

Where and Why are Labels Necessary?*

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Barrie, Michael Jonathan Mathew. 2021. **Where and Why are Labels Necessary?** *Studies in Generative Grammar*, 31-1, 25-52. There has been considerable debate recently as to when labels are created and whether they're necessary at all (Collins 2002). Chomsky has proposed that labels are necessary at LF only. Takita (2020) has argued that labels are necessary at PF only. I propose that labels are necessary at both interfaces. This explains why movement for labelling takes place overtly, as noted by Ott (2015) and Moro (2009). I illustrate the necessity of labels for Pseudo Noun Incorporation (PNI) in three languages. Specifically, I argue that labels are necessary to identify the category selected by the verb in PNI. Some languages select a bare nP, while other select a bare NumP. Finally, I combine these observations with Wiltschko's theory of number. The observed properties of PNI fall out from Wiltschko's theory, but only if we assume labels are formed in the overt syntax.

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1. Introduction

With the advent of Bare Phrase Structure, Chomsky proposed that syntactic

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objects require a label in order to be identified (Chomsky 1994). Since then, much research has investigated exactly why labels are needed, where they are needed (LF or PF), and whether they can be dispensed with. This paper reviews this literature and concludes that labels are created by overt movement as they are required both at PF and at LF.

After reviewing prior literature on labels, I discuss recent proposals to restrict or eliminate labels and identify problems with these proposals. Crucially, what is observed is that overt movement takes place in situations typically implicated in the formation of labels. I argue, *contra* Collins (2002), that labels are necessary for selection and that selection is strictly local. That is, the selector and the selectee are sisters. Since unlabelled structures are created and not repaired until later in the derivation, then clearly selectional restrictions are not satisfied upon Merge, but at LF. This begs the question as to why movement for labelling is overt. I propose that labels are necessary at PF in addition to LF, thus requiring overt movement.

The principle of strictly local selection (and hence the need for labels) is tested against pseudo noun incorporation (PNI). This proposal predicts that PNI can arise by selection of a bare *nP* or a bare NumP (among other possible nominal functional projections; however, these are the most common in the literature on PNI). A theory of BPS that does not allow for labels cannot accommodate these differences in selectional restrictions. Specifically, I examine PNI in Niuean, Hindi, and Nepali using published sources in addition to my own field in the case of Nepali.

Furthermore, the PNI facts are evaluated against the current proposal that labels are necessary in light of Wiltschko's (2008) proposal that Num does not always project to NumP. Wiltschko proposes that Num (in addition to other functional projections) either merge and project (and provide a label to the resultant structure) or merge as an adjunct (thus not providing a label to the resultant structure). Wiltschko's proposal is directly relevant to both the issue of labelling and our understanding of PNI.

Thus, one option is that PNI can involve a verb selecting either NumP or *nP*. Another option is whether Num projects to NumP or adjoins to *nP*. Note that if Num does not project, then it cannot be selected. These two options predict the following three-way typology for PNI.

- (1) a. V selects NumP – number is always encoded, bare N, if possible, is singular

- b. V selects nP, Num projects – Num is not possible in PNI, bare N is always number neutral
- c. V selects nP, Num adjoins to nP – bare N is number neutral, but Num may be present in PNI constructions

The remainder of this paper is structured as follows. Section 2 discusses the background on labels, including recent arguments about why labels are necessary, if at all. Section 3 refutes some of the claims in section 2, arguing that labels are necessary in narrow syntax. Section 4 examines data from pseudo noun incorporation (PNI) in light of Wiltschko's (2008) theory of projecting versus non-projecting number. It shows that labels are necessary in narrow syntax to account for the range of patterns observed. Section 5 is a brief conclusion

2. Background

This section introduces Chomsky's original discussion of labels and the more recent discussion of the Labelling Algorithm. It then goes on to discuss other current treatments of labelling.

2.1. Chomsky and Labels

The concept of a label was introduced by Chomsky when he proposed Bare Phrase Structure as a replacement for X-Bar Theory (Chomsky 1994). In brief, he proposed that when two syntactic objects undergo Merge they form a larger, nested set that consists of the two merged items and a label. In the following schema, *z* is the label. Specifically, he said that in the simplest scenario, *z* is identical with either the label of *x* or the label of *y*.

