectiveness: existence of a defective/nondefective alternation
  a. [+ [+/− defective]]: T, *v*
  b. [− [+/− defective]]: C

Clearly, if we are to attain a deeper understanding of the CFC system, we need to find principled explanations for these asymmetries, i.e. for why the CFCs pattern together in these particular ways. Ideally, we might also seek to reduce the three asymmetries to a single source. In this paper, I argue that phase theory holds the key to explaining the various pairings and properties of (1)-(3). In particular, by reconsidering the notions of phases and phase heads (Chomsky MI, DbP, OP), I show that these disparate and shared properties fall out from the basic composition of phases themselves. Ultimately, the asymmetries in (2) and (3) will be reduced to (1) – that is, all of these properties are properties of phase heads.

We proceed as follows. Section 2 reviews the historical development of phases through Chomsky's recent work, highlighting the conceptual problems faced by the theory. Section 3 suggests that we can remove these problems by returning to Chomsky's original (MI) conception of phases as lexical subarrays. Section 4 then demonstrates how this revised view of phases sheds light on and derives the remaining properties of phases that have to be stipulated under existing approaches, in particular those encoded in the various formulations of the Phase Impenetrability Condition (PIC). Having reduced the PIC to its ineliminable core, we then conclude with a comparison of the present proposals – which essentially eliminate the notion of phase head – with Chomsky's recent (OP) claims that phase heads are the engine of the derivation and the locus of φ-features.

2. Phases as lexical subarrays

As originally conceived (MI: 106ff.), phases are subarrays of the numeration, thus yielding 'closed systems' for external merge. That is, a phasal array defines the domain in which Merge is predicted to pre-empt Move, deriving the Merge-over-Move (MOM) effect in (4a) and its absence in (4b-c).

(4) a. *There is likely [$_\alpha$ a proof to be discovered *(a proof)*]
  b. There is a possibility [$_\alpha$ that proofs will be discovered *(proofs)*]
  c. Which article is there some hope [$_\alpha$ that someone will read *(which article)*]

If MOM is defined over the entire numeration, then Move of the internal argument (*a proof/proofs/which article*) should be blocked by the possibility of Merge-Expl at stage α in (4a), (4b) and (4c) alike. Therefore, Chomsky proposes that only a subset of the numeration (a lexical subarray, LA) is placed in the active workspace of a derivation. When one LA is exhausted, then the next is extracted from the numeration and placed in active memory; in this way, the difference between (4a) and (4b-c) will follow insofar as α defines such a *phase* of the derivation in (4b-c) but not in (4a). That is, T_{def} (= α in (4a)) is not formed from a distinct LA, whereas C (= α in (4b-c)) is. It is therefore possible for Expl to be excluded from the relevant workspace from which α is constructed in (4b-c) but not in (4a). Hence MOM effects obtain only in (4a), since here the entire structure is the only phase – a single LA.

The next question that arises is how the phases are defined. Chomsky (MI: 106, DbP: 12) suggests such criteria as 'independence' at the interface, or 'propositionality', so that C(P) and *v*(P) are the phases: *v*P corresponds to full argument structure, and CP is the full clause including tense and force. Each phasal LA is then assumed to contain exactly one instance of exactly one of the phase heads (i.e. either C or *v*). Setting aside the widely noted problems with this definition of phasehood (see, e.g., Bošković 2002, Abels 2003, Matushansky 2003, Boeckx & Grohmann 2005, Epstein 2006), not least of which is the troubling discrepancy between the entities defined as phases (i.e. CP/*v*P) and those which are actually spelled out (transferred) and which should therefore define the 'independent' categories at the interface (i.e. TP/VP; we return to this point below), a major issue for this approach is the question of whether passive/unaccusative *v* should also be taken to define a phase along with transitive *v**. The availability of long-distance agreement in expletive-associate constructions suggests that it cannot be, given basic assumptions about the computational properties of phases.

As conceived by Chomsky, phases (C and *v*) represent points at which the existing syntactic object is accessed and evaluated by the interface components, thereby rendering the domain (complement) of the previous phase inaccessible to further operations, in accordance (some version of) the Phase Impenetrability Condition (PIC). Two distinct versions of the PIC are proposed by Chomsky. The original definition, given in MI: 108, is stated as follows (I adopt Müller's (2004) convention and refer to this version of PIC as PIC_1):

(5) *Phase Impenetrability Condition$_1$* (MI version: PIC_1)
In phase α with head H, the domain of H is not accessible to operations outside α; only H and its edge are accessible to such operations.

This yields the search space pattern in (6) (again based on Müller 2004), where phase heads are <u>underlined</u> and the search space of the nonphase head selecting H is given in **bold**:

(6) <u>Search space available to nonphase head X</u>:
<u>Z</u> [$_{XP}$ … X [$_{\mathbf{HP}}$ **…** **<u>H</u>** [$_{YP}$ … Y [$_{WP}$ … <u>W</u> …]]]]

That is, the domain of the phase head H (=YP) is spelled out as soon as HP is complete and thus the next head (X) is merged, rendering YP (and anything it contains) inaccessible to search by a probe on X. Substituting Z/X/H for the CFCs C/T/*v*, this entails that T (= X) cannot see into the complement of a phasal *v* (i.e. into VP).[3] Consequently, the existence of T-associate Agree in expletive existentials such as (7) would seem to exclude nontransitive *v*

[3] This is assuming that Agree, as well as Move, is barred into/out of a lower phase. In OP, it is suggested that only Move (out of a lower phase) is barred, leaving open the possibility of Agree into a phase that has already been transferred. However, since the unvalued feature on the would-be goal of any such transphasal Agree operation should crash at the lower phase level, I assume this option to in fact be barred.

from the class of phases.

(7) a. There T [$_{v/\mathrm{VP}}$ arrived [$_{\mathrm{DP}}$ a man]]
b. Agree(T, *a man*) →
[$\mathrm{T}_{[\phi,\ (\mathrm{EPP})]}$ ... $\mathrm{DP}_{[\phi,\ \cancel{\mathrm{Case}}]}$]

If passive/unaccusative *v*P is a phase, then Agree(T, *a man*) should be blocked since it involves Agree into a lower phase (a phasal domain which has already been spelled out, namely VP). Hence, for Chomsky/MI, *v* is not a phase, unlike transitive *v**.

Nevertheless, several objections can be raised to this conclusion. Firstly, there are numerous empirical arguments that v_{def} (i.e. passive/unaccusative *v*) behaves identically to transitive *v** in terms of the PIC: it provides the same reconstruction sites characteristic of an intermediate phase edge (see Fox 2002, Legate 2003), and allows for the same freedom of reordering of verb and object as other transphasal movements (Richards 2004, 2006a). Further, it is surely the case that passive/unaccusative *v*P has as much semantic-phonetic integrity as *v**P (i.e. PF-isolability and full argument structure at LF, its single θ-role having been discharged), and should therefore meet the propositionality criterion for phasehood (cf. Richards 2004, Epstein 2006). For such reasons, Chomsky (DbP:12) introduces a distinction between *strong* and *weak* phases. The latter are phases only in the 'propositional' sense; they do not 'count' for determining points of spell-out under PIC. C and transitive *v**, then, are strong phases, whereas passive/unaccusative *v* is a weak phase.

