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Checking theory: features, functional heads, and checking-parameters[*]

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Abstract

Structures with subordinating conjunction, covert or overt, provide evidence for checking theory, and offer an interesting testing ground for the theory of feature checking, and for theories of the interpretation of inflectional morphology and the lexicon. We argue for a radically separationalist account of verbal inflection. Certain functional heads (which have no phonological content) need to be in an appropriate checking relation with one or more appropriate morphophonological operators on lexical heads, within the syntactic structure. The checking configuration is parametrised, taking one of the values 'head check' 'scope-check' and 'asymmetric check', where checking is 'at a distance' rather than under the higher head.

1 Minimalist architecture

We assume a Minimalist language architecture, in which a generative component assembles structures, by Merge and Move, to a point where the conceptual-intentional and the articulatory-perceptual processes diverge.[1] This point we will refer to as 'Separation', (S), rather than the standard 'Spell out'.[2] During Merge, there will be features inserted in the structure which must be 'checked' before Separation.

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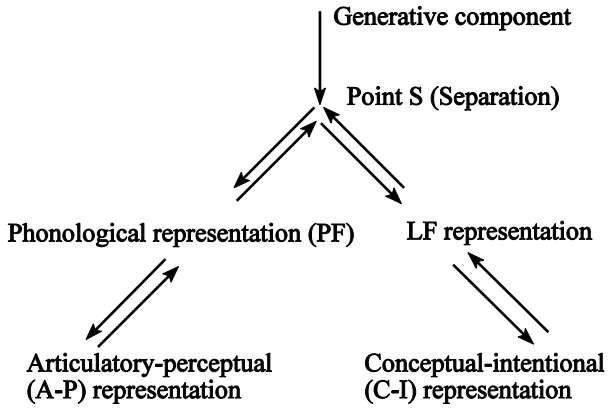
[1]For a brief guide, see Chomsky's replies in Cheng and Sybesma (1995).

[2]'S' may be taken to stand for 'somewhere' – see Chomsky's reply concerning 'Where is morphology?' in Cheng and Sybesma (1995).

(1)



The generative device is neutral between the two directions of separation. The well-formedness information that it encodes is available to the four processing devices. On the left branch, processing continues from S to the articulatory system, or to S from the auditory system; but at some point we emerge from the language module. The processing leading from S to PF is SPELLING. On the right branch, processing continues to construct an interpretation and implicatures (based on the explicit content of the sentence in combination with the context), or proceeds from a set of propositions to be expressed or implicated. Possibly all of the further processing to and from LF on the C-I branch falls within pragmatics, with its principles falling outside the language module.

In addition to the processing devices and information indicated in the model in (1), there are other sources of information to be drawn on. One of these is a 'substantive' lexicon of signs; that is, of lexemes each of which constitutes a pairing of semantic-syntactic and morpho-syntactic information. One of the questions to be addressed in this paper is whether such lexemes emerge from the lexicon complete with inflectional information. If so, does this include associated semantic information, or simply a feature to be checked against a head which does contain that information. If lexemes emerge with no inflectional information, then there has to be some other lexicon containing the phonological shapes of the inflections, with or without associated semantic information. If inflectional information is stored separately, but without the associated semantic information, there will have to be an entry in some further repository, this time of semantic-syntactic heads.

For example, consider the past tense structure of a regular verb like *stop*. Minimally, the following things are involved: the root *stop* (with its semantics and phonology), the

inflection *-t*, the position INFL, the position V, and the semantic notion PAST. The inflection must be related both to the root and to PAST. The root, the inflection and PAST must be inserted in some position at some point in the derivation. In addition, current practice (Chomsky 1995) permits the use of uninterpretable checking features (say [PAST]), which may be attached to items in a lexicon or inserted freely during Merge. Moreover, any proposed model must also take into account verbal irregularity and the re-use of morphemes for other inflectional purposes. It is not obvious how the grammar organises all this, but it is plausible that the organisation is largely uniform across languages.

Under Minimalist assumptions, the ideal is that all features are interpretable, at one interface or the other. This ideal cannot be maintained, so it is necessary to allow that certain features may be totally deleted (erased).[3] We lack at the moment any principled characterisation of deletable features: the best we can do is to avoid them if possible. We reject, therefore, the idea that what is inserted at Merge might be a complex such as [*bought* [PAST]], where this [PAST] would be an uninterpretable feature, to be deleted under checking and 'matching' with the PAST under INFL. Instead, we assume that the form *bought* will be constructed by the Spelling process, from the lexeme *buy* together with morphophonological information related to PAST. We assume that this information is coded in the form of a feature, which for mnemonic convenience, we will label [past]. At this point we do not commit ourselves as to whether this is an affix, a morpheme, a morphophonological operator, a morphome, or something else. We may refer to it however as a morphophonological feature.[4] At this point, we do not commit ourselves either as to where in the derivation the feature [past] is entered. All that is essential so far is that it may appear as a feature on a verb at Separation. Checking must ensure the proper association of PAST and [past].

[3]Uninterpretable features seem to include selection features, which are deleted as part of Merge, (Cormack 1995), and Case features (see Chomsky 1995:278 for discussion).

[4]In particular, if the feature is a morphophonological operator, then it takes as its operand the phonological representation of the verb. Since the verbs form an open class, there must be a regular subpart to the operator (e.g. the default operation for past tense). However, a finite number of partially or entirely irregular input-output pairs can be part of the definition of the operator.

2 Checking theory

The essence of a checking theory is that some features, 'checking features', have to be checked by some other feature(s). Suppose that a feature *F* of some projection H, may check some feature *f* of a projection K. Checking will only take place if *f* is in a checking relation to *F*, Rel<*F, f*> and if *F* (via H) is in a particular configurational relation to *f* (via K), Con<*F,f*> (the checking configuration). In particular, some checking features must be checked and deleted, because they are uninterpretable by either of the interpretive processes.[5] Interpretable features if checked are not deleted, but an unchecked checking feature causes the derivation to crash. Checking theory is neutral as between production and interpretation, in that in the former, F and the checking relation would determine the occurrence of *f*, whereas in the latter, *f* and the checking relation would be used to infer F.

The characterisation above is more general than that of the standard Minimalist formulation. In Chomsky 1995:310, it is stipulated that the relation Rel<*f, F*> holds if and only if *F* and *f* match. It is also supposed that Con<*F, f*> holds if and only if Con<*f, F* > holds, so that checking may be mutual. For example, a Case feature [NOM] may occur on a noun phrase and on INFL[+finite]; *F*= *f* = [NOM]. Con is set to be the Spec-Head configurational relation, so that if the noun phrase is in the Spec of INFL, both instances of [NOM] will be checked, and deleted (erased) because they are -Interpretable. We argue below (and in particular in section 8) that some of the asymmetry allowed by the more general formulation is necessary.

The standard checking configuration for features of heads is adjunction. That is, it is assumed that matching checking features on INFL and V can be checked only if V is raised to adjoin to INFL. In a language like English, where overt movement of V to INFL is not manifest (Pollock 1989), the movement was supposed to take place at LF. LF operations of this type are theoretically undesirable (Brody 1995), so we assume they are not available. Alternatively, a parameter allows the relevant feature of V to move to INFL without pied-piping the verb itself. This 'movement without movement' is unappealing, and we argue in section 5 that this too is neither workable nor necessary.

In a structure like that in (2), two other configurations for checking suggest themselves.

(2) $[_{\text{InflP}}$ INFL[PAST] $[_{\text{VP}}$ [V [past] ...]]]

[5]Some features, for example the syntactic category of a head, seem to escape this stipulation.

The primary configurational relation is head-complement (Chomsky 1995), or head to head (i.e. to head of the complement: Manzini 1995). Suppose then that there can be checking in the head-head configuration, if INFL selects V. More generally, we are suggesting that one possibility for Con<*F*,*f*> is the head-head configuration, where H selects K. We will refer to checking licensed under this configuration as HEAD-CHECKING.

An alternative is to see the relation between INFL and V as one of scope, where V is in the scope of INFL. Here, the proper notion seems intuitively to correspond to logical binding, so that PAST under INFL may check the elements which could be bound by PAST in virtue of their position. We take the syntactic analogue of logical scope to be given by selection. The verb must be within the complement that INFL selects, that is, the INFL must S-COMMAND (selection-command) the verb. Some locality or minimality consideration must also ensure that the verb's feature is checked only by a feature of the nearest INFL.[6] We will assume that the obvious definition as in (3), of checking range in a variable-free notation, is adequate at least as a first approximation.[7]

(3) A category K is in the checking range of a K-related operator *F* under a head H_1 of category H if *F* s-commands K, and there is no other K-related operator *F´* under H_2 of category H such that *F´* s-commands K and *F* s-commands H_2.