(2) Merge (*x*, *y*) → {*z*, {*x*, *y*}}

The choice of the label is not arbitrary. In later work Chomsky introduced the Labelling Algorithm as follows (Chomsky 2008; 2013; 2015).^{1,2}

¹ The merger of two heads is often left unspecified. Chomsky (2013) addresses this issue by effectively proposing that in the initial merger one of the two heads must be a root, which is unable to provide a label. The issue is not relevant to the current discussion, so I leave it here.

² In Chomsky's later works (2013, 2015) he proposes a complex label of the form <*a*, *a*> in the

- (3) a. Merge (H, XP) --> H is the label
- b. Merge (YP, XP) -->
- i. If YP and XP share a common criterial feature, that feature is the label.
 - ii. If YP and XP share no such feature, there is no label.

It is assumed that an unlabelled structure cannot be tolerated, so in the case where YP and XP share no criterial feature a label must be created by some other means. Chomsky suggested that if a phrase moves out of an unlabelled structure, the element that remains labels the remaining structure. Long-distance *wh*-movement illustrates this point. Consider the following example.

- (4) What does Mary think John read?

Merger of the *wh*-phrase with the embedded CP creates an unlabellable object as the two phrases, DP and C', share no criterial feature. When the *wh*-phrase later raises to the matrix SpecCP the lower clause can then be labelled as CP.

Chomsky (1995; 2013; 2015) argues that labels are needed for interpretation at the CI interface. He does not, however, go into details about exactly why labels are necessary or what they accomplish. Accordingly, many researchers have rightly questioned whether labels are necessary at all. In the next sections, we review some of the arguments against labels.

2.2. Eliminating Labels

Collins (2002; 2017) proposes to eliminate labels altogether. He discusses arguments in which labels are needed for selection and for PF.³ We consider the notion that labels are thought to be necessary for selection first. Selection is typically considered to be a strictly local relation. In a sentence such as *Mary ate an apple*, the verb selects the DP, which is identified by the label. In general, when

case of (3bi). This additional refinement does not play a role in the current discussion, but see Shim (2018) for discussion.

³ Collins (2002) also discusses X-Bar Theory and the Minimal Link Condition. X-Bar Theory, of course, has given way to Bare Phrase Structure in current Minimalist theorizing (Chomsky 1994). In the most recent discussions of Minimalism (Chomsky, Gallego & Ott 2019), machinery such as the Minimal Link Condition are eliminated. Thus, I do not discuss these aspects of Collins' proposal.

X selects Y, X and Y are sisters, hence the requirement of strict locality.⁴ Thus, it appears labels are necessary for selection.

Collins suggests that the sisterhood requirement in selection is an illusory effect. He proposes that selection be rethought of as an Agree relation between a Probe and a Goal involving subcategorization features. In most cases the Goal is the sister of the Probe, giving rise to the illusion that selection is strictly local. He suggests that there are some cases of long-distance selection, however, asking us to consider the following examples.

- (5) a. John said that Bill left.
b. John demanded that Bill leave.

Collins assumes the following partial clausal structure.

- (6) CP > MoodP > T

The verb *say* subcategorizes for indicative mood, while the verb *demand* subcategorizes for subjunctive mood; however, the CP intervenes between the selector, the verb, and the selectee, MoodP.⁵ Thus, Collins argues, there is a selection relationship between V and Mood, bypassing CP.

For completely different reasons, Bruening et al. (2018) refute this analysis of selection of subjunctives and indicatives. They note Romanian (among many other languages), which has different complementizers for indicative and subjunctive clauses. They suggest, for English, that a verb such as *know* selects an indicative complementizer, which in turn selects indicative Mood. Likewise, a verb such as *hope* or *demand* selects a subjunctive complementizer, which in turn selects subjunctive Mood. Consider the following Romanian examples, which illustrate this idea overtly (Alboiu & Hill 2013).

- (7) a. Consider [că Ion e băiat deștept].
consider.1SG [that Ion is boy smart]
'I consider Ion to be a smart guy.' (Alboiu & Hill, 2013: ex. 6)

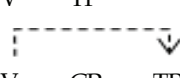
⁴ Alternatively, if X selects Y, Y may appear in the specifier of X (Hallman 2004; Koopman 2006). See also Rezac (2003) for arguments that the X' projection can become the Probe, thus the Probe and the Goal, Y, are still sisters. These mechanical details do not play a role in the argument laid out here, so I do not consider them further.

⁵ This problem was first noted by Payne (1993).