This new distinction is, however, dubious on numerous grounds. For one, it fails to explain the shared behaviour between v_{def} and *v** in the empirical domains mentioned above (reconstruction, linearization, etc.), since these rely on v_{def} performing as a *strong* phase (thus providing a phase-edge landing site). The extra strong/weak technology is, further, insufficient to allow for Agree across a strong phase boundary, such as that which obtains in Icelandic 'DAT-NOM' constructions involving quirky subjects and nominative objects (Taraldsen 1995, Sigurðsson 1996 and many others). Here, (number) agreement between T and the in-situ nominative object indicates T-Agree across a strong, *v** phase, as in (8).

(8) <u>Icelandic DAT-NOM constructions</u>
a. $\mathrm{Her}_{\mathrm{DAT}}$ T [$_{v^*\mathrm{P}}$ $\mathrm{bored}_{3\mathrm{pl}}$ [$_{\mathrm{DP}}$ $\mathrm{they}_{\mathrm{NOM}}$]]
b. Agree(T, *they*) →
[$\mathrm{T}_{[\phi,\ (\mathrm{EPP})]}$ ... $\mathrm{DP}_{[\phi,\ \cancel{\mathrm{Case}}]}$]

To allow for such Agree, Chomsky (DbP) proposes a revision to the MI version of PIC, such that only phase heads should count as the triggers of spell-out (thus transfer of HP occurs not at X/T but at Z/C). The relevant definition is given in (9); following Müller 2004, I dub this PIC_2, which has the search-space profile in (10).

(9) *Phase Impenetrability Condition$_2$* (DbP version: PIC$_2$)
[Given structure [$_{ZP}$ Z … [$_{HP}$ α [H YP]]], with H and Z the heads of phases – MDR]: The domain of H is not accessible to operations at ZP; only H and its edge are accessible to such operations.

(10) Search space available to nonphase head X:
Z [$_{XP}$ … X [$_{HP}$ … H [$_{YP}$ … Y [$_{WP}$ … W …]]]]

As a comparison of (10) with (6) readily reveals, the effect of delaying transfer until the next ('strong') phase level is that the search space of the non-phase head (X = T) is extended. Whereas under (5)/(6), VP was inaccessible to T, now T can see right down into the complement of V. Thus (9)/(10) renders the internal argument accessible to T – the correct empirical result, for (7) *as well as* (8). As I point out in Richards 2004, PIC$_2$ therefore has the desirable consequence of rendering the already dubious (and ineffectual) weak/strong distinction conceptually redundant – (7) and (8) instantiate identical configurations under PIC$_2$, and thus passive/unaccusative *v*P can be a ('strong') phase after all. Since this is indeed what we find (i.e. the evidence presented by Fox, Legate, and Richards, cited above), PIC$_2$ is to be preferred on empirical grounds.

However, there may yet be conceptual grounds for maintaining PIC$_1$ over PIC$_2$ (and, indeed, for rejecting both of them). Firstly, as Müller argues, PIC$_2$ would seem to be a 'weaker' formulation than PIC$_1$ since it increases X's search space and thus the amount of structure that has to be kept in active memory for longer. Since a major conceptual argument for phases is the reduction in computational burden that can be afforded by allowing the system to periodically 'forget' derivational information (see, e.g., BEA: 4, OP: 9), this 'weakening' of the PIC arguably undermines the computational rationale for having phases in the first place.

More generally, phases and PIC (i.e. cyclic transfer) are supposed to conform to the Strong Minimalist Thesis (SMT), which means that they should facilitate and optimize the mapping to the interfaces (such as by reducing operative complexity, as above, etc.). As such, PIC should have the status of a natural, necessary principle. It therefore sits rather uncomfortably with this that two nontrivially different formulations of the PIC exist. Ideally, there should be no room for such equivocation, since the PIC dichotomy could well mask a deeper conceptual flaw undermining the entire enterprise. Perhaps, then, both formulations are equally optimal, in some sense (cf. Uriagereka 1999 on alternative formulations of the LCA)? This seems unlikely, since whilst it may well be true that some notion of PIC and phase edge follows from SMT (see OP: 8-9 and section 4 below), the current formulations ((5) and (9)) are rife with stipulations. These stipulated, as yet unexplained, properties are listed in (11).

(11) a. the size of the search space for nonphase heads (X in (5)/(9))
b. the size of the spelled-out unit ('phasal domain')
c. the size and accessibility of the edge

d. the timing of spell-out of the lower phasal domain (HP in (5)/(9))
e. the identity of the phase heads (as C and *v*), which does not follow from (5)/(9) but requires independent determination (e.g. the 'propositionality' / 'interface independence' criteria).

If phases/PIC are an inevitable property of an optimally designed language system (as SMT would have it), then why do so many nontrivial properties need stipulating within the definition of the PIC? As numerous authors have pointed out, the system smacks of arbitrariness (cf. Abels 2003, Boeckx & Grohmann 2005, who draw comparisons with GB-era Barriers). The challenge, then, from the minimalist perspective, is to reconcile these stipulated aspects with the necessary core of the PIC (that is, the provision of an edge). Instead of directly encoding the nontrivial properties of phases and cyclic spell-out, the aim is to show how (11a-e) can emerge for free in a nonarbitrary, nonstipulative, principled system. This is the challenge taken up in the subsequent two sections.

3. Picking a PIC? Two indeterminacies and a possible unification

Let us first address the general problem of why there should exist an indeterminacy in the very definition of the PIC (i.e. the coexistence of PIC_1 and PIC_2). Recall that the two existing definitions, repeated for convenience in (12), serve to alter the search space available to the nonphase head, X (= T).

(12) Given structure [$_{ZP}$ Z [$_{XP}$ X [$_{HP}$ α [H YP]]], with H and Z the heads of phases:
a. *Phase Impenetrability Condition*$_1$ (MI version: PIC_1)
In phase α with head H, the domain of H is not accessible to operations outside α; only H and its edge are accessible to such operations.
b. *Phase Impenetrability Condition*$_2$ (DbP version: PIC_2)
The domain of H is not accessible to operations at ZP; only H and its edge are accessible to such operations.