We have used s-command rather than standard c-command in this definition in order to allow for two place operators (see Cormack, 1995). It is intuitively clear that a two-place operator at H in a structure $[_{HP}\ [_{H'}\ [H\ A]\ B]]$ has both its operands A and B in its logical scope. Standard c-command has B c-commanding H, and would lead to incorrect results.[8]

The idea, then, is that checking of INFL-features takes place under a scope relation restricted by minimality. The checking configuration we are considering can be defined by: Con<*F*,*f*> holds if and only if K is in the checking range of *F*.

We argue below that this alternative checking configuration is needed and, in the context of asymmetric conjunction, gives different effects from head-checking. We will

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[6]In other languages, verbal morphology may relate to more than one semantic-syntactic operator. See section 11 for discussion.

[7]It is implicit in this that in as much as tense deals with temporal arguments, these are to be accounted for in a variable-free semantics. But scope WITH variables would appear to be much harder to organise, in the absence of movement and the concomitant indexing which identifies like variables.

[8]See discussion in footnotes 18 and 51.

refer to checking licensed under this configuration as SCOPE-CHECKING. Like head-checking, scope-checking operates 'at a distance', rather than requiring movement of the checkee to the checker, as does asymmetric checking, which will be introduced and defined in section 8.

3 Asymmetric conjunction of predicates

Interesting problems concerning feature-checking arise in the context of asymmetric conjunction where the primary (host) category is a verb. We have argued (Cormack and Smith, 1994) that such asymmetric conjunction is implicated both in classic serial verb constructions and in secondary predication and certain QUASI-SERIAL 'V *and* V' structures in languages like English. As a starting point, consider the following active and passive pairs:

(4) a The audience laughed John off the stage
b John was laughed off the stage
c * John was laughed

(5) a John ran and bought a paper
b * The paper was run and bought
c * The paper was run

(6) a John ran his trainers bald
b John's trainers were run bald
c * John's trainers were run.

In examples (5) and (6), the intended *run* is the unaccusative motion verb. This becomes syntactically and semantically transitive if we assume that the verb selects internally for a noun-phrase which will designate the runner, and externally for a noun phrase whose semantics is nil – that is, nothing is said about its role in the meaning postulates or inference rules associated with the verb. We give such a verb the type <nil,<e,t>>.[9] There

[9]This is not the standard unaccusative type, which would be <e, <nil,t>>. There is not, unfortunately, room in this paper to explain how either is derived, but we would argue that it should be done in somewhat the same way as passive, for which, see section 6.4 below.

exists in addition a standard transitive *run*, of type <e,<e,t>>, (presumably derived from the motion verb by a causativising operation), as seen in (7a). Note that with the latter, passivisation is perfect as in (7b), whereas the comparable addition of an adverb to (6c) does not help at all:

(7) a John ran the paper well
b The paper was run well
c * John's trainers were well and truly run

Consider the contrast in (5). In (5a), there is inflection for past tense agreement on both verbs, and the whole is well-formed. In (5b), with passive inflection on both verbs, the result is ill-formed. Why? In the discussion below, we will propose an answer to this and related questions. We concentrate on inflectional morphology, but for simplicity ignore phi-feature agreement almost entirely.[10] There are many other issues that we do not take up.

First we need a structure for the clauses. The analysis we are assuming for the (a) sentences is based on that given in Cormack and Breheny (1994) and Cormack and Smith (1994).[11] This assumes an asymmetric conjunction of a verb with either an adjective, a preposition, or another verb, (or with a projection of such a head). The subordinating head, with conjunction for its semantics, is $. For simplicity of exposition, we will assume that the $-projection, with its two operands, is as shown in (8).[12] In transitive structures, the host verb, or the $P containing it, will first move leftwards to local AgrO, round the object. This analysis is similar to that of Larson's (1988) V-shell proposal.[13] Thus in (6a) for instance, there is a constituent $[_{\$P}\ [_{V}\ \textit{ran}]\ [_{\$'}\ \$\ [_{A}\ \textit{bald}]]\ ]]$ at Merge, giving $[_{AGRoP}\ [_{AGRo}\ \textit{ran}_{k}\ ][_{np}\ \textit{his trainers}\ [_{\$P}\ [_{V}\ t_{k}\ ]\ [[_{\$'}\ \$\ [_{A}\ \textit{bald}]]]]]]]$ after movement of the V to

[10]Durie (in preparation) discusses agreement in serial structures.

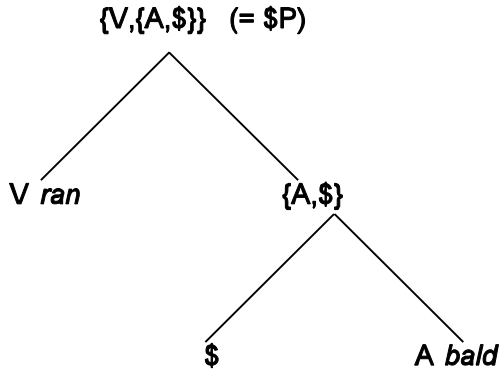
[11]The analysis offered below would for the most part apply equally to any theory of serial constructions which treats them as falling within a single VP. However, it would be inapplicable to theories such as those of Déchaine (1993) where it is proposed that which verb is the head (host) in a serial structure varies according to the interpretation.

[12]Functional heads in English might arguably be uniformly head-initial, even when they have two operands. The fully head-initial structure necessitates leftward movement of the host to obtain the correct word order; this movement is not germane to the discussion here.

[13]See also Larson (1991) for application to serial verbs and secondary predication.

AgrO.

(8)



In diagram (8), the 'bare' notation of Cormack (1995) is used. The host category here is V. That the whole is a projection of $ is encoded by the fact that the mother has $ as its most accessible (least nested) functional projection; that the whole counts as a projection of V for selection purposes is registered by the fact that V is the most accessible lexical projection in the mother category. The semantics of $ is that of generalised conjunction. We assume that *ran* here is of the type <nil,<e,t>>, and *bald* of type <e, <nil,t>>; the $P will have the type <e,<e,t>>. The conjunct head $ is phonologically empty when its operands are V and non-V, as in (4) and (6), but where both the heads are verbs as in (5), $ is filled by *and*.

It may be questioned why in (5), it should be supposed that we have asymmetric conjunction, i.e. subordination, rather than symmetric conjunction i.e. coordination. Coordination is of course possible, but not with the mildly idiomatic reading where, as in serial constructions generally, there is a single activity involved. The two kinds of conjunction behave differently with respect to extraction, as can be seen in the contrasts between the (a) and (b) examples in (10) and (11).

(9) a Which paper did John run and buy?
b Which cake did John cook and decorate?

(10) a * Which paper did the same person run and buy?
b Which cake did the same person cook and decorate?

(11) a * Which paper did John both run and buy?
b Which cake did John both cook and decorate?

Whenever coordination is forced, the extraction of a putative shared object in the *run and buy* instances is ungrammatical. There is no contrast in (9), because the (a) example may have the subordinating interpretation. In the discussion that follows, we will be considering just the subordinating, quasi-serial interpretation of examples like (5).

Let us now return to the question of why (5b) is ungrammatical. The obvious explanation, as suggested by (5c), is that this 'transitive' run does not have a passive. The passive of a standard transitive of type <e[+],<e,t>> is a head of type <e[*by*], <e[-], <nil,t>>>,[14] where the kind of Case-licensing is shown in square brackets. The [+] and [-] features refer to the Case-licensing made available by the verb at that argument selection, as in Cormack (1995). A [+] feature signals a regular argument; a preposition indicates that the argument is Case licensed within a PP; a [-] feature signals 'np movement' (e.g. the licensing of just a trace as argument); and the absence of such feature signals the necessity for an independent Case-licenser such as INFL[+FINITE] or C[*for*]. It follows that the passive of this transitive *run* has the type suggested, viz. <e[*by*], <nil[-], <nil,t>>>. We then need to ask if this is a legitimate object? It certainly cannot be used as the sole verb in a clause, as we see from (6c), because it can assign only a nil role to the external argument. But this in itself does not make it illicit, any more than the failure of transitive active *run* to assign a role to its object makes this illicit in (5a) or (6a). If conjoined with another suitable head, as in (6b), the types at $P may be satisfactory. Indeed, we can see that this is indeed the case, despite the ungrammaticality of (6c), from the acceptability of the passive in (6b). The same phenomenon is seen in (4).

It is not that two passive participles cannot ever be conjoined, as we see from (12), where there is a reading with a shared *by*-phrase which can only arise from conjunction of two verbs:

(12) The fish was [cooked and eaten] by the boys.

However, in (12), we have coordination rather than subordination: that is, &-conjunction rather than $-conjunction, whereas in (5) because of the special reading, we must have $-

[14]The *by*-phrase may be phonologically null. Given pragmatic expectations, the content must then be irrelevant. It follows that the argument has existential and not unusual content, but no special stipulation regarding this need be made in the lexicon.

conjunction. It must then be some property of $-conjunction that renders (5b) ungrammatical.