- b. Vreau [ca ei să reușească].
 want.1SG that.SUBJ he SUBJ succeed.3.SUBJ
 ‘I want them to succeed.’ (Alboiu & Hill, 2013: ex. 5)

The verb *consider* (‘consider’) selects a declarative C, which in turn selects an indicative complement (which has no special morphology in Romanian). The verb *vreau* (‘want’) selects a subjunctive C, which in turn selects a subjunctive complement, headed by the subjunctive mood particle *să*. This pattern is obscured in English simply because the subjunctive and indicative complementizers are not morphologically distinct.

Collins’ reformulation, furthermore, is unable to capture selectional properties that refer to the size of the complement, a phenomenon that has come to be known as restructuring (Rizzi 1978; Wurmbrand 2001; Cinque 2006). For example, the traditional analysis of control and ECM in English involves the selection of a CP complement by control verbs and a TP complement by ECM verbs. Under Collins’ approach, the selection cannot make any reference to the maximal projection of a complement. If a verb selects a TP, then it’s still possible for a CP to be present and for the selectional feature to be satisfied by long-distance Agree. To be clear, under the traditional approach to selection advocated here, the sister of an ECM verb must be a TP, whereas under Collins’ approach the sister to an ECM verb must merely contain a TP, contrary to fact. The schemata below illustrate the problem Collins’ proposal of selection at a distance raises. The third line shows that in an ECM construction the verb can take a CP complement because the verb can select the TP at a distance.

(8)	Selection under sisterhood	Selection at a distance
Control	V — CP	V — CP
ECM	V — TP	V — TP
		 V — CP — TP

Collins mentions PF only briefly in the context of modularization (in the sense of Zwicky 1969). Relying on traditional notions that PF does not make reference to syntactic information such as NP or VP, he summarily dismisses any need for labels at PF. We revisit this idea below, however.

2.3. Linearization and Labels

Takita (2020) also argues against the necessity of labels at LF, arguing instead that labels are necessary at PF for linearization. Takita proposes that only labelled constituents can be linearized, adapting the usual Labelling Algorithm as in (3). He proposes that Headedness is part of the linearization algorithm as follows.

- (9) a. Head-initial linearization rule (e.g. English): $\{X X, YP\} \rightarrow \langle X, YP \rangle$
 b. Head-final linearization rule (e.g. Japanese): $\{X X, YP\} \rightarrow \langle YP, X \rangle$
- (10) Linearization rule for SOs labeled as $\langle F, F \rangle$: $\{\langle F, F \rangle XPF[val], YPF[unval]\} \rightarrow \langle XP, YP \rangle$

He leaves for future research whether (10) is universal or is parameterized as in (9). It has been noted, however, that specifiers are generally, if not universally, on the left (Oishi 2003).

Takita also draws arguments from long-distance wh-movement. Again, consider the following example.

- (11) What does John think \langle what \rangle that Mary bought \langle what \rangle ?

Takita argues that the intermediate copy creates an unlabelable constituent as it has no feature in common with the intermediate C. Thus, the wh-phrase must raise and delete. The reason deletion is necessary is that linearization not possible between intermediate \langle what \rangle and C' under Takita's linearization algorithm.

Unfortunately, Takita's proposal is incompatible with wh-copy constructions, in which the intermediate copies of wh-movement appear to be spelled out (McDaniel 1986 *inter alia*). Consider the following examples.

- (12) a. Wer glaubst du, wer Recht hat? [German]
 what believe you, who righthas
 'Who do you think is right?'
- b. Wen meint Karl, wen wir gewählt haben?
 whom thinksKarl whom we elected have
 'Who does Karl think we have elected?' (McDaniel, 1986: ex. 59a)

Clearly, whatever mechanism is responsible for linearization must be able to accommodate the existence of intermediate copies of long-distance movement.

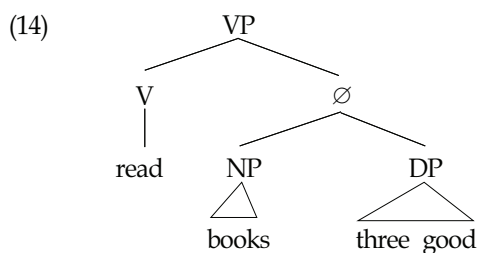
Crucially, since the intermediate copy of the *wh*-phrase does not enter into a feature checking relationship with the intermediate CP, no linearization statement can be formed between the *wh*-phrase and its sister, under Takita's proposal.

I have reviewed problems with the idea that labels are evaluated at PF only and with the idea of dispensing with labels altogether. In the next section I review evidence for overt movement to satisfy labelling before moving on to the core proposal.