In fact, as observed in Richards 2004, this alteration to X's search space is *all* that changes from (12a) to (12b). This is illustrated in (13), which gives the search space patterns for all three heads (again, Z-X-H can be taken to correspond to the CFCs, i.e. to C-T-*v* respectively, with search space in **bold** and phase heads underlined):

(13) a. Search space under PIC_1:
Search space for H: $\underline{Z}\ [_{XP} \ldots X\ [_{HP} \ldots \underline{H}\ \mathbf{[_{YP} \ldots Y\ [_{WP} \ldots \underline{W}}\ \ldots]]]]$
Search space for X: $\underline{Z}\ [_{XP} \ldots X\ \mathbf{[_{HP} \ldots \underline{H}}\ [_{YP} \ldots Y\ [_{WP} \ldots \underline{W}\ \ldots]]]]$
Search space for Z: $\underline{Z}\ \mathbf{[_{XP} \ldots X\ [_{HP} \ldots \underline{H}}\ [_{YP} \ldots Y\ [_{WP} \ldots \underline{W}\ \ldots]]]]$
b. Search space under PIC_2:
Search space for H: $\underline{Z}\ [_{XP} \ldots X\ [_{HP} \ldots \underline{H}\ \mathbf{[_{YP} \ldots Y\ [_{WP} \ldots \underline{W}}\ \ldots]]]]$
Search space for X: $\underline{Z}\ [_{XP} \ldots X\ \mathbf{[_{HP} \ldots \underline{H}\ [_{YP} \ldots Y\ [_{WP} \ldots \underline{W}}\ \ldots]]]]$
Search space for Z: $\underline{Z}\ \mathbf{[_{XP} \ldots X\ [_{HP} \ldots \underline{H}}\ [_{YP} \ldots Y\ [_{WP} \ldots \underline{W}\ \ldots]]]]$

Thus, as we saw in the previous section, if Z = C, X = T, H = *v*, Y = V and W = D, then YP (= VP) is accessible to T but not to C under PIC_2, but to neither T nor C under PIC_1. The indeterminacy in PIC-formulations is thus identical with and equivalent to an indeterminacy in T's search space – nothing else changes or is at stake. The question of why two divergent definitions of PIC are possible (as opposed to just a single PIC, or indeed to three, four, or thirty-four PICs) thus reduces to the question of why T's (i.e. the nonphase head's) search space is undetermined by phase theory in this way. If we can find a principled answer to this latter question, then we can remove the stipulation of T's search space (i.e. (11a)) from the definition of the PIC itself, and thus reduce the two PICs to a single, fundamental formulation – a unified PIC (Richards 2004).

The answer lies in a further observation. We have ascertained that the only thing that changes from PIC_1 to PIC_2 is the range of the probe on T. More specifically, T (=X) shares search space with C (=Z) under PIC_1 (cf. (13a)) but with *v* (=H) under PIC_2 (cf. (13b)). C and *v*'s search spaces, on the other hand, are *unaffected*. This would follow if search space for phase heads (C and *v*) is inherently constrained by the very fact that they can never belong to the same LA (i.e. the fact that they are phase heads). We therefore need to tie search space with LA-composition. Of crucial relevance here is the novel observation that there is a further indeterminacy that arises when we consider the composition of phasal LAs themselves (i.e. 'phases proper'): namely, does T belong to C's subarray (i.e. {C, T}, {*v*, V}) or to *v*'s subarray (i.e. {C}, {T, *v*, V})? In principle, T could belong to either (the theory does not exclude either option), something which seems to have gone unnoted in the literature. We therefore have an indeterminacy in the phasal allegiance of the nonphase head to go with the indeterminacy in the search space of this same head. This would be a surprising coincidence, and suggests that there is indeed a strong connection to be made between LA-composition and search space.

The claim I would like to make is that the indeterminacy in T's search space is directly related to the indeterminacy in T's phasal allegiance in the following way: T belonging to C's subarray implies PIC_1; T belonging to *v*'s subarray implies PIC_2. This follows if we simply reformulate PIC in terms of *phases proper* (i.e. subarrays) rather than in terms of 'phase heads' (as was the case in the existing definitions in (12)):

(14) *Phase Impenetrability Condition* (unified, relativized to the lexical subarray: PIC_{LA})[4]
[In phase α with head H,] the domain of H is not accessible to operations 'outside' [the XP projected from] LA_H; only H and its edge are accessible to such operations
where LA_H = the lexical subarray defined by phase head H,
with **either** $X \in LA_H$ (= PIC_2)
or $X \notin LA_H$ (= PIC_1)

That is, if the nonphase head (T/X) belongs to the lower phase/LA, we obtain the search

[4] It is also a 'literal' PIC in that it is the entire phase (i.e. the entire structure built from the relevant LA) that is impenetrable, rather than some subpart of it (as on previous definitions).

patterns characterized by PIC_2; if it belongs to the higher phase/LA, we obtain the search patterns characteristic of PIC_1. This is because T's LA-membership directly affects the timing of spell-out on this definition, and thus the structure that is available to T at the point at which it is merged: sharing LA implies sharing search space. The choice between (12a) and (12b) now reduces to the choice between whether T is an LA-mate of C or of *v*. There is thus no need to choose amongst formulations of the PIC itself – the phasal composition does this for us.

Since the indeterminacy in question holds for all nonphase heads, PIC_{LA}/(14) should generalize right the way down the tree, thus providing a generalized algorithm for assigning phase heads and nonphase heads pairwise to LAs. Let us assume so. Then, setting aside many important and unresolved questions relating to the phasal status of DPs and their internal constituents (Svenonius 2004, Chomsky 2005), we arrive at a system in which phases are composed maximally of two heads in the main projection line: a phase head plus a nonphase head (plus any arguments they select).[5]

(15) Given the clausal 'backbone' structure [C-T-*v*-V]:
   a. PIC_1 = {C, T}, {*v*, V}, i.e. pairs of heads {phase—nonphase}
   b. PIC_2 = {... C}, {T, *v*}, {V, …}, i.e. pairs of heads {nonphase—phase}

Both of these two pairing algorithms would seem equally 'optimal' from the computational perspective, thus removing Müller's conceptual argument against PIC_2 (conceived as in (14)/(15b)): there is no sense in which the phasal composition in (15b) is a 'weaker' version of that in (15a). The PIC itself doesn't change, and so there can be no question of a 'weakening' of the PIC from (15a) to (15b). Assuming, however, that PIC_2 is correct on empirical grounds (cf. section 2), we will adopt (15b) as the correct characterization of UG: that is, phasal LAs consist of pairs of phase heads and nonphase heads, such that the latter (T/V/N) selects the former (C/*v*/D), so far as possible:[6]

(16) $Phase_{LA}$ = {nonphase—phase}

To summarize this section, we have seen that by eliminating the search-space stipulation from the definition of the PIC itself, we can reduce PIC_1 and PIC_2 to the elementary

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[5] Admittedly, this pairwise composition of phases (essentially, a constraint such that phases may consist maximally of two heads in a projection line) does not follow from anything – it is an assumption of the theory, but one which has the interesting consequence of deriving all the remaining stipulated properties of phase theory/PIC (see next section). In section 5, pairwise composition will be reduced to the level of principled explanation (i.e. shown to follow from independent 'good design' factors).

[6] The 'nonphase head' will clearly be absent in the case of root nodes (matrix CP) and left branches. The latter, and maybe arguments in general, are constructed separately, in parallel derivations (MI:110) – whether via PIC_1 or PIC_2 is an open question – and the labels of the syntactic objects thus formed (D etc.) are then returned to the relevant main-branch array, cf. Rezac 2002.

composition of phases and thus eliminate one conceptual flaw (*viz.* (11a)): there is now just one, invariant PIC.