Moreover, it is not just passive that is problematic. Some other morphological V-V $P combinations are shown in (13):

(13) a John goes and buys a paper every morning
b John went and fetched a paper
c (*)John is going and getting a paper at this very minute
d John wants to go and get a paper
e (*)John wants to go and to get a paper
f John has run and fetched all the papers
g (*)John has run and has fetched all the papers
h John must go and buy a paper
i (*)John must go and must buy a paper
j * The paper gone and fetched by John was *The Observer*
k * The paper gone and fetch by John was *The Observer*
l * The paper go and fetch by John was *The Observer*

In the examples marked (*), the serial reading disappears, leaving only the coordinated reading.[15] Notice that just as the ungrammatical (13j) having V as non-host contrasts with the grammatical (6b) having A as non-host, so (13c) contrasts with (14):

(14) John is ironing his shirt dry

It seems that we cannot have V-V $P with Vs which are passive or progressive participles, and we cannot have tensed auxiliaries or modals or infinitival *to* within the V-V $P. However, the Vs within V-V $P may bear tense morphemes, and they may occur bare after auxiliaries and modals, or as perfect participles after *have*. With A-V $P, both

[15]One might take (i) as a possible counter example to the unavailability of $P with two progressives.

(i) The man standing holding a cup

But this is not a true N-V-V $P, as we can see that [a cup] is not a shared constituent by attempting a parasitic gap:

(ii) Which cup is the man holding not the owner of?
(iii) * Which cup is the man standing holding not the owner of?

passive and progressive are possible. Using a bare form instead of the participle in the non-host, as in (13k), does not render the passive grammatical.

Accordingly, we need a way of differentiating the passive and progressive forms from the tensed forms. In many standard serialising languages, as we will see below, morphology is borne only on the host verb, even though the semantics requires that both verbs are interpreted as having the same tense and aspect. This suggests that we take the Inflectional head containing the semantic-syntactic information about Tense or Mood to be outside the $P, with only morphological reflexes of this showing up on the verbs inside the $P. In order to differentiate passive and progressive from tense, we can then exploit the two kinds of checking described in section 3, with scope checking for tense, and head-checking for passive and progressive.

We assume that the relevant morphological feature is present on the verb before Separation, but that it needs checking by a higher operator. We then have to show how we can obtain the distribution in (13), shown schematically as (15) and (16), under these assumptions.

(15) $[_{IP}\ [_{I}$ PAST] $[_{VP}$ ...$[_{\$P}$ V[past] V[past]] ...]]

(16) * $[_{IP}\ [_{I}$ PASS] $[_{VP}$ ...$[_{\$P}$ V[pass] V[pass]] ...]]

We also have to justify the position of PAST and PASS outside the $P. The exact nature of the [past] and [pass] items will be discussed in section 11.

In the following sections, we will attempt to make explicit the parts of feature theory and checking theory that bear on these examples. We will concentrate initially on the English data, and in particular on the contrast between past and passive.

4 Tense and scope-checking

Our original problems was that in V-V $P, both verbs could bear tense morphology, but not passive morphology, as in the examples from (5) repeated here as (17a) and (17b):

(17) a John ran and bought a paper
b * The paper was run and bought

We first need to establish that there is only one T (i.e. the INFL node containing the finite tense operator) and that it is outside the $P. On the standard view of T there could not be two instances of T here, since in a TVO structure T and V do not form a constituent. Conjunction notoriously fails to respect constituents, but the $P is more closely integrated, both semantically and phonologically, than a Right Node Raising (RNR) structure, which would appear to be the only alternative.[16]

There is more direct evidence from other languages that T cannot fall inside $P. Serial verb structures, which we analyse as V-V $P with phonologically null $, always demand tense matching. The same is true of $P constructions in the Trøndelag dialect of Norwegian, as is evident from the contrast between (18a) vs. (19).[17] The fact that there is an apparent ATB violation in the verb movement points to the use of subordinating $ rather than coordinating conjunction. In these examples, the host verb has moved out of $P, leaving the second verb and its 'and' stranded behind the object, like the adjectives and PPs in English, so the analysis is as indicated in (18b):

(18) a Jon knekket noetter og spiste
Jon cracked nuts and ate
'Jon cracked and ate nuts'

b Jon knekket$_i$ [$_{VP}$ noetter [$_{\$P}$ t_i og spiste]]

(19) * Jon knekket noetter og spiser
Jon cracked and eats nuts
'Jon cracked and eats nuts'

If T were internal to $P, it would be possible to require $ to match the T features on its two operands. However, in sentences like (20), it is reasonably clear that the past tense has scope over *hot*, and we certainly do not want to introduce an independent instance of T for the adjective.

(20) John drank his coffee hot

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[16]There must be two occurrences of T in RNR structures such as (i):
(i) John has already bought or will very soon buy a new and expensive car.

[17]See Creider and Åfarli (1987). The examples are from Tor Åfarli (p.c. 1996), as is (21).

We take it then that $ cannot have scope over T.

We now require that PAST, from its position under T external to the $P, is to check the verbal morphology inside the $P. It is to check both the verbs in a V-V $P, and also to admit V-A $P with just the single verb bearing tense morphology. How should this checking be done?

Suppose that the $P as a whole moves to T, and that checking is under the functional head T. This offers no help in explaining the difference between Tense and Passive in English, and is highly implausible (even at LF) for other languages. Consider the Norwegian Trøndelag dialect of example (18) and (21), and the similar 17th century Middle Dutch of (22):[18]

(21) Kan Jens ha kjoept en ring og git til Marit?
Can Jens have bought$_i$ [a ring [t_i and given to Marit]]?
'Can Jens have bought and given to Mary a ring?'

(22) Een waterlandse Trijn zat eens ajuin en schelde
A waterlandic trijn sat$_i$ once [onion [t_i and peeled]]
'A Waterlandic Trijn once sat and peeled an onion'

(Waterland is a region in Holland. Trijn is a personal name. Example supplied by Teun Hoekstra.)

In (18) and (22), the verb has presumably moved through T on its way to the V2 position C. However, in clauses with a modal and an auxiliary, the order [V1 O *og* V2] still occurs, as we see in (21).[19] Hence the order here is derived from movement of V1 to AgrO, as in English, rather than by movement to T. It seems clear that T must check the verbs' features when they are within its scope. We may suppose that this checking is

[18]Collins (1995), who argues for a different analysis of serial structures, claims that in those where both verbs show morphological marking, there is LF checking of both verbs under T. The LF checking is achieved by adjoining V2 to V1, and then moving the whole to T. In a footnote he suggests that broadening the checking domain might be an alternative. A multiple feature checking parameter allows two heads to be checked. However, Collins excludes the English structures from the serial analysis, with the parameter set to 'one head only' for English. In addition, given the s-command amendment to c-command of section 3, V1 will not s-command V2, so that this movement will be precluded.

[19]A verb and an indirect object count as a V^0 projection for $-conjunction, as does a motion verb and a goal in English.

done as soon as T is merged with its complement AGRoP, at which point the structure for (18) is as in (23).

(23) $[_{TP}\ [_{T}$ PAST $[_{AGRoP}\ [_{AGRo}$ knek-[past]$_i$ $[_{VP}$ noetter $[_{\$P}\ t_i$ og spis-[past]]]]]]

We require that PAST check the feature [past] on each of the two verbs. So here we are obliged to allow T to 'check at a distance', as suggested in section 3. There seem at first sight to be several possible mechanisms. One, which we can dismiss at once, is that T head-head checks, while \$ enforces feature-matching. Such a move would leave the feature of the non-host verb in a V-V phrase unchecked, leading to an undesired crash of the derivation. PAST must check all verbs in its scope for the occurrence of the feature [past].[20] The use of scope-checking would permit both verbs to be checked at a distance by PAST. Note that the \$P structure makes it essential either that the checker PAST and the checkee [past] are distinct, rather than, as Chomsky (1995) suggested, matching; or, that c-command is modified to take account of binary operators. If only matching were required, and c-command is as standard, the non-host feature [past] would incorrectly be checked by the host verb's feature [past], either under scope-checking or under Collins' proposed V to V raising (see section 3 and footnote 18).

We will assume that English Tense checking works in the same way as the Norwegian, by scope-checking at a distance. There is then no problem with 'lowering' of features of T to V, nor any need to invoke LF movement of V to T, or of non-pied-piping features of V to T. The idea that the features relating to (for example) Tense should be entered into Merge in separate places and then brought together at LF or PF (Chomsky 1995) can happily be abandoned.[21]

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[20] Some account of φ-feature agreement must be added. One possibility is that φ-features are present on the [+finite] INFL heads, and that in consequence, the checking-relation holds between PAST[φ_i] and [past$_i$], rather than simply between PAST and [past].

[21] It would however still be possible for Tense to attract V in a given language by means of a checking parameter. Suppose that checking is asymmetric: [PAST] can check [past] under scope, but [past] can only check [PAST] *in situ* i.e. adjoined to [PAST]. For discussion of asymmetric checking, see section 9. Alternatively, V might be attracted to [PAST] if the head must have phonological content or is an affix. What sort of metaphor or description is most appropriate depends on what generalisations across and within languages need to be made.