2.4. Labels and Movement

Ott (2015) adopts Chomsky's conclusion that unlabelled phrases, or points of symmetric Merge, force movement of one or the other phrases. Moro (2000; 2009) makes a similar point, which I discuss below. Ott and Chomsky share a common tacit assumption, namely that an unlabelled structure is not permitted by the grammar. Ott examines split topics in German. Consider the following example, with English words substituted in the tree for convenience.

- (13) Bücher hat Peter leider erst drei gute gelesen. [German]
 books hasPeter unfortunatelyonly three good read
 'As for books, Peter has unfortunately only read three good ones.'
 (Ott, 2015: ex. 1)



The question here is why overt movement is required. If the label is required only at LF, then we should expect to find some cases of LF movement resolving unlabelled constituents; however, the evidence is not forthcoming.

In addition, Moro (2009) offers the following argument. Italian does not require an overt subject in TP as the EPP is not active in this language.⁶ In particular, the subject can remain in situ while SpecTP is empty. Example (15)

⁶ There are other explanations for the putative lack of EPP effects in Italian (Alexiadou & Anagnostopoulou 1998). The precise details as to why SpecTP can be empty in Italian do not concern us here.

illustrates the well known observation that an overt subject in SpecTP is not required for Italian.

- (15) Sono arrivati gli studenti.
 are arrived the students
 ‘The students have arrived.’

In light of this Moro asks us to consider the following the paradigm in (16). These examples show that in a predicate nominal construction one of the two nominal phrases must raise to SpecTP. Thus, while SpecTP may remain empty in (15), overt movement is required in (16).

- (16) a. [una foto del muro]_i è [t_i [la causa della rivolta]]
 [a picture of.the wall] is [t [the cause of.the riot]]
 ‘A picture on the wall is the cause of the riot.’
 b. [la causa della rivolta]_i è [[una foto del muro] t_i]
 [the cause of.the riot] is [[a picture of.the wall] t]
 ‘The cause of the riot is a picture on the wall.’
 c. *è [∅ [una foto del muro] [la causa della rivolta]]
 is [[a picture of.the wall] [the cause of.the riot]]
 (‘A picture of the wall is the cause of the riot.’)

(Moro, 2009: ex 1-2)

I assume that the difference is not in the EPP property of T in predicate nominal constructions, but rather in the predicate construction itself. When the two DPs are initially merged as in (16c) they create an unlabellable structure, indicated by ∅. If labels matter only at LF, then LF movement should be able to repair (16c). Crucially, what we see both in the German and in the Italian data is that an unlabelled structure gives rise to overt movement. That is, the grammar does not wait until LF to repair the unlabelled structure.

2.5. Summary

We have seen that arguments that labels are needed only at LF or at PF fail. We have also seen that Collins’ arguments that selection be reconfigured as Agree fail to predict the existence of restructuring. In the next section I discuss why it might be necessary to create labels overtly and reconsider labels in light of Wiltschko’s (2008; 2014) theory of grammatical number.

3. Discussion

This section discusses the issues raised in the previous section. In the first subsection we review the arguments raised in section 2 and propose that labels are necessary in overt syntax. The second section discusses the role of labels in Wiltschko's (2008, 2014) Universal Spine Hypothesis.

3.1. Assessment of Labels

The previous discussion showed that movement to alleviate unlabelled structures takes place overtly. Furthermore, to the best of my knowledge, no cases of covert movement for the purposes of creating labels have been proposed in the literature. The question, of course, is why the formation of labels is necessary in overt syntax. I have suggested above that labels are necessary for selection, an idea I explore more in section 4. Nevertheless, it is clear that selection is not evaluated immediately, as movement takes place after selection to alleviate an unlabelled structure. Consider again long distance *wh*-movement, as in the following example.

(17) What did Mary say that John ate?

When the *wh*-phrase is at the left edge of the embedded clause, the clause is not yet labelled as CP. The DP *what* and the CP *that John ate* undergo Merge, but no label is formed as these two phrases do not share a criterial feature. When the *wh*-phrase ultimately raises to the matrix CP, the embedded clause is labelled CP and the selectional restriction of the verb *say* is satisfied.⁷ So, if selectional restrictions can be satisfied at LF, why is such movement overt, as the German and Italian data illustrate? The answer I propose is that labels are also needed at PF. If labels are needed both at PF and at LF, then the label must be present before Transfer. To ensure this is the case, then, movement must be overt.