Still, the other stipulations in (11b-e) remain built into the revised PIC in (14), no less than in (12). These, too, must be eliminated if the relevant properties are to become more than just a matter of definition and thus qualify for Chomsky's more stringent level of (beyond) explanatory adequacy. The next section attempts to show that the LA-based reconception of PIC in (14) indeed allows for such a refinement of the core concepts of phase theory.

4. Phases without phase heads

If the preceding section is along the right lines, then the differing search spaces of T under PIC_1 and PIC_2 reduce to different choices of LA-composition under PIC_{LA}, viz. [{C}, {T, *v*}] (= (14b)) vs. [{C, T}, {*v*}]) (= (14a)). However, various constraints on the range of a probe (search space) remain stipulated, in two ways:

(17) a. The *domain* clause:
the domain (complement) of a phase head is spelled out rather than the phasal XP itself ("the domain of H is not accessible to operations [at/outside HP/ZP/LA_H etc]") – cf. (11b/d)

b. The *edge/accessibility* clause:
the head and specifiers of a phasal XP are not spelt out at the same time as the complement domain, yielding the 'edge' (escape hatch) ("only H and its edge are accessible to such operations") – cf. (11c)

Both of these stipulations have been criticized in the recent literature (see Boeckx & Grohmann 2005 for recent summary and discussion), with some justification. At the core of the problems raised by (17) is the apparent inconsistency between the phasal and spelled-out categories: that is, if CP/*v*P are the phases, then why are TP/VP the units that are actually sent to spell-out? (Not least, such an inconsistency threatens to render completely unreliable the already inconclusive diagnostics for phasehood, such as the supposed 'phonetic isolability' of phasal constituents for right-node raising, extraposition and the like – see Bošković 2002, Matushansky 2003 for discussion.)

However, the criticisms are perhaps only partially justified. This is because at least some notion of phase edge, and thus the differential spell-out of phase heads and their complements, follows simply from SMT (optimal design), or as Chomsky (BEA) puts it, from "meaningful cyclic computation". If the entire phase were spelled out, then phases would always crash at the interface (unless it could somehow be ensured that only internally convergent entities are sent to spell-out, in which case only entire clauses could be phases, depriving the phase system of any computational advantage). Further, no movement out of a phase would be possible (since there would be no position to escape to), and perhaps even the very iterability of merge would be compromised (insofar as the latter depends on the accessibility of the edge feature in the label of the complement selected for merge; cf. OP: 6). In short, no integrated, compositional, or convergent structure could be formed without some notion of phase edge (i.e. an 'escape hatch' domain that counts as part of the *next* phase for the purposes of spell-out), so that the latter is a requirement of good (let alone optimal) design. The disparity between CP/*v*P and TP/VP, then, follows as a way to ensure that Full Interpretation can be met – only a subpart of a phase can possibly be spelled out if language is to conform to SMT; in particular, the head must remain accessible (for selection, and maybe also head movement), and therefore any higher material in the projection (i.e. specifiers) must be accessible too (MI:108).

If this is correct, then a phase-internal cut-off point would seem to be conceptually necessary (that is, it follows from SMT and can therefore be said to come 'for free'). This disarms the general objections to edge-type escape hatches raised by the above-cited authors. Nevertheless, the precise definition of this escape hatch remains arbitrary. In particular, we might ask why this phase-internal cut-off point falls specifically between the head of the phase and its complement. That is, why does the edge-nonedge distinction coincide specifically with head-complement within the phase? If the domain/edge distinction is so natural, surely it should emerge from the theory and not need to be directly and arbitrarily stipulated in the definition of the PIC itself?

The revised PIC in (14) would again seem to provide the key to solving these remaining inadequacies. Recall our reconception of PIC_2 in terms of PIC_{LA}, repeated here:

(18) PIC_2 = {... C}, {T, *v*}, {V, ...} [cf. (15b)]

All the familiar (and formerly stipulated) properties of phases can be shown to follow as automatic consequences of (18), thus removing the final conceptual hurdles in (11b-e). In the following subsections, we run through each of these in turn, and address the first two of our asymmetries, (1) and (2), along the way.

4.1 What gets spelled out?

We start with problem/stipulation in (11b): that is, why is it specifically TP/VP that is transferred and not CP/*v*P (or some other phase-internal constituent)? The answer provided by (18) is straightforward. Not only does the LA-composition {T, *v*}, {V, ...} derive the shared search space between T and *v* (cf. (13b)), but it also identifies the units that are actually sent separately to spell-out: these are simply (the units projected from) distinct LAs. Thus the structure projected from the LA {T, *v*}, i.e. TP, is spelled out separately from the phase head C (which belongs to the next LA), and the structure projected from the LA {V, ...}, i.e. VP, is spelled out separately from the phase head *v*, which belongs to the next LA ({T, *v*}). Once we reconceive phases as LAs, and once we view T as belonging to *v*'s rather than T's LA, it is phases (LAs) themselves that are spelled out by PIC (qua PIC_{LA}). That is, just as we observed a parallel (equivalence) between LAs and search space in section 3, so there is a parallel between LAs and the 'phasal/complement domains' sent to spell-out.

In short, the phasal units (LAs) identified in (18) *are* the spelled-out units: there's no longer any phase/domain dichotomy.

4.2 Why does the edge remain accessible?

This is question (11c), i.e. why do *v* and spec-*v* 'stay behind' when VP is spelled out (and similarly C and spec-C when TP is spelled out)? Again, (18) provides a transparent answer. The edge material (i.e. head plus specifiers) stays behind because it constitutes a *different* phase from the 'phasal/complement domain': *v* and spec-*v* belong to the LA {T, *v*}, not to the LA {V, ...}. Consequently, the fact that the edge belongs to the next phase for the purposes of spell-out no longer needs to be stipulated: the edge *is* the next phase, and not some special, arbitrary subpart of the current phase, hence the fact that it isn't spelled out with the current phase. (See Svenonius 2004 for a similar, what we might dub 'phase-external', view of the 'edge'.)

In sum, the reformulation of the PIC in (15b)/(18) renders superfluous the specific provision of a phase-internal edge-nonedge cut-off point. The phase head and its complement simply belong to separate LAs, hence their being transferred at different times.[7]

4.3 The first asymmetry: What are the phase heads?

We are now in a position to address the first of the three asymmetries in section 1, repeated here:

(19) Phase heads
  a. [+ phase]: C, *v*
  b. [− phase]: T

This is the problem in (11e). The question to be answered here is why T is unique amongst the CFCs (C-T-*v*) in *not* being a phase head, a problematic anomaly that has beset Chomsky's phase theory since its inception. Our present proposals allow this problem to be approached from a new perspective. In this light, there is nothing special about T (or V for that matter), apart from its ambiguous phasal allegiance; *nothing* is a phase head on this approach, because there is simply no such thing. Phases are LAs (i.e. subarrays of the numeration), and LAs do not have 'heads'. Of course, we still have to account for the special behaviour of those heads previously privileged as phase heads, namely their role in triggering spell-out and defining a 'complement domain' for spell-out. These special properties normally associated with phase heads are now once again simply a function of how phases (LAs) are composed: once one LA