In order to show that the checking is scope-checking as defined in section 3, we need to demonstrate that the minimality clause of the scope-checking definition in (3) is needed. Consider the sentence in (24):

(24) John left singing

We must assume here that there is a subordinating $ head mediating between the main verb and the adjunct, and that for its first operand, this head selects a VP[PROG].[22] The second operand is V^0, giving the structure in (25).[23]

(25) John $[_{IP}$ PAST $[_{\$P}$ $[_{V}$ leave-[past] $[_{\$'}$ [$ $[_{IP}$ PROG $[_{VP}$ $[_{V}$ sing-[prog]]]]]]]]]

The PROG will check [prog] on the verb of the VP, and being V-related and under Infl (like PAST), will protect the feature on *sing* from being checked by the higher feature PAST.

In such cases, the main clause can passivise while the adjunct is active, so that examples like (26) are grammatical.

(26) The anthem must be [sung standing up]

Notice that we are claiming that English does not have distinct Tense and Aspect categories for these operators, but rather uniformly INFL. To obtain the proper distribution of other scope-checked verbal inflections in English and Norwegian, we must ensure that each auxiliary selects for a V-related operator under INFL. This not only prevents tense from showing up on the main verb if there is an auxiliary, but checks for the correct inflection related to the particular auxiliary. Modals like *must* will check for a [bare] morphophonological feature, giving -∅ (null) inflection.

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[22]This distinction will be made in the type-system, rather than in the category system, given that the -ing phrase will be simply {I,V}in the bare phrase structure notation of Cormack 1995. We leave open the question of whether the IP is a predicate, or has a PRO subject.

[23]This is not a true quasi-serial structure, because we do not have a V^0-V^0 $P. As we can see from example (13c), the quasi-serials do not admit internal PROG. The $ here is acting like a normal subordinator. The 'while' reading of the $P is obligatory: resultatives demand object-sharing, which we do not have in this case, and temporal sequence is ruled out by the progressive.

For the English quasi-serials with past tense, we also need to accommodate the V-A $P and V-PP $P structures. The relevant examples are repeated below, with some structure shown.

(27) The audience [PAST [laugh-[past]$_i$ John [$_{\{V,\$\}}$ t_i [$ off the stage]]][24]

(28) John [PAST [ran-[past]$_i$ his trainers [$_{\{V,\$\}}$ t_i [$ bald]]]

We have argued that PAST scope-checks. However, it need not check every single lexeme in its checking range: we may suppose it confines its attention to heads bearing INFL-related features. The simplest assumption is that the adjectival and prepositional lexemes in English are entered into Merge without any INFL checking feature. Thus in such $P no feature of the A or P head is checked, and no tense-feature can occur.

5 Passive and head-checking

5.1 The data

The next task is to use the passive data to further determine the nature of checking. We need to explain the difference in grammaticality between the A-V $P and V-V $P constructions with passive: no V-V passives are grammatical, whatever the morphology, but V-A passives are. The relevant examples are shown again below.

(29) a * The paper was run and bought
b * The paper gone and fetch by John was the Observer
c * The paper go and fetch by John was the Observer
d John's trainers were run bald

In section 4, it was suggested that we use head-checking to account for the distribution of grammaticality. This necessitates representations with a functional semantic-syntactic head PASS associated by checking with the morphophonological feature [pass]. It might be thought that to postulate the existence in the syntax of an operator such as PASS,

[24]The 'PP' *off the stage* functions as if it were a P^0 level unaccusative. Since the head does not dispose an agent role, but assigns theme to *John*, this is not surprising.

which manipulates the theta roles of phrases, is misguided. Notice however that the Meaning Postulates associated with each role are unchanged, so that there is no difficulty in setting up the semantics of the operator, as we will see below in section 6.4. The existence of PASS in the syntax should not be rejected without its explanatory power being tested: we have yet to see whether the hypothesis will serve its purpose. As with tense, we first justify the position of PASS outside the $P.

5.2 PASS and $P

Let us assume that there is a syntactic head INFL, which may contain information relating to passive, and which we will label PASS. In order to rule out (29a), we cannot allow PASS to occur inside the $P. If $P cannot dominate PASS, we immediately explain the following contrast:

(30) a John pushed the door open
b * John pushed the door opened

While *open* is an adjective, *opened* is a passive.[25]

It might be claimed that the passive *by*-phrase with a 'by someone' interpretation is incompatible with John's agency, but passive is not available even when a plausible alternative agent is offered – (31) is ungrammatical on the intended resultative reading:

(31) * John ironed the shirt singed **by the overheated iron**/**by himself**.

We thus have some further support for the idea that passive is external to the $P. This is true for independent reasons where a passive has a resultative reading. Resultatives are only obtained in English where there is a patient[26], so a $ whose operands were passive Vs would never give rise to the resultative reading seen for instance in (6b).

Apparent counter-examples like

[25]We assume that the adjectival passive 'opened' does not exist because of competition from *open*; if it does, there should be a grammatical reading of (30b).

[26]Hence *The ice froze solid* vs. * *John laughed silly*, (but *John laughed himself silly*).

(32) The pie must be eaten cooked

turn out to be illusory. First, an active parallel to (32) might be (33):

(33) John ate the pie cooked

where the form *cooked* in (33) is not the active verb, as witness *The pie was eaten frozen*. Second, the fact that *eaten* and *cooked* are not in iconic chronological order shows that *cooked* is an adjectival passive. With two verbs, iconic ordering is pragmatically obligatory; but with a verb and an adjective, there is no syntactic choice as to which is host, so the linear precedence of the verb, *eaten*, is as expected. The interpretation of (32) is roughly 'It is obligatory that the eating activity take place within the period of the cooked state'. No such interpretation is available for *The pie must be cooked and eaten*, for instance, where *eaten* is passive, and the verbs are coordinated. The alternative ordering *The pie must be cooked eaten* gives only a bizarre reading, because the interpretation is dependent not on linear order, but on the possible canonic relations of state and activity within a single event, with the *eaten* being a state.

Like Tense, PASS may appear inside coordinate verb phrases. This is clear from examples like (34),which can only have a coordination interpretation.

(34) He either jumped or was pushed

All we are claiming here is that $P cannot dominate PASS.

5.3 Using head-checking

The suggestion of section 4 was that we use head-checking to give the following schematic results:

(35) a * $[_{IP}\ [_{I}$ PASS] $[_{\$P}$ V1[pass] V2[pass]]]
b * $[_{IP}\ [_{I}$ PASS] $[_{\$P}$ V1[pass] V2]]
c * $[_{IP}\ [_{I}$ PASS] $[_{\$P}$ V1 V2]]
d $[_{IP}\ [_{I}$ PASS] $[_{\$P}$ V1[pass] A]]

The claim is that PASS is a semantic-syntactic operator, which is connected by checking with [pass]. As shown in (35),we have three configurations to rule out, and one to permit. We omit the V-PP version, since it patterns in the same way as V-A $P. The suggestion of section 4 was that we should exploit head-checking.

By hypothesis, the complement of the PASS head is V_i[$P], where V_i is the host verb in $P. In each of the forms in (35), V1 is the lexical head.[27] Thus PASS can check features of V1, as required, eliminating (35c). However, under this form of checking, only the host verb is available as a head of the complement, so in the (a) scheme,V2 will correctly not get its [pass] feature checked, and the derivation indicated in (35a) will crash as desired.

As with Tense, we need it to be the case that the adjective at A bears no relevant features. We assume this to be so, here, and that this also holds for P. Thus the passives of depictive and resultative V-A $P will not crash, and similarly for V-P $P. We also need to exclude the possibility of V2 improperly not participating in the checking, as in (35b) and (35c). We may suppose for the moment that every verb must arrive at Merge with some morphological feature (even if this may be [null]); this will ensure that an unchecked feature remains on a second verb, so that the derivation will crash. We discuss the absence of morphology on A and P, but its obligatory presence on V, in section 7.

It is also possible to have passive phrases that are not introduced by *be*. These will similarly be headed by INFL with PASS content, with the expected acceptability of V-A $P and unacceptability of V-$P, as we see in (36).

(36) a The shoes run bald (by my son) have been thrown away.
b The coffee drunk cold was specially prepared.
c * The paper run and fetched was the Times.
d * The programme sat and watched by the most people was Coronation Street

Provided that examples like (5), with [*run and buy*] are necessarily $-conjunction, as was argued in section 4, then we have accounted for the differences between the grammatical and the ungrammatical V-X conjunction examples with passive.

[27]There is also a functional head, $.

5.4 The semantics of PASS

What sort of content does PASS have? We have suggested that it must have semantic (i.e. C-I-interpretable) content, but it is not a substantive lexeme: it is an operator which forms a passive head or phrase out of an active one. In a change from active to passive, the external role of the active is demoted (to a *by* phrase), and replaced by a nil role.[28] For example, in (6), repeated here as (37), PASS operates on the active $P [*run bald*] of type <e[+],<e,t>>, to give a phrase of type <e[*by*]<e[-],<nil,t>>>, just as in a regular transitive passive.