I now present arguments that labels are needed at PF. Match Theory provides a highly explanatory theory of the syntax-phonology interface, in which prosody is assigned to syntactic structure (Selkirk 2009; 2011; Elfner 2015). Without going into fine detail, Match Theory crucially makes reference to maximal

⁷ On the view that selection is a relation between two heads, (i) a head X, and (ii) the head of the complement of X, the failure of selection here reduces to the fact that the verb *say* has no way to decide between D or C as the relevant head to form a selectional relation with. Once the *wh*-phrase raises to its surface position, the verb *say* selects C. Thanks to a reviewer for clarifying this.

projections. Consider Elfner's formulation of the constraint Match-Phrase (Elfner 2015, ex (3)).

(18) "For every syntactic phrase (XP) in the syntactic representation that exhaustively dominates a set of one or more terminal nodes α , there must be a prosodic domain (ϕ) in the phonological representation that exhaustively dominates all and only the phonological exponents of the terminal nodes in α ."

Furthermore, in some languages ternary branching in the prosodic structure is possible when the specifier of an XP is filled (Clemens 2014; 2019). Recall that Collins argued that PF crucially cannot make reference to maximal projections in a label-free version of grammar. Assuming prosodic structure is built at PF, I put forth that PF requires access to information provided by labels.⁸ Specifically, PF must be able to recognize labels and specifiers.

To recap, movement takes place overtly to create labels. Labels are not required by the syntax *per se*, as witnessed by the fact that the derivation can proceed with an unlabelled constituent, see example (17). Labels are required both at LF and at PF, thus, the label must be created before Transfer. We move now to a discussion of Wiltschko's Universal Spine Hypothesis and how it relates to labelling.

3.2. Labels and the Universal Spine Hypothesis

Wiltschko (2008) proposes an attractive theory of grammatical number in which Num projects to NumP (Ritter 1991; 1992) in some languages, such as English (Indo-European), but not into other languages, such as in Halkomelem (Salishan). She later expands this into a full-scale theory of structure building (Wiltschko 2014). She discusses various diagnostics specifically for number, three of which are shown here: i) obligatoriness of number marking, ii) obligatoriness of agreement, and iii) selection.

The first property is obligatoriness of number marking. In languages with projecting number the absence of plural marking gives rise to a singular reading. Thus in English, *the cat* must have a singular interpretation, while *the cats* has an

⁸ It is beyond the scope of this paper to launch a full scale defense of Match Theory in order to support the idea that PF requires labels. Instead, I rely on the prolific and fruitful results of Match Theory, which provide an understanding of the syntax-phonology interface, to motivate the claim that labels are required at PF.

obligatory plural interpretation. Consider the following Halkomelem data (Wiltschko 2008, ex (3)). Observe that plural marking is optional on the noun, in contrast to English. Note, incidentally, that plural is encoded by ablaut (as in English *foot-feet*).

- (19) a. te lhíxw swíweles b. te lhíxw swóweles
 DET three boy DET three boy.PL
 ‘the three boys’ ‘the three boys’ (Wiltschko, 2008: ex 3)

Observe that in Halkomelem, plural marking on the noun is optional. A singular noun can have either a singular or a plural interpretation. Wiltschko notes, however, that the plural form has only a plural interpretation.⁹

The second property Wiltschko discusses is agreement. She notes that number agreement is obligatory in English but optional in Halkomelem. The following example shows the well known fact that number agreement between the demonstrative and the noun is obligatory in English.

- (20) a. this boy/*these boy
 b. *this boys/these boys

Consider the following Halkomelem data (Wiltschko 2008, ex. 6).¹⁰ Observe that agreement between the determiner and the noun is optional.

- (21) a. t'ílém ye s-í:wí:qe
 sing DET.PL man.PL
 ‘The men are singing.’
 b. t'ílém te s-í:wí:qe
 sing DET man.PL
 ‘The men are singing.’
 c. t'ílém ye swíyeqe
 sing DET.PL man
 ‘The men are singing.’