[7] Note that PIC_1, reconceived as (15a), would yield the wrong results here, since it defines the wrong units: CP and *v*P would be the spelt-out units under the LA-composition in (15a), and TP/VP would provide the edge/escape hatch. Thus the familiar, observed properties of phases (reconstruction sites at spec-C and spec-*v*, successive cyclic movement through CP, etc.) all now imply PIC_2, conceived as (15b). We return to this point in section 4.5 below.

is exhausted, the next one begins, and spell-out of a lower phase thereby triggered. It thus follows that the first (= lowest) head in an LA will have the effect of triggering spell-out. Given (18), C and *v* are spell-out triggers (i.e. 'phase heads') simply because they are the first head in their respective LAs. That T is not a 'phase head' is simply due to how LAs are composed, i.e. as in (15b)/(18).[8]

The notion 'phase head' thus becomes epiphenomenal on this approach, its properties divided amongst the heads in a phasal LA: the first (= lowest) head in an LA triggers spell-out of the lower phase (i.e. the structure built from the lower LA), whilst the second (= higher) head in an LA defines the spelled-out unit (as in sections 4.1-2):

(20) {H_2, H_1}
↑ ↑
spelt-out unit spell-out trigger (for lower phase)

In sum, phases are headless under the LA-based approach proposed here, which eliminates the phase head as a primitive of the theory.

4.4 The second asymmetry: Merge-Expl as a property of phase heads[9]

With the lexical arrays that constitute phases defined as in (18), a new perspective also emerges for addressing the second asymmetry in section 1, repeated here:

(21) <u>Expletive sites: the 'Merge-Expl' property</u>
a. [+ Merge-Expl]: C, T
b. [− Merge-Expl]: *v*

The typology in (21) is illustrated in (22-24), from Richards & Biberauer 2005.

(22) <u>CP-Expl</u>
a. 'V2-expletives'/'expletive topics'
[$_{CP}$ ***Það*** *klaruðu* [$_{TP}$ *margar mýs* [$_{vP}$ *ostinn* [$_{vP}$ *alveg* [$_{vP}$ t_{subj} [$_{VP}$ t_V t_{obj}]]]]]]
there finished many mice cheese-the completely
[Icelandic, from Alexiadou & Anagnostopoulou 2001: (41)]
b. 'Wh-expletives'/'partial wh-movement'
Was glaubst du, welchen Mann sie liebt?
what believe you which man she loves
[German, from Felser 2003: (17)]

[8] Under (15a)/PIC_1, *T and V* would be the spell-out triggers (i.e. they would be the 'phase heads' in this now derived, secondary sense).

[9] See Richards 2004, 2005, Richards & Biberauer 2005 for more detailed discussion of the material in this section.

(23) TP-Expl
'Expletive subjects' (i.e. standard, EPP-satisfying, *there*-type Expl)
[$_{\text{TP}}$ ***There*** T [$_{\text{VP}}$ *arrived a man*]]

(24) *v*P-Expl
= n/a ?
*[$_{\text{CP}}$ *Það klaruðu* [$_{\text{TP}}$ *margar mýs* [$_{vP}$ **Expl** [$_{vP}$ *alveg* [$_{vP}$ t_{subj} [$_{\text{VP}}$ t_{V} *ostinn*]]]]]]

The expletives in (22) have been argued by various authors to merge directly into spec-CP (see, e.g., Holmberg & Platzack 1995, Bobaljik 2002, Bowers 2002). The most compelling argument for this, as explored and explained in Richards & Biberauer 2005, is the simple fact that these expletives can never appear in the spec-T position (i.e. immediately post-V2) in which they are standardly assumed to merge. The question that then arises is whether perhaps even the supposedly TP-expletive in (23) is similarly unable to merge into spec-T, despite appearances and contra standard wisdom. Indeed, there have been many proposals in recent years that TP-Expl in fact raises from a lower position – Groat 1999, Bowers 2002 are prominent examples. As pointed out in Richards 2004, Richards & Biberauer 2005, there are in fact independent reasons for assuming such a low merge-site for Expl in the Probe-Goal system of Chomsky (MI/DbP/BEA). It is already clear that Expl must be able to raise to spec-T in at least some cases, namely in raising constructions such as *There seem [(there) to have been caught several fish]*. For this reason, Chomsky MI:125 proposes that Expl is a simple head with a defective and uninterpretable φ-set, perhaps simply [uPerson] (see also Chomsky BEA:12), thus rendering it active for probing and raising from the embedded TP in the complement of raising predicates, as in the example just given.

However, this raises a number of technical issues that Chomsky leaves unresolved. Most pressingly, we might ask how Expl's [uPerson] is valued from the spec-T position (as in (23)). Any Agree operation initiated by Expl in this position is countercyclic (Expl is not the root node), and should fail due to a lack of an active and/or interpretable goal (see Richards 2004 for details). Further, under the assumptions of Chomsky 2005 (OP), only phase heads may act as probes, and Expl is not assumed to be a phase head.

The simplest solution to these problems is to treat Expl as T's goal rather than as a probe. This implies that Expl must in fact merge *low* (in spec-*v*, like any other EPP-satisfying category) and that it raises to T on the back of a canonical Agree operation.[10] In short, what

[10] Evidence for such an Agree(T, Expl) operation comes from *anti-Person-agreement effects* in expletive 'list constructions' (cf. Chomsky 2000:149 fn. 90), which share properties with the Icelandic construction in (8). See Richards 2004 (Chapter 4) for discussion and analysis of such partial Agree effects.

(i) Q: Who's still here?
a. A: There is/*am only me
b. A: There remains/*remain only me
c. A: There is/are only us

have traditionally been analysed as TP-expletives are really *v*P-expletives.

In fact, therefore, the asymmetry in (21) is not between C/T and *v*, but rather between C/*v* and T. This revised asymmetry is given in (25).

(25) Expletive sites: the 'Merge-Expl' property
   a. [+ Merge-Expl]: C, *v*
   b. [− Merge-Expl]: T

In other words, Merge-Expl is in fact a property of *phase heads*. With this new perspective in place, we can now seek an explanation of this asymmetry by attempting to derive this property of phase heads. Once again, the proposed reformulation of PIC in (15b)/(18) provides the key, as the Merge-Expl property of phase heads is precisely what it predicts. Consider the following.

In (15b)/(18), we have an LA that includes both *v* and T. Therefore, this must also be the LA that contains Expl (be it TP-Expl or *v*P-Expl). That is, since T and *v* belong to the same LA, so must any expletive selected for merger in that phase. Further, since *v* is the first head to be merged from this LA, any Expl that would be destined for Merge-TP will be intercepted by *v*, which effectively has 'first refusal' on any Expl in this subarray. Therefore, given the possibility of merging Expl to a nonthematic spec-*v*P (i.e. spec-v_{def}, or the Object Shift position – see Richards 2004, 2005), Expl must *always* merge to spec-*v*P – there is no way to delay Merge-Expl until the TP stage (unless we add extra stipulations). It follows that Expl is no longer available for merge by the time T is the selector. Thus, given the LA composition in (18) in which T and *v* are part of the same LA (= PIC_2), it is T, and not *v*, that will lack the Merge-Expl property.