(37) a John ran his trainers bald
b John's trainers were run bald

The semantics of the operator as required for a simple transitive is $\lambda V\ \lambda x \lambda y \lambda z[((Vy)x)]$. The first element called for is the verb, whose arguments are then manipulated. The vacuous lambda abstraction on *z* gives the nil role for the subject. The operator will have parallel syntactic characterisation, reordering the arguments by category rather than type. All the semantic and syntactic manipulation is here, at PASS, rather than in the inflectional morphology, so that the story is very different from those such as that of Baker et al (1989) (based on Jaeggli, 1986), where the *-en* morpheme acts as a theta-role absorber.

6 Summary

In section 2, we suggested that there might be more than one way of carrying out checking, and in particular, that 'checking at a distance' could be instantiated as either 'scope checking' or 'head checking'. In section 4, we described some gaps in the paradigm of inflectional variants of quasi-serial structures in English, and put forward a suggestion that these might be accounted for by postulating that different INFL heads might check their associated verbal morphophonological features in different ways. In sections 5 and 6, we pursued these suggestions, and showed that it was indeed possible to account for the data in this way. In particular, we argued that the $P of the quasi-serial

[28] Any other theory of how the passive is formed will do equally well, provided that it can operate on the $P.

and secondary predicate structures could not dominate any INFL head. Rather, the INFL head stands outside and has scope over the $P, but checks the morphophonological features on the verbs inside the $P. Finite tense under INFL must scope-check, while passive and progressive head-check.

7 Default features: Nupe

7.1 Nupe serial verb structures

The possibility that some heads but not others can remain bare, that we postulated to account for the differential behaviour of V-V and V-A passives in English, needs more exploration. We extend the discussion by considering Nupe. We put forward two alternative analyses of the Nupe data: the first is the simpler, but the second is the more general, and will be needed for languages with just slightly more complex verbal morphology.

Nupe is a typical example of a serial language, with VOV order. Interestingly, while some of the serialising languages, like Akan (Schachter, 1974), behave like English with respect to the iterated occurrence of tense morphology, there are many others, like Nupe, where only the host of a pair of $-conjoined verbs bears tense morphology, while the other is bare.[29] Examples are shown in (38) to (40), and given schematically in (41) to (43).

(38) musa à du eci gï
musa FUTURE cook yam eat
'Musa will cook and eat a yam'

(39) musa è du eci gï
musa PROGRESSIVE cook yam eat
'Musa is cooking and eating a yam'

[29]The only overt scope-checker is the subjunctive mood, which manifests itself with agreement clitics on every verb including the parts of inseparable V-V compounds.

(40) musa gà á eci du gï
musa FUTURE PERFECTIVE yam cook eat
'Musa will have cooked and eaten a yam'

(41) S *à*-V O [$_{\$P}$ *t* V]

(42) S *è*-V O [$_{\$P}$ *t* V]

(43) S *gà- á* O [$_{\$P}$ V V]

In Nupe, and presumably in the other Kwa VOV serial languages, the VOV order arises from movement of V1 to finite T. Movement to AgrO leaves the initial OVV order unchanged, as in (43).[30] In (41) to (43), the head T occurs immediately after the subject.[31]

7.2 Auxiliaries without checking

In Nupe, the exponents of tense and aspect are totally regular: their phonological shape is never conditioned by the verb. This suggests that they might all be affixal auxiliaries, which are followed by bare verbs.[32] The possibility of taking the tense inflections to scope-check for a null-morphology feature (realised as -Ø), on both verbs, might be considered. However, to allow this would mean that a Tense head would both have its own morphology present at merge, and check the morphophonological feature on the verbs in its checking range. The more restrictive system allows morphological information in one place or the other, but not both. We will assume this more restrictive system, unless forced to abandon it.

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[30]The OVV order in Ijo (Williamson 1965) will be compatible with attraction of V to T if T is head-final in Ijo.

[31]See Smith (1969:119), and Cormack and Smith (1994). It is necessary that the conditional particle *(g)á* be analysed either as some sort of adverbial operator, selecting a T, or as a V head selecting for a control clause, since it occurs between the subject and what we have analysed as a T-headed phrase.

[32]An auxiliary is presumably simply a raising verb with functional rather than lexical content, or at least a raising verb with special properties. See Picallo (1990) for arguments that modals can be inserted under T or as auxiliary verbs.

A variant which preserves the restriction is that there is no checking at all. Suppose Tense exponents and Aspect exponents are all auxiliaries, and hence are signs in the sense defined earlier. Suppose further that Nupe verbs may enter Merge without any checking features. Then we only have to explain movement. Movement can be dictated by the fact that the T exponents *à-*, *(g)à-* and *è-* are not words, but affixes. In the lexicon, they will need to be marked as affixes selecting for the category V. We assume this is sufficient to determine that only V may adjoin, and not the functional head $. That is, we suppose that the effect of Lasnik's 'Stray Affix Filter' is obtained by stipulating that an affix-selection feature is checked only if the complement head is under the same head as the affix at Separation. (A clitic, on the other hand, is less discriminating in what it is to adjoin to). This will give the correct results for (38) and (39), as shown schematically in (41) and (42). However, in (40), there is no movement of a lexical verb, as shown in (43). This can be accounted for if we take the perfective *á* itself to be a verb, satisfying the affix filter.[33]

Under this proposal, what characterises Nupe is that Tense and Aspect content consists of signs, rather than being only semantic-syntactic. These morphemes, which are functional heads, must have their affixal or independent status registered in the lexicon. The strong prediction made is that all tense and aspect morphology is regular, and that the associated inflection on the verbs is uniform (probably null). By contrast, if the content is just semantic-syntactic, then the associated morphophonological features may permit irregularity. For Nupe, the regularity prediction is correct, and the same appears to be true of many serialising languages.[34]

We have proposed that Nupe verbs, in contradistinction to English verbs but like English adjectives, may enter Merge without checking features. We accordingly need to postulate some parameter to account for this. For theoretical reasons, we wish to restrict parametric variation to the functional lexicon (Borer, 1984; Chomsky, 1991). Let us suppose that it is possible for lexemes to be drawn from the lexicon by means of a non-checking morphophonological operator. This operator is represented as a feature, say $[_{\text{default}}]$.[35] This feature is interpretable, and when it is applied to a lexeme it delivers the

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[33]That the perfective does not pattern with tense and progressive is to be expected on a Reichenbachian analysis, where perfective is the only item relating to the R-E ordering.

[34]If this is the correct analysis of Nupe and other serialising languages, then the notion that Creoles with a substrate of such languages lost the inflections of the substrate language as a result of a prior stage of pidginisation is suspect.

[35]The subscript notation is meant to distinguish this feature as a non-checking feature.

default form for that stem - perhaps bare. However, if it is an operator rather than simply a morpheme, it can also deliver irregular forms if necessary.[36] It is now possible to propose that the items inserted under lexical categories at Merge are lexemes, but that these are not words, and that as a UG property, they must bear some feature ultimately licensing them as PF words. We further propose that the morphophonological checking features may individually or in groups perform this function, or alternatively $[_{default}]$ may.

The feature $[_{default}]$ is a partial function, with a defined domain for each language. We stipulate that it include adjectives in its domain in English, but not verbs. This requirement has the effect of forcing all English verbs to bear some checking-feature, as required. In Nupe, it does include verbs in its domain. Thus in Nupe, both the verbs in a $P may enter Merge with the feature $[_{default}]$, and there need be no checking features.

7.3 Head-checking with a default feature on V2

The Nupe data are capable of bearing another interpretation. Suppose *(g)à-*, *∅-*, and *è-* are the realisations of [future], [non-future], and [progressive], respectively, and T checks by head checking. This idea is compatible with the order in (41) and (42), where we could claim that the tense-marked host V has been attracted to T. The non-host verb must be permitted despite not being checked, so we assume it has default morphology, $[_{default}]$. Thus in Nupe when T[FUTURE] head-checks for (41), it checks [future] (realised by *à-*) on the initial verb; the non host verb is not checked, but is licensed because it appears with the non-checking feature $[_{default}]$.

It is also necessary to ensure that the feature [future] cannot appear on V2 of a $P. We will stipulate that the default feature is to be utilised unless some more specified feature is demanded in order for the derivation to be properly licensed.

Head-checking is compatible with (43) if the perfective *á* is a verb, bearing the feature [future] realised as *gà-*. If *á* is an auxiliary verb, what needs to be said about the verbs in $P? There is no motivation for postulating an intervening INFL head, as we did for English at the end of section 5, we may suppose that although these verbs are within the checking range of the initial T, both simply appear with the default feature $[_{default}]$.

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[36] Note that further features, such as φ-features, can be added to an item which has been drawn form the lexicon with $[_{default}]$,if the derivation so demands, so that adjective agreement, for instance, can be accounted for. We assume that φ-features emanate from D, and so their checking conditions are orthogonal to those of the INFL heads we have been discussing.