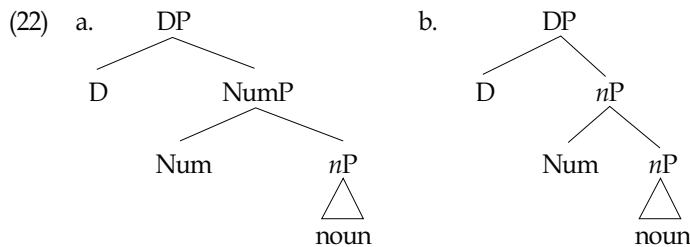
⁹ An obvious question at this juncture is how the Korean plural *-tul* fits into the picture. Much research has gone into understanding the nature of *-tul*, and only a few references are mentioned here (C. Kim 2005; Park 2008; An 2016; K. Kim & Melchin 2018b; 2018a). While a full discussion of the Korean plural is beyond the scope of this article, I do note K. Kim & Melchin (2018a), who argue that *-tul* adjoins to nP in Wiltschko’s framework.

¹⁰ Wiltschko notes that (21d) can receive a plural interpretation if the context allows it. The other examples in (21), of course, are obligatorily interpreted as plural.

- d. t'ílém te swíyeqe
 sing DET man
 'The man is singing.' (Wiltschko, 2008: ex. 6)

The third property Wiltschko discusses is selection. As is well known, certain English determiners select particular values of Num. The determiner *every*, for example, selects only singular nouns, *every student*/**students*, while the determiner *many* selects only plural nouns, *many students*/**student*. Wiltschko notes that there are no cases of determiners that impose selectional restrictions based on number in Halkomelem reported in the literature on Salish linguistics.

Wiltschko proposes that these three properties receive a principled explanation if we assume that Num projects to NumP in English (Ritter 1991; 1992), while Num in Halkomelem does not project, but rather adjoins to a lower projection, such as *nP*.¹¹ The two possibilities are shown below. In both cases Num adds a [plural] feature, giving rise to a plural interpretation. The difference is merely syntactic in that one projects and the other doesn't.¹²



Wiltschko (2014) goes on to build a general theory of syntactic structure that relies on these two ways of merging, namely as a head in (22a) and as an adjunct in (22b). It is crucial, then, for this theory that a label be projected in order to capture the differences between English and Halkomelem. In the next section we examine the predictions that Wiltschko's theory of number makes for

¹¹ Wiltschko later revises her analysis of Halkomelem and proposes that Num adjoins to the root rather than to *nP*. In the languages we examine later, Num adjoins to *nP*.

¹² A reviewer asks how the adjoined Num fails to provide a label. This issue is related to a lack of understanding of adjuncts and labelling in general. I will not provide a solution here, but will offer an idea for future research. First, I note that the issue here differs from the issue of adjunction in general since non-projecting Num is arguably a head and not a phrase. I adopt Chomsky's idea that roots are too weak to provide a label to the current situation. Specifically, in languages with non-projecting number, the Num head is too weak to provide a label. Thus, in (22b) when Num adjoins to *nP* the resultant structure is labelled as *nP*. See Saito (2016) for a similar idea for Case.

pseudo noun incorporation. To the extent that her theory of number can capture the cross-linguistic facts, we have evidence that labels are needed in syntax.

4. Predictions with Pseudo Noun Incorporation

This section investigates how labels play a role in Pseudo Noun Incorporation (PNI), strengthening the position that labels are formed in the overt syntax. Recall that since labels are necessary at PF and LF, they must be formed overtly. The grammar can then take advantage of the labels thus formed to give rise to PNI. Specifically, the verb can select a full DP object (as is the canonical case) or can select a reduced nominal – either *n*P or NumP as explained below. I begin with a brief overview of PNI and discuss the range of variation found in PNI constructions. I then discuss the predictions the theory of labelling makes in conjunction with Wiltschko’s (2008) theory of number.

PNI is largely thought to involve a nominal phrase rather than an N head (Massam 2001; Dayal 2011; 2015). Unlike noun incorporation, which involves a syntactic operation of head movement (Baker 1988), PNI does not involve any kind of movement operation. As Massam points out PNI results merely from (i) a reduced nominal object (either an *n*P or a NumP, as discussed below) and (ii) the failure of the object to move away from its position as the complement of the verb.¹³ It has also been shown that the size of the PNI object can vary (in the sense of Barrie & Mathieu 2016). Specifically, PNI can involve the verb selecting an *n*P or a NumP.¹⁴ Massam (2001) provides the following minimal pair, which nicely illustrates PNI.

- (23) a. Takafaga tūmau nī e ia e tau ika.
 hunt always EMPH ERG he ABS PL fish
 ‘He is always fishing.’
- b. Takafaga ika tūmau a ia.
 hunt fish always ABS he
 ‘He is always fishing.’

¹³ Baker (2014) has proposed that PNI involves LF head movement. Whether LF head movement of N to V takes place or not does not affect the conclusions here, so I do not discuss his analysis further.