In sum, TP-Expl cannot, in fact, exist. We thus derive the asymmetry in (25), i.e. Merge-Expl as a property of phase heads, C and *v* (*qua* the first heads in their respective LAs).

4.5 Bare phase structure: Towards a minimalist PIC

Before turning to the third asymmetry (cf. (3)), it is instructive to consider what remains of an axiomatic PIC at this point. This, in turn, will allow us to address the final remaining conceptual flaw for current phase theory, i.e. the timing-related stipulation of (11d).

Once edges are removed from the definition of the PIC itself (and simply reduce to 'the next phase', as in section 4.2), a new implication emerges for the timing of spell-out, which previously had to be stipulated in the definition of the PIC via statements such as "at ZP" and "outside HP" in (5) and (9). A delay to the timing of spell-out of a phase now simply reduces to the SMT-imposed need for an edge (i.e. Chomsky's "meaningful cyclic computation" in section 4), which was not the case before. Simply put, a phasal array LA_n cannot be spelled out immediately upon the initiation of the next phase LA_{n+1} since *none* of (the structure built from) the lower phase LA_n would be accessible to the heads merged from LA_{n+1}. This is precisely because we are no longer stipulating an escape hatch at the edge of the lower phase.

To take the LAs {T, *v*}{V, ...} (i.e. (18)) as an example: in order for V to be accessible to *v* for selection, and for D to be accessible to *v* for probing (Agree) and movement, there must be a delay – LA_n cannot be spelt out until LA_{n+2}, else the numeration fails to map to a single, integrated, convergent syntactic object.

This logic holds for PIC_2 and PIC_1 alike on our LA-based reconception of phases (cf. (14)/(15)). The delay, stipulated under the original PIC_2 in the form of the statement "at ZP" (i.e. 'delay spell-out until the next phase head is merged'), now simply follows from SMT/"meaningful cyclic computation", i.e. the need for some kind of edge, without which nothing could converge, nothing could move out of a phase, and no expression generated by the system could satisfy legibility (due to Case crash at lower phase levels, etc.).

If the above is correct, then we have eliminated the remaining stipulations from the PIC in (12)/(14), reducing it to a bare minimum – an irreducible, interface-imposed timing statement, as in (26).

(26) *Phase Impenetrability Condition* (minimal PIC_{LA})
Spell out phase LA_n at LA_{n+2}.

(26) is itself essentially a version of 'impatient spell-out' (cf. Svenonius 2001) – phases are spelled out as soon as they can be, which, in accordance with SMT (the need for an edge), now equates to the next phase but one (i.e. LA_{n+2}).

'Translating' this view of phases into the terms familiar from standard phase theory yields (27) for the phase LA_n = {V, D}, with all the familiar phase-theoretic concepts under the arrows (edge, domain, phase head, etc.) now derived notions rather than primitives of the theory. Under PIC_{LA}, all we have (and need) are *phases*, i.e. LAs.

(27)

{... C}	{T, *v*}	{V, D}
LA_{n+2}	LA_{n+1}	LA_n
↑	↑	↑
'spellout trigger'/ 'phase head'	'edge'	'spelt-out unit'/ 'complement domain'

Further, all the familiar properties of phases (i.e. C/*v* but not T/V as the phase heads, TP/VP but not CP/*v*P as the spelled-out 'complement domains', etc.) now themselves become arguments for PIC_2 over PIC_1, i.e. for (15b) over (15a), since (15a) identifies different units from (15b), and indeed the wrong units if the empirical claims of current phase theory are correct.

Finally in this section, there is one further question that needs to be addressed, pointed out to me by David Adger (p.c.): How does the system proposed here keep track of which LA is which for the purposes of spell-out/(26)? That is, how does the system know which LA any given lexical item or syntactic object originated from? Does this not imply additional computational complexity in the form of extra memory load (thus undermining the entire enterprise; cf. our comments relating to PIC_2 at the end of section 2)?

As a first step towards answering this important question, it should be noted that the system does not need to keep track of *everything* (i.e. the phasal origins of *every* item in the tree). All that is needed is a way for the system to be able to tell where one LA ends and another begins – i.e. the *juncture* between phases/LAs needs to be marked, ideally in a local, minimal way. To this end, any kind of 'marking' on the first (lowest) head in an LA will achieve this purpose; furthermore, any such marking device will conform to SMT as the only way to ensure that (26) can be met. In this sense, we derive and maintain some secondary notion of 'phase head' as the head with this special marker.

What might this marker be? Two possibilities suggest themselves. The first is the EPP-feature. The EPP-property is arguably independently required in order to allow a head to function as an edge and thus extract things out of its domain (cf. MI: 109 (24)). If the first head in an LA is ascribed this property, then no further marking is necessary, which perhaps makes this the optimal solution from the SMT perspective. Secondly, and perhaps more interestingly, it might be possible that uninterpretable features (i.e. φ/Agree-probes) serve this purpose, thus finally providing a possible answer to the long-standing question of why these features should exist at all. If phase heads are the locus of uninterpretable features/probes (uF), as Chomsky (OP) suggests, then (26) may plausibly offer a rationale for why this is so (i.e. why such 'special heads' exist) – syntactically visible formal features (uFs) provide a local marker of phase junctures, ensuring that spell-out can be delayed (as required by SMT/(26)) in a computationally efficient manner. In this connection, it should be noted that there is one aspect of the LA-composition/PIC in (14)/(15) that remains unaccounted for and underived in the foregoing, and that is the very fact that only one 'phase head' may be contained in any LA. If phase heads are not primitives of the theory, as I have claimed above, then it becomes hard to explain why C and *v* cannot be contained in the same LA (i.e. an LA of the form {C, T, *v*}) – as mentioned in footnote 5, the pairwise composition of phasal LAs that would rule this out is an assumption of the theory. However, assuming one (and only one) juncture marker is required per phase and thus sanctioned by SMT, we arrive at an at least partial account of why more than a single probe (= 'phase head') is not allowed in any given LA.

Nevertheless, we are still without an explanation for why an LA containing all three CFCs, i.e. {C, T, *v*}, could not exist with just a single head marked via uF as a phase/juncture head. In other words, we need an explanation for why a single phase cannot contain more than a single *nonphase* (i.e. uF-less) functional head. The next section sketches out an argument that derives exactly this result – i.e. a strongly pairwise composition of LAs that yields strict alternations of phase heads and nonphase heads.