There seems to be no reason to prefer this analysis over the 'no checking' solution proposed earlier. But there may be languages where the auxiliary solution is ruled out because of irregularity in the realisation of inflected verbs, or where the non-host verb bears some morphology distinct from that on the host.

Languages with morphology on the non-host V might be of one of several kinds. If the morphology is the same for all tenses and other Infl operators, then this may simply be due to a non-null affixal instantiation of $ itself. Alternatively, there may be a non-null realisation of the default for verbs, and we can postulate head-checking and default marking as described above. If on the other hand there is distinct morphology for each kind of INFL operator, or if the default analysis is inappropriate, then asymmetric checking, as described below for Japanese, is needed. The third case would have something like a full inflection on the host but a reduced form of inflection on a non-host, so that the non-host inflection varied with the exponent of tense and so on. Asymmetric checking would be needed here, too. It is surprisingly difficult to find clear cases of any of these possibilities, though at least the first two undoubtedly occur.

8 Asymmetric checking

We argue in this section that scope-checking and head-checking are not sufficient, and that there is one more kind of checking, which we call ASYMMETRIC checking. We offer two arguments for asymmetric checking based on Japanese.

Japanese, like English, has a number of structures which have often been considered to be distinct, but which we analyse uniformly as instances of V-X $P, with variable interpretation depending on semantic or pragmatic considerations.[37] Three examples with cause-effect interpretation are shown in (44) to (46) (the categories of some heads are shown in brackets in the glosses).

(44) a John-ga Mary-o tuk-i-otos-u
John-NOM Mary-ACC push(V)-*i*-drop(V)-[non-past]
'John pushes Mary down'

[37]See e.g. Shibatani (1990) p 246.

b John-ga Mary-o tuk-i-otos-i-ta (Li 1993)
John-NOM Mary-ACC push-*i*-drop-*i*-PAST
'John pushed Mary down'

(45) a John-ga ie-o kuro-ku nur-u
John-NOM house-ACC be.black-[*ku*] paint-[non.-past]
'John paints the house black'

b John-ga ie-o kuro-ku nut-ta (Ken Nakatani)
John-NOM house-ACC be.black(A)-*ku* paint(V)-∅-PAST
'John painted the house black'

(46) John-wa ie-o kuro-ni nutta (Fuyo Osawa)
John-NOM house-ACC black(Noun)-DAT painted[38]
'John painted the house black'

The main point we shall be discussing below is the occurrence and checking of the *-i*, -∅ and *-ku* inflections shown in italics in the glosses above, which are manifestations of the Renyoo (otherwise known as 'adverbial' or 'infinitival') inflectional paradigm. We will follow Shibatani (1990) in taking the Tense PAST to be a suffixal auxiliary, while the non-past phonology is inflectional. We take Japanese to have many head-final functional heads, including Tense, Voice, and so on.

The simplest argument for some form of checking other than those we have offered so far is the following. Many of the resultative constructions above may alternatively be given with a *-te* morpheme after the non-host verb. In many grammars, this morpheme is treated as part of the Gerundive inflection. If this is the correct analysis, then it cannot be that both the Renyoo and the Gerundive are default inflections. At least one must be due to a morphophonological checking feature, and this will necessitate more complexity in the overall checking; we argue below that the appropriate checking is asymmetric checking (mentioned in footnote 21). It is not, however, agreed that *-te* is inflectional, despite the fact that some auxiliaries such as *i-ru* 'to be in a state of' apparently select for

[38]There are homophonous noun and adjective *kuro* 'black', as in English.

VPs with this inflection. Shibatani (1990), for instance, argues that *-te* is a conjunct.. Note however, that in (46), we do plausibly have default [$_{default}$] on the postposition *-ni*.[39]

Our next argument is based on the behaviour of Adjectives. Notice that in (44) where both *tuk-* 'push' and *otos-* 'drop' are true verbs, the verbs appear at surface in the canonical iconic order. In (45), where *nut-* 'paint' is a verb, but *kuro-* 'be-black' is an inflecting or verbal adjective, the canonic cause-effect order is not evidenced. If the $P consists of two verbs, as in (44), the speaker is obliged by considerations of Relevance to enter the verbs in such a way as to give the iconic order at surface. Since the order in (45) is not canonical, we take it that the speaker has no flexibility in arranging the order. The explanation will be that *kuro-* is an adjective, and as such it cannot be the head of the underlying $P. The situation here contrasts with that in Ijo (Williamson 1965), which also has OVV order in serials. Here, as shown in (47), the canonical order is apparent even with 'adjective verbs' (ibid. p57; nasalisation omitted):

(47) erí béle sùru pámo-mi
he pot wash be-clean-DEFINITE.PAST
'he washed the pot clean'

These adjectives in Japanese (unlike the 'nominal adjectives') can be used as predicates without the copula:

(48) Ano hito wa utukusi-i / utsukusi-ka-tta (Fuyo Osawa)
that person TOP beautiful-[non.past] / beautiful-[*ku*]-PAST
'That person is/was beautiful'

The predicate here bears tense inflection. However, there is no reason to suppose that for this reason, it must be a verb. Provided that the head of the predicate can bear tense, we have a full clause, albeit with an adjectivally headed predicate.[40] It is not even necessary that the c-selection by T is distinct in say English and Japanese: T could select for X, X lexical, with the range of X for a particular language determined by the possible values

[39]If *-ni* is not a postposition, nor the case marking induced by an empty postposition, then it might be the manifestation of the [default] morphophonological feature on the noun. There is no formal Case assigner for predicate noun-phrases, and if *-ni* is a case-morpheme it cannot be so by agreement with the accusative noun phrase *ie-o* (nor with the nominative subject).

[40]Other languages, such as Mojave (Schachter 1985) have the same property.

of X specified for the T-related morphophonological operators.[41] In English, these operators select only for V; in Japanese, they select for V and these 'verbal' adjectives. The structure of the second version of (48) is roughly as in (49), then.

(49) $[_{TP}$ Ano hito wa $[_{TP}$ $[_{AP}$ utsukusi-*ku*] $[_{T}$PAST]]

These adjectives must appear tensed when they are used as modifiers within NP, as in (50):

(50) Mary wa utsukusi-i kodomo da
Mary NOM beautiful-[non.past] child be-[non.past]
'Mary is a beautiful child'

The adjective here is in fact the head of a relative clause.[42]
Consider first (44a) and (45a) repeated here as (51).

(51) a John-ga Mary-o tuk-i-otos-u
John-NOM Mary-ACC push-[*i*]-drop-[non.-past]
'John pushes Mary down'

b John-ga ie-o kuro-ku nur-u
John-NOM house-ACC be.black-[*ku*] paint-[non.-past]
'John paints the house black'

These have the structures shown in (52).

[41]If the 'no-checking' option is taken for Nupe, then there would have to be c-selection by T rather than just by the morphophonological tense-features.

[42]For the occurrence of the non-past tense in the relative clause, see Kuno (1973). We ignore here a complication with respect to *na*, which Shibatani (1990) argues is a separate inflection 'attributive' (Rentai) of the copular *da*. It seems more likely that *na*, and the *no* occurring with nominal modifiers, are forms of $ specialised for N-modification by nominal adjectives and nouns respectively. The copula appears in its normal past and non-past forms in relative clauses (see examples in Kuno (ibid., p 261)), but in the *na* form when selected by certain auxiliaries.

(52) a John-ga [$_{VP}$ Mary-o [$_{\$P}$ [$_{\$'}$[tuk-*i*] \$] otos-[non.past]]] [$_{T}$ NON.PAST]

b John-ga [$_{VP}$ ie-o [$_{\$P}$ [$_{\$'}$[kuro-*ku*] \$] nut-[non.past]]] [$_{T}$ NON.PAST]

One possibility is to take the *-i* and *-ku* Renyoo inflection as [$_{default}$], and have head-checking by Tense elements. However, if a default existed, it is hard to see how it could be prevented from occurring on the adjective in noun modification structures, giving examples like the ungrammatical (53).

(53) * kuro-ku ie
be black-*ku* house
'black house'

But as we have seen, verbal and adjectivally headed modifiers in NP always head tensed relative clauses.[43] We assume therefore that the Renyoo inflection is not the non-checking default, but the manifestation of some checking feature. In the \$P instances, it must be checked by some higher functional category, outside the \$P. In (53), then, we require that NON.PAST may scope-check both [non.past] and [Renyoo]. We also need just [non.past] to head-check NON.PAST, otherwise we might have Renyoo inflection on both verbs. It is always the case that the non-host has Renyoo inflection, whatever the Tense, Mood or other operators. Suppose then that Renyoo is designated as [neutral] with respect to such operators. The feature [neutral] is like the default, [$_{default}$], except that it requires checking. In particular, we need it to have the default property of being preferred over more specified forms.[44] This will ensure that [non.past] cannot appear on the non-host verb. Note that [neutral] can presumably only be checked once, so that it is essential that

[43]By way of contrast, note that in English, as well as heading relative clauses, verbs in the *-ing*, *-ed* or *to*-infinitival form can head phrases acting as noun modifiers.