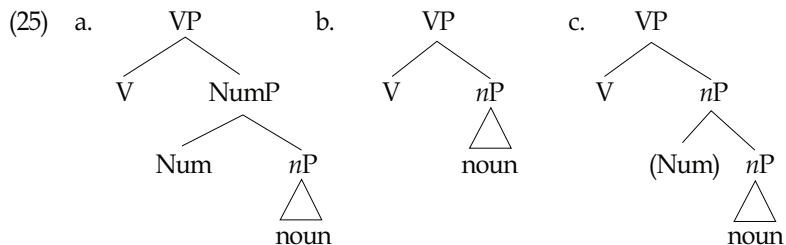
¹⁴ Other possible root nodes are possible for PNI constructions, but these are the most commonly mentioned in the PNI literature.

Niuean is a VSO language, as (23a) shows. Observe that the object has a case marker (absolutive) and a plural marker. In the PNI example, (23b), the noun is bare and is adjacent to the verb. As mentioned above, Massam argues that there is no movement or incorporation operation in the sense of Baker (1988), rather the object is an NP (or an *nP* in more updated terms), which simply remains adjacent to the verb.

Furthermore, under Wiltschko's proposal, Num either projects or adjoins. Given these ingredients, we predict the following three possibilities for PNI constructions.

- (24) a. The verb selects NumP, Num projects, and is valued either singular or plural
 b. The verb selects *nP*, Num projects, so is not available in PNI constructions
 c. The verb selects *nP*, Num adjoins, so may optionally appear in PNI constructions

The three possible tree structures are as follows. I run through the possibilities below.



I make the usual assumption that Num specifies a number value and that the absence of Num gives rise to a number neutral interpretation.¹⁵ In the first scenario, (23a), the verb selects a NumP to undergo PNI. In such a case, the language necessarily has projecting number. The only possible structure is (24a), and a number value will always be specified. That is, number neutrality will not be observed.¹⁶ In the second scenario, (23b), the verb selects an *nP*, and the

¹⁵ Number neutral interpretations in English are found in compounds. For example, in John is an elephant-washer, John could be in charge of washing one elephant or several elephants. In John washed the elephant only a singular interpretation is possible.

language has projecting number. In this case, only the tree in (24b) is possible, and PNI constructions will always exhibit number neutrality. In such a language number appears only in a full DP, that is, when PNI does not take place. Finally, in the third scenario, (23c), the verb selects an *nP*, and the language has non-projecting number. In this case, only the tree in (24c) is possible, with optional number as indicated. As with full DPs in such a language a PNI object unmarked for number exhibits number neutrality, and a PNI object marked for number, then, is interpreted as plural. Crucially, this system predicts that in a language with non-projecting number it is impossible for PNI to require number marking as Num cannot be selected.

It is worth re-iterating here that the system just described crucially requires labels. We have seen that PNI can vary cross-linguistically and that this variation can be captured by assuming the verb selects a projection with a particular label. Furthermore, selection must be under sisterhood and not at a distance as Collins proposed. In the next section we test these predictions against PNI constructions in Hindi, Niuean, and Nepali.

4.1. Hindi

Before introducing PNI in Hindi, it is necessary to ascertain whether Hindi has projecting or modifying number following the diagnostics discussed by Wiltschko. First, Hindi has obligatory number marking (Agnihotri 2013; Dayal 2015). Consider the following examples.

- (26) anu bacce-ko sambhaaltii hai
 Anu child-ACC manages
 'Anu looks after the child.' (Dayal, 2015, p. 49)

- (27) a. kamr-aa b. kamr-e
 room-SG room-PL
 'room' 'rooms' (Agnihotri, 2013, p. 50)

The bare roots *bacc* ('child') and *kamr* ('room') cannot appear alone. Agreement in Hindi is rather complex (Mahajan 1990). An incorporated case-less object triggers agreement on the verb, while a case-marked object does not. The mechanics of

¹⁶ This claim must take into consideration Dayal's (2011) observations on number neutrality in Hindi. There, she argues that the perceived number neutrality in Hindi PNI is the result of interaction between the PNI object and aspect. We take this up in more detail below.

this somewhat unexpected agreement pattern do not concern us here. What is important is that number triggers agreement. The following examples illustrate this pattern (Dayal 2011 ex 24). In (27a) the verb agrees in number and gender with the object. In (27b) the verb does not agree with any argument and bears default masculine singular agreement.