5. From LA's to all-powerful phase heads

The version of phase theory proposed in the preceding section is 'conservative' in that it returns to a strong, LA-based notion of phase (as originally conceived in MI) and denies the role of phase heads as primitives of the theory. By stark contrast, Chomsky in his latest work (OP) is moving ever further away from his original, LA-based notion of phases and strengthening the role of phase heads, elevating them to the level of the engine of the derivation. Phase heads now do *everything*: all uFs (φ-probes, Agree-features) belong to the phase heads (a property which might be explained in terms of juncture-marking, if the speculations of the previous section are on track), and thus all operations (Agree, Value, Transfer, Internal Merge) are driven by the phase heads. Accordingly, the role of nonphase heads (such as T) is severely diminished. Thus T, for Chomsky, is no longer a probe in its own right: it may only act as a probe if it is selected by a phase head (C), in which case the Agree-feature of the phase head is transferred to its complement via a mechanism of *feature-inheritance*. That is, T becomes a probe 'by inheritance' from C. Traditional subject-agreement and EPP effects associated with T (such A-movement of the formal subject to spec-T, expletives, etc.) are thus the result of the feature-inheritance mechanism, by which uFs are passed down from the phase head to its complement.[11]

Chomsky offers numerous arguments in support of the feature-inheritance system. For one, it captures in a simple and transparent manner the long-standing observation that raising and ECM-infinitival T (= T_{def}), which lacks C, also lacks φ-features (failing to value Case on DP) and independent tense; cf. Chomsky MI:102, 105; BEA:13; OP:9. Secondly, it yields a natural simultaneity of operations at the phase level (something which was previously an awkward stipulation and extension to the probe/locus cycle; cf. Collins 2002 on the latter). All operations – both A-movement to spec-TP and A-bar movement to spec-CP – are initiated by the phase head and can thereby be assumed to take place *in parallel*. Further, the feature-inheritance view of phases allows for a uniform, *syntactic* definition of phase head (replacing or supporting the 'propositionality' and 'independence' criteria of section 2, which are, at best, interface properties): namely, phase heads are uF sites. Finally, it provides an optimal means for encoding the A/A-bar distinction, which Chomsky assumes to be a legibility condition imposed by the semantic interface – feature-inheritance thus conforms (supposedly) to SMT. As an additional welcome side-effect, once motivated in this way, feature-inheritance is reasonably expected to apply to the *v*-V relation as well as to C-T. This immediately yields the famous 'raising-to-object' paradigm in ECM constructions (cf. Lasnik & Saito 1991 and many others), a vacuous movement which had appeared unmotivated and "puzzling" on previous approaches (OP:14).

There are, nevertheless, considerable conceptual hurdles undermining the arguments for feature-inheritance. Not least, as pointed out in Richards 2006b, it is surely the case that the A/A-bar distinction is already sufficiently instantiated by the two types of formal feature (the

[11] The apparent countercyclicity of this operation is not an issue, since only a single notion of cycle remains on this approach – the phase cycle – and so T is no longer a cyclic node in any relevant sense (see also Preminger 2006). Thus, at the level of the phase, operations are unordered with respect to each other (there can only be ordering between phases themselves, not within them); see the mention of 'simultaneity' and parallel operations in the next paragraph.

edge feature EF, yielding A-bar, and the Agree-feature, yielding A-type operations). Why not, then, leave the Agree-feature on C and simply project multiple specifiers on CP? Furthermore, the extension of feature-inheritance to where it is not directly motivated in this way (i.e. to *v*-V as well as C-T) does not seem inevitable. Surely it would be equally 'optimal' or 'efficient' *not* to extend feature inheritance to *v*-V, where the A/A-bar motivation does not hold?[12]

What is lacking, then, is a general rationale for feature-inheritance that necessarily holds of all phases alike, something that renders the nonphase head (i.e. feature-receptacles of the kind that T now becomes) truly necessary, for convergence. I propose precisely such a rationale in Richards 2006b, in which it is argued that feature-inheritance follows directly from PIC in conjunction with Full Interpretation. There are two premises to this argument, both of which have been widely discussed and motivated in the literature (though neither, of course, is uncontroversial). Firstly, we assume that there cannot be any delay between valuation of uF and its transfer to the interface (see Epstein & Seely 2002 for insightful discussion of this point).

(28) *Premise 1*:
Value and Transfer of uF must happen together.

Underlying (28) is the familiar assumption that uninterpretable features (valued or otherwise) crash at SEM, due to a violation of Full Interpretation. However, the distinction between valued interpretable and uninterpretable features is lost once Agree applies (see DbP: 5), with the result that they cannot be told apart locally. Therefore, to avoid having to reconstruct the derivation, Value (Agree) must be *part of* Transfer, hence (28).

Secondly, we assume (29).

(29) *Premise 2*:
The edge and nonedge (complement) of a phase are transferred separately.

This is simply the edge requirement (cf. section 4.5), as captured by PIC.

Crucially, the requirements of (28) and (29) are actually at odds with each other. This is because (29)/PIC forces edge material (specifiers + head) to be transferred at the *next* phase level, whereas (28) forces uF on the phase head (which is part of the edge) to be transferred together with the rest of the completed phase. We thus have an apparently irreconcilable tension between two conflicting convergence conditions: (28), essentially Full Interpretation, and (29), the edge-accessibility requirement captured by the PIC. My claim is that feature-inheritance now emerges as the minimal solution for resolving this tension. Put informally, valued uF cannot hang around in the phase edge (as PIC forces it to do); therefore it has to

[12] Further, there is empirical evidence from languages such as Hebrew that A-bar Agree-type features (Q/*wh*, etc.) may also be inherited from C to T, yielding *wh*-movement to spec-T in such languages – see Preminger 2006, whose analysis thus provides a further argument against Chomsky's A/A-bar rationale for feature-inheritance.

drop down into that part of the structure which *is* spelled out – namely, the complement of the phase head. We thus derive (30) from (28) and (29).

(30) *Conclusion*: uF must descend from edge to nonedge (i.e. from C to T, *v** to V, etc.).

That is, we have derived feature-inheritance, which now follows from 'good design': it ensures convergence by enabling Agree-type features to indeed be valued at the phase level (i.e. as part of Transfer), a requirement that the PIC would otherwise render impossible to meet.

As a further desirable consequence, (28-30) provides a rationale for why nonphase functional heads exist at all (something which is otherwise mysterious given the availability of multiple specifiers on C) – they serve an essential purpose as feature-receptacles, without which the conflicting requirements in (28-29) could not be resolved. In short, nonphase functional heads (e.g. T) exist only to receive Agree-type features from a phase head.

If this argumentation is along the right lines, then it entails that neither phase heads nor nonphase heads may cooccur in succession: that is, of the various possibilities in (31), only (31e) conforms to SMT (assuming (28)-(29) to be imposed by SMT as minimal design requirements). Sequences of multiple phase heads (designated P in (31)) are barred since feature-inheritance (and thus convergence) cannot then obtain (cf. (28)-(30)), and sequences of multiple nonphase heads (designated N in (31)) are excluded since N is sanctioned by SMT only insofar as it performs the function of receiving features from a phase head P. Any additional nonphase heads are thus superfluous, redundant, and disallowed.

(31) a. * P – P – P – P ...
b. * P – P – N – P ...
c. * P – N – N – P ...
d. * N – N – N – N ...
e. √ P – N – P – N ...

have now arrived at the same view of phases as that which we assumed on wholly It is notable that, by pursuing a rationale for Chomsky's feature-inheritance mechanism, we have ultimately derived (31e) as the only possible sequence of functional heads, since we independent grounds in the LA-based simplification/reduction of the PIC in sections 3-4 (cf. (16)):

(32) Phases consist (maximally and minimally) of **pairs** of phase heads and nonphase heads.