[44]It is possible that some languages have a neutral form without this property. Byrne (1990) gives Saramaccan examples, where an overt tense/aspect morpheme *bi* may occur before one or other or both of the verbs in a serial structure. Here, we might propose simply that the INFL head scope-checks either the feature giving *bi* or a [neutral] feature realised as ∅, without any requirement that the INFL head is checked at all. If [neutral] is not preferred, there will be four distributions accepted by checking. Presumably the occurrence of at least one instance of the morpheme *bi* will be needed for pragmatic reasons. Alternatively, one occurrence could be forced if we require that the INFL head be scope-checked by the *bi* feature.

only one of the morphemes that can appear on the host verb is the realisation of a checking feature: the others must be affixal auxiliaries.[45]

If we now look at the PAST versions, in (44b) and (45b), we find that we need [neutral] on both verbs. As with the English auxiliaries, we introduce an intermediate INFL, bearing the content RENYOO, which is selected for by the relevant auxiliaries. This may head-check, and be head-checked by, [Renyoo] morphology, and scope-check for [neutral].[46] This kind of checking, where Rel<F,f_i> does not entail Rel<f_i,F>, we call ASYMMETRIC CHECKING.

We need one more restriction on the scope checking involved for this to work properly. Recollect that we cannot have Renyoo inflection on an adjective (or verb) as a noun modifier. But suppose the adjective modified an object DNP (noun phrase plus determiner): then it would apparently be in the checking domain of the Tense operator of the clause, and so should be able to be Merged with [neutral] inflection. It would seem that there must be some barrier protecting NPs from Tense. There is good reason to suppose that something like this is correct, and that what we have is due to the minimality clause restricting the checking range of the operator. The structures we have proposed are conventional in as much as the tense operator has scope over the whole VP, but Enç (1986) shows that the interpretation of NPs (ie DNPs) is "temporally independent of the tense that is present in the syntax". She concluded there that nouns had their own 'pronominal' or referential temporal index, fixed pragmatically, and that non-clausal modifiers such as AP would be operators on the N, which include this information. Given the Cormack and Breheny (1984) structure for modification in NP, with $ as the functional head, it is necessary that the temporal 'pronominal' position for NPs be higher up. If this is an INFL-like position within DNP, as has been proposed by Szabolcsi (1987),

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[45]It also follows that the apparently serial structures with *-i* and *-te* which have inflectional morphology on both verbs, discussed by Kuno (1973) and Tokashiki (1989), must be $-conjunction at the tensed-predicate level. Here, we have treated the compound VV structures as serial, with compounding after checking.. If the arguments for asymmetric checking are not correct, then Renyoo would be the realisation of [$_{default}$], and none of these assumptions need be made.

[46]Alternatively, we might allow the auxiliaries to check, despite their already having phonological content. We would still assume that PAST scope-checks [neutral], but this time [neutral] head-checks PAST, and so on for PASS and various other auxiliaries. There seems little justification for introducing the intermediate INFL node, unless by UG principle, but if we did not the restriction on signs suggested in section 8.2 would have to be relaxed to the extent of allowing signs to check at least for [neutral].

then the minimality condition applies. Through this, [neutral] inflection may be excluded from modifiers in NP.[47]

9 Checking-parameters

Baker (1989) proposes as the primary parameter distinguishing serialising languages from languages like English, the possibility of having VPs projected from more than one head. He notes the problem of parametrising the difference between serial languages showing inflection on just the host verb, and those marking agreement on all the verbs in a serial structure, and suggests that inflectional processes are sensitive to either head, or to primary head (approximating to our non-host vs. host distinction) in his double-headed structure. For discussion of different serial patterns, and of difficulties with Baker's proposals, see Durie (in press). See also Byrne (1990), and Campbell (1995) who argue for some form of 'spreading' of features, under scope, and Collins (1995) noted in footnote 18.[48] Given that we have argued that English requires multiple tense inflection in quasi-serial structures, we cannot agree with any of the proposed explanations for parametric differences between languages.

We argued in Cormack and Smith (1994) that the 'serialising' parameter is essentially simply the existence or not of V^0-V^0 \$P, with V^0-X^0 \$P having essentially identical properties. Our proposals above have postulated several kinds of checking necessitated by such structures. First, we distinguished two kinds of checking configuration: head-checking and scope-checking. Second, we distinguished situations where asymmetric checking was required. We also introduced a non-checking default morphological operator, whose domain varies from language to language.

We have reduced the parametric variation and checking mechanism possibilities to the following (where as usual, we use capital letters for the semantic-syntactic heads under INFL or Tense etc., and lower case in square brackets for the morphophonological operators):

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[47]The exact mechanism remains to be determined. We may postulate that the INFL in DNP is V-related, but does not scope check (possibly it does not check at all). This would mean that any V within the DNP would have to have its own INFL, which, not being selected, would have to be finite.

[48]Campbell argues that the spreading is from V1 to V2, but this will not account for all of Byrne's Saramaccan data. Byrne suggests that the dropping of overt morphological marking is due to 'phonological economy'.

a) Scope-checking: e.g. of [past] by PAST, for English and Norwegian Tense, and for Nupe subjunctive.

b) Head-checking e.g. PASS head-checks [pass], for English and Norwegian passive; perhaps for Nupe Tense (with default $[_{default}]$);

c) Asymmetric checking: NON.PAST scope-checks [non.past] and [neutral], but only [non.past] checks NON.PAST, for Japanese tense.

d) No checking: Semantic and morphophonological content given by auxiliary. No paired checking features. Perhaps for Nupe Tense (with default $[_{default}]$).

e) Domain of $[_{default}]$: English and Norwegian – A and P, but not V. Nupe – includes V. Japanese – P but not A or V.

Suppose a semantic-syntactic functional head F is in a checking relation to one or more features $[f_i]$. These may be scope-checked, or head-checked. Asymmetric checking arises when [F] may scope-check say $[f_i]$ and $[f_j]$. In addition, it may be necessary (perhaps as a UG property) that F is checked by some $[f_i]$. Thus the learner has to establish the following:

f) What features $[f_i]$ are in a checking relation to each [F]?

g) Does [F] check $[f_i]$ by head-checking or scope-checking?

h) Is [F] a checking feature, and if so, which $[f_i]$ may check [F], and how?

i) What categories are in the domain of the default (non-checking) $[_{default}]$?

j) How are the features $[f_i]$ and $[_{default}]$ spelled out?

The first question is the requirement that the learner determine which pairs <F,f> are members of the checking relation Rel<F,f>. The second question asks for all pairs <F,f> falling within Rel<F,f>, which value of Con<F,f>, Con_{head} or Con_{scope}, they are members

of. These questions are unavoidable: they represent the relevant parameters. The situation with respect to the third question is less clear.

If there is always a unique answer to positive cases of the third question, it may well be answerable by UG principles: for a certain F, the set of f_i such that Rel<F,f_i> can only contain one more-specified feature and other less-specified ones. The former will always be the one belonging to Con<f,F>. The alternation between [-*ed*] and [-*en*] in the English passive now presents a problem. We could not have both [-*ed*] and [-*en*] checked by PASS, so the alternation would have to be learned as part of a morphome instantiating [pass] [49]– unless PASS did not have to be checked. In practice PASS does not have to be checked, as the default non-checking feature [$_{default}$] does not select for verbs in English.

The parameters would be simplified if we could assume as a UG property that [F] is checked by some [f_i], and must be head-checked, but the Saramaccan data (see footnote 44) might require scope checking of the INFL feature. We do not claim to have found instances of all the possible checking arrangements, nor have we attempted to decide between alternative Spelling hypotheses, so we cannot tell how much must be learned for the third question.

The last two questions are essentially morphosyntactic: what are the c-selection and Spelling properties of the morphophonological features?

It is also necessary to know whether an operator [F] may fall inside serial $P, but we need to know this for the other (sign) functional heads too. In general, the answer is 'no', as we have seen, but there are exceptions (for example, emphatic repetition in Nupe - see Smith 1970).

It is perhaps not insignificant that none of the checking operations postulated involves $ itself. The question is whether we ever need $ to force the matching of features on its two operands. This could be done by listing those features for which such matching is required. For example, it is clear that Category is not matched in English, or no V-A $P could be produced. Similarly, for the V1(tensed)-V2(bare) serial languages, clearly $ must not require that the T-features on its two operands match, otherwise tensed V-V $P would be ruled out. An informal notation for the sort of checking done by $ uses matching [α] features on the two operands of a head, but such a notation is clearly outside the Minimalist feature-checking and deletion pattern (actually, it amounts to generating a set of possible operand-pairs). The answer to the question seems to be 'no'. The reason is that if such features need checking, then the checking must be done on the individual heads anyway (rather than on the $P). But if this is so, the matching by $ is otiose. The

[49]For the notion of morphome, see Aronoff 1994, and section 10 below.

features must need checking, unless they are susceptible to interpretation at both PF and LF. Would these really be features at all? Certainly, they would not be features of the sort we have been discussing here.

10 Spelling, nested features, and the Mirror principle

We note here some possibilities concerning the operation of the Spelling component, in relation to the structures we have proposed. Spelling is where many, or maybe all, morphological processes are carried out. The suggestions below are not intended as articulated proposals, but simply to indicate that there are a number of possible approaches to Spelling under these proposals.

Notice that there has been an assumption that no verb bears the morphophonemic operators relating to more than one INFL head. The minimality condition on checking range ensured this. For Nupe and English, this has been realistic, but for many languages it is not. In Yakuts (Spencer, 1991:238), it is possible to have sentences with both passive and past inflection on a single verb, as in (54). We assume, as is standard, that the morphology is inflectional (rather than being due to affixal auxiliaries); if this is incorrect, some other language should be substituted.

(54) Biir taabïrïn taaj-ïlïn-t-ta
one riddle solve-[passive]-[past-3sg]
'One riddle was solved'

In order to sidestep the minimality condition on checking range, it is necessary to adopt a 'split INFL' hypothesis for Yakuts and other such languages, under which the various heads which can check morphophonological content fall under different categories. Categories which might be invoked include Tense, Mood, Aspect, and Voice. Schematically, we can assume that the checking situation for the sentence will be as in (55).

(55) $[_{T}$ PAST $[_{VOICE}$ PASS [... V[pass][past]] ...]]

PASS will be inserted at Merge before PAST. Let us assume that the checking of the head PASS is to be done before the Merge process can continue.[50] PASS must head-check [pass], while [pass] head-checks PASS. When PAST is Merged, it must head-check [past], (and we assume that [PAST] also carries information relating to φ-features, as mentioned in footnote 20). The checking mechanism must look each time for the innermost unchecked operator: in other words, it looks for an unchecked operator applied to a legitimate (fully checked) root. For discussion, see Halle and Marantz (1993, section 6). We do not agree that the natural expectation about checking features is that they will form an unstructured set: checking is an operation referring to features together with the heads they attach to, not simply to features, and it is this property which demands ordering on the set of features.

Given such a mechanism, the morphophonological operators are necessarily ordered in a nested fashion with respect to the semantic syntactic operators, as if we had [[V[pass]][past]], and there must be no gaps in the pairings. This most naturally corresponds to affixes ordered according to the Mirror Principle (Baker 1985). For a regular agglutinating language, the [infl] labels may be replaced by the names of the relevant affixes. In a less regular language, the [infl] labels may be replaced by morphophonological operators, which are sensitive to the phonological content of their operands. Such an operator takes the verb as its operand, and Spelling will apply the operator to the phonological information given by the verb lexeme to give the correct phonological output.

Under the operator interpretation of [infl], we do not even need a one-one correspondence between for instance PASS and [pass]. For example, in the spirit of the Separationists, we might list for English a number of morphophonological operators which PASS would check, including that giving *-en* and that giving *-ed* morphology. Note that the morphophonological operators themselves will be partial functions over verbs, since each will apply only to a subset of verbs. The same set of morphophonological

[50]It cannot be a requirement that the morphophonological operators are checked before Merge proceeds, since the Tense-associated operators are already by hypothesis present when the verb is first Merged. The alternative scenario, under which morphophonological operators could be added in the course of the derivation would not be viable without changing some of our premises. We know that both PASS and PERF stand outside the $P, but [-*ta*] could be permitted to select for an InflP. If this is the (only) proper construction, we would make the strong prediction that the non-host in a V-V $P could never bear the products of more than one morphophonological operator. Unfortunately, very few serialising languages have passive at all, or rich verbal inflection, so the prediction cannot easily be tested.

operators might be checked by PERF, and some of the same ones by PAST. Because of the identical set of such operators for PASS and PERF, Aronoff (1994 pp 22-25) argues that these are grouped together as one function whose domain is the whole of the verb class - the function $f_{\text{-}en}$., which he dubs a MORPHOME. These functions are purely morphological ('morphology by itself') since they are independent of both the morphosyntax and the morphophonemics. It would be equally possible, (and possibly necessary, as noted in section 9), that each [infl] label is rather a morphome. Some such replacement is consistent with the spirit of our 'split sign' theory, and with the Separationist morphological theorists (Aronoff 1994, Beard 1996) who argue that morphophonology is indeed independent of the semantics. Thus it should be the case that the [infl] label represents morphophonological material in some form or other, with no reference to meaning as is suggested by the use of the mnemonic [past] for instance.[51] However, not all languages seem suitable for such a treatment.

If the realisation is not affix by affix in the given order, then 'Spelling rules' might arrange for permutation or fusion. However, these probably need to refer to the 'name' of the [infl] features, rather than just to morphophonological content, which is undesirable. Alternatively, checking could be set up in such a way that a single morphophonological operator was in a checking relation to a complex of two or more INFL operators. The required complex would be derived from head-movement from one INFL position to the next higher one; the adjunction would have the semantic content of function composition (notated by '$\circ$'). So for Latin, for instance, there might be no checking available for Mood heads alone, but only for Mood$\circ$Tense$\circ$Voice triples. There is also the possibility (see footnote 20), that φ-features might be present on the various INFL heads such as Mood, as well as finite Tense, with the consequence that φ-feature agreement may appear in more than one place in the inflection.

[51] In his discussion of φ-features and checking, Brody (1995) offers a 'Bare Checking Theory'. All features must have semantic content at LF. Movement to the standard checking configuration is demanded to eliminate redundant features (e.g. duplications of φ-features). Our hypothesis here differs in that we take paired features like PASS and [pass] to be interpretable at different interfaces. In parallel, we would expect that a feature say [PLURAL] on a Determiner (a two-place operator, according to Cormack (1995)), might be paired with a morphophonological feature [plural] on each of its operand heads i.e. on N of NP and V of VP. There will be no duplication of semantic features, and duplication of morphophonological features is permitted.

11 Summary

The distribution of information about form and meaning which we are now suggesting includes the following. There is a standard lexicon for substantives, containing lexemes. These are signs, and consist of associated semantic-syntactic, and morpho-syntactic information. There is in addition, a lexicon for functional items.[52] One subset of this contains signs – for instance in English, the Determiners. Another subset of these functional items consists of what we call SPLIT SIGNS, where a semantic-syntactic functional head has associated with it by a checking relation a morphophonological feature.[53] Under this interpretation, irregular morphology is stored as part of the morphophonological operator, rather than in the lexeme.

In the architecture outlined in section 2, at Separation the information pertaining to PF will be visible on one branch, and the information pertaining to LF on the other. A lexeme in a certain position will have information for both branches. For a split sign, the semantic-syntactic functional heads and the associated morphophonological features will be in different positions in the structure, and each of these passes information to a different branch. A Minimalist approach would suggest that neither branch had further contact with the other.

12 Conclusions

We would like to draw a number of conclusions from this work. In order for the facts about serial and related structures to be captured, several moves are necessary.

First, a number of operators have been shown to require positions under functional heads. These include Tense, Passive and Aspect, among others. There have been understandable objections to the recent proliferation of functional heads, but the facts discussed here support such heads. In particular, the heads are necessary in order that the semantic operators may have scope over complex syntactic structures. However, it should be noted that every such head discussed here has semantic-syntactic content, and

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[52]For discussion, see Smith and Tsimpli (1995, chapter 5), and Beard (1996).

[53]We are endorsing a model under which there is indeed what Halle and Marantz (1993:169) in their postscript on checking theory characterise as a ‘disturbing split among terminal nodes in the grammar’.

Cormack (1995) argued that even AGR has semantic content. Perhaps this will mollify the objectors.

Second, we have shown that these semantic operators may be paired with morphophonological material which is not adjacent, and indeed may be manifest in more than one position. A checking system is therefore mandatory. We suggest that the pairs of semantic-syntactic operator and morphophonological operator are parts of entries in a lexicon of split-sign functional categories.

The upshot is a more symmetric Separationist proposal, with equal attention being paid to the morphophonological and the semantic. The relations between these two are however not symmetric, in that one semantic-syntactic head can license more than one morphophonological operator, but not vice-versa.

Third, we have shown that checking is licensed in more than one configuration, and that head-movement is not a necessary ingredient of checking.[54] Instead, checking 'at a distance', in the form of head-checking, scope-checking, or asymmetric checking may be used. The information about the required checking parameters forms part of the syntactic information in the entry for the split-sign functional category. We also invoked a non-checking default morphophonological operator.

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[54] Sells (1995) argues against head movement for Japanese and Korean verbal morphology. But he consequently rejects the higher functional heads such as INFL; if checking does not necessitate head-movement, that argument falls. He also argues against the functional heads on the grounds of selection, but we believe that if functional heads are treated syntactically as operators, and if selection is treated as a form of checking, the interesting problems he discusses can be overcome.

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