That is, we now have a stronger, conceptual argument for the pairwise composition of phases that was an assumption of the approach proposed in section 4. There, the pairwise composition of phases derived the familiar properties of the PIC without further stipulations. In the present section, we have shown the opposite: that PIC (cf. (29)) derives the pairwise composition of phases.[13] Whether this is mere coincidence or reveals a deeper, substantive generalization about the nature of the computational system is a question I leave to future research.

We can now turn, finally, to the third asymmetry with which we started, repeated here as (33).

(33) Defectiveness: existence of a defective/nondefective alternation
  a. [+ [+/− defective]]: T, *v*
  b. [− [+/− defective]]: C

The question raised by (33) is: why does C_{def} not exist? In other words, why is T_{def} not selected by a C_{def} analogously with selection of (nondefective, φ-complete) T by (nondefective) C?

In light of the preceding discussion, the question can be sharpened further. How can raising/ECM infinitivals consist of a single nonphase functional head above *v*P (i.e. T_{def}) rather than the paired C-T complex found in finite and control clauses? As we have seen, the argument from (28)/(29) entails that, if there are no features around to inherit, there is no reason for a nonphase functional head (such as T) to exist at all. Nonphase functional heads may exist only insofar as they are selected by a nondefective phase head. Therefore, if we assume the line of reasoning in (28)-(32) to be correct, T_{def} should not exist – it is entirely featureless, it inherits no features from a phase head, and it is not selected by a phase head. Even if it were to be selected by C, the C in question must lack a φ-probe (i.e. be defective), and thus has no need for a nonphase complement. The theory thus makes a clear prediction regarding defective functional heads: only defective *phase heads* should exist; defective *nonphase heads* should be impossible (insofar as there are no features to inherit). In short, *non*phases must be *non*defective.

The conclusion is that T_{def} is really C_{def}, so that the asymmetry in (33) is really as in (34).

(34) Defectiveness: existence of a defective/nondefective alternation
  a. [+ [+/− defective]]: C, *v*
  b. [− [+/− defective]]: T

Raising/ECM infinitivals must therefore be projections of C_{def}, not T_{def}. Whilst this may seem uninteresting and fairly trivial (if this is simply a matter of relabelling), it may pose a problem for the usual kinds of analyses of accusative assignment into ECM clauses, since the relevant

[13] There is a considerable difference, however: the pairs of heads in sections 3-4 were assumed to be of the form {nonphase—phase}, i.e. the nonphase head selects the phase head, whereas the pairs of heads we arrive at via feature-inheritance are of the form {phase—nonphase}. This may well have a bearing on the (in)compatibility issue raised in the following section.

Agree operation between matrix *v* and the embedded ECM subject must now cross a phase boundary – presumably C_{def}, unlike T_{def}, is a phase. I leave this matter open.

6. Concluding remarks

This paper has sought to demonstrate how phase theory can shed light on the properties – both shared and idiosyncratic – of the core functional categories. The reworked phase theory proposed in sections 3-4, along with the findings of section 5, allow all three of the unexplained asymmetries in section 1 to be reduced to a single asymmetry between phase heads and nonphase heads:

(35) a. [+ phase], [+ Merge-Expl], [+ [+/− defective]]: C, *v*
b. [− phase], [− Merge-Expl], [− [+/− defective]]: T

That is, we obtain the cluster of properties in (36), with all three properties now falling out as predictable.

(36) C and *v* are phase heads, Merge-Expl sites, and have a defective counterpart;
T lacks all of these properties (and perhaps exists only to receive features from C, ensuring Full Interpretation can be met).

Furthermore, not only can the reworked phase theory provide a principled explanation for these properties of phasal functional categories, but it also allows us to derive numerous other properties of phases, namely those that previously had to be directly stipulated in the wording of the PIC (cf. (11a-e)). The highly simplified, unified PIC that emerges thus has greater claim to attaining the level of a natural and necessary component of the language faculty.

The reader will have noticed, however, that our explanation of the three asymmetries in (1)-(3) has *not* been unified in its approach: whereas (1) and (2) were shown to derive from the LA-based reformulation of phase theory in sections 3-4 that dispenses with phase heads as a primitive notion, the explanation of (3) was premised on Chomsky's (OP) feature-inheritance system, a maximally phase-head-centric approach to phase theory. The question that arises, then, is to what extent these two seemingly diametrically opposed approaches to phases are compatible with each other. As we saw in section 5, both approaches, despite their differing premises, involve pairs of functional heads, a suggestive convergence that may well indicate an underlying unity. Thus section 4 proposed an advantageous view of phases, based on the PIC_{LA}, comprising the pairwise composition of phasal LAs in (15)/(16) in conjunction with the timing statement in (26). Section 5, on the other hand, proposed that Chomsky's (2005) 'all-powerful phase-heads' revision of phase theory also yields pairs of phase heads and nonphase heads. Can we thus unify the two approaches to phase theory (and thus our account of the three asymmetries)?

As desirable as such a unification might be, it soon runs into seemingly insurmountable problems. Foremost amongst these is that Chomsky's feature-inheritance system is incompatible with PIC_2, i.e. the pattern of search space in (13b). This is because T in Chomsky's system cannot do anything (act as a probe, etc.) until C is merged and feature-inheritance takes place. Thus PIC_2 becomes unformulable for Chomsky: even if T were to belong to *v*'s LA as in (15b)/(18), the PIC_1 pattern of search space is forced (i.e. T must share search space with C). The PIC_1/PIC_2 distinction thus collapses. Although this is not in itself a bad thing (after all, the elimination of this indeterminacy was the original motivation for the LA-based reformulation of PIC in section 3 (cf. (14)), we saw in section 2 that the empirical arguments weigh in favour of PIC_2 over PIC_1. This would seem to argue against Chomsky's radically phase-head-based, feature-inheritance view of phases and in favour of the radically LA-based approach in sections 3-4. Strengthening this conclusion is the fact that the rationale for having feature-inheritance at all, i.e. the argumentation in (28)-(30), only goes through under (the original) PIC_1, since PIC_2 states that spell-out is delayed until the *next phase but one*. To ensure Value-Transfer simultaneity/(28) and thus Full Interpretation under PIC_2, features on C would therefore have to be inherited all the way down to VP, rather than just to the immediate complement, TP.

For now, I leave the issue of reconciling the two approaches unresolved, with a view to settling the matter in future work.[14]

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[14] Any such reconciliation must not come at the price of compromising the advantages of a phase-based derivational system under SMT (cf. section 2). Thus, for example, one could quite easily reconcile the two approaches by extending the delay provided for by (26), e.g. substituting LA_{n+3} for LA_{n+2}. This would buy the necessary extension to C/T's probe range, with feature-inheritance in the lower phase triggered at the next phase but one. However, such an extension would not be sanctioned under SMT – whilst the extra delay still provides for the necessary phase edge, spell-out is no longer 'as soon as possible', undermining the computational rationale for having phases at all (see section 2).

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