- (28) a. Raam-ne/Siitaa-ne (ek) macchlii pakaRii
 Ram-ERG/Sita-ERG (one) fish.FEM caught.FEM.SG
 'Ram/Sita caught a fish.'
- b. Raam-ne/Siitaa-ne macchlii-ko pakaRaa
 Ram-ERG/Sita-ERG fish.FEM-ACC caught.MASC.SG
 'Ram/Sita caught the fish.' (Dayal, 2011: ex 24)

These facts both suggest that Hindi has projecting number. Let us move on to PNI in Hindi.

PNI objects in Hindi appear with number marking. Consider the following PNI examples (Dayal 2011).¹⁷

- (29) a. anu baccaa sambhaaltii hai
 Anu child manages
 'Anu looks after children.' (Dayal, 2015: ex 5a)
- b. anu bacce sambhaaltii hai
 Anu children manages
 'Anu looks after children.' (Dayal, 2015: ex 6a)

At first glance, it appears as though the singular form exhibits number neutrality when a singular noun undergoes PNI, as suggested by the English translation in (28a). Dayal (2011, 2015), however, shows that number neutrality in Hindi is illusory. In particular, she shows that the interpretation of number results from an interaction with aspect. Consider the following crucial example (Dayal, 2015, p.67). If Hindi PNI truly did exhibit number neutrality (29a) should be grammatical and have a plural interpretation.

- (30) a. *anu-ne tiin ghanTee meN kitaab ikaTTa-karlii
 Anu-ERG three hours in book collected-COMPL

¹⁷ See Dayal (2011, 2015) for extensive evidence in favour of a PNI analysis of the data in (28).

- (‘Anu got done collecting *a book in three hours.’)
- b. anu-ne tiin ghanTee meN kitaabeN ikaTTa-karlii
 Anu-ERG three hours in book.PL collected-COMPL
 ‘Anu got done collecting books in three hours.’

Since number morphology must appear in PNI constructions in Hindi I conclude that PNI arises by the verb selecting bare NumP. As such number is always interpreted in PNI constructions, interactions with aspect as Dayal describes notwithstanding.¹⁸ I now move on to a discussion of PNI in Niuean.

4.2. Niuean

PNI was first described in Niuean (Austronesian) by Massam (2001). Number in Niuean is complex as it can be expressed in more than one place inside the KP. The following quote by Massam is instructive here (Massam 2020: 227).

“We see thus that number can be expressed in a range of places within the noun phrase...I have noted that the various expressions of plural number can co-occur with tau ‘PI’... I therefore propose that # is an obligatory head in the left periphery, along with K and D, with the further observation that pronunciation of tau ‘PI’ is optional only in cases where plurality is indicated elsewhere in the nominal. **This accounts for the fact that plural (i.e., non-singular) number is always overtly marked (and hence that singular is also made clear, by the absence of plural marking)**, as well as for the fact that plurality can be marked in more than one place.” (emphasis mine)

The take-home message from Massam’s discussion is that number marking is obligatory in Niuean, like English, and unlike Halkomelem. Recall that in Halkomelem if the context supports a plural reading plural marking is still optional. In Niuean, plural marking is obligatory, however, it can be expressed in different places in the nominal. Let’s see some of Massam’s examples. Note that plurality is productively expressed by the marker tau, but can also be expressed by reduplication for a small set of nouns. (C = common noun)

¹⁸ This brief discussion does not do justice to Dayal’s detailed analysis of number and aspect interactions in Hindi PNI constructions. It would be out of place to simply recapitulate all of Dayal’s arguments. To give a similar example in English, consider the sentence Mary ate an apple every day for a week. In total, Mary ate seven apples, even though the object is singular.

- (31) a. e tau tagata
 ABS PL person
 ‘the people’ (Massam, 2020: p. 221)
- b. e Ø tagata
 ABS SG person
 ‘the person’ (Massam, 2020: p. 221)
- c. mo e tau kau lakapi ha lautolu
 with C PL CL rugby GEN 3.PL
 ‘with their rugby teams’ (Massam, 2020: p. 224)
- d. Ti lalahi e fānau
 then PL~grew ABS PL.child
 ‘Then the kids grew.’ (Massam, 2020: p. 222)
- e. Faka-Niue au ke he tau fānua kua
 make-Niue 1.SG Goal PL PL.child PERF
 iloa he vagahau Niue.
 know COMPL speak Niue
 ‘I speak Niuean to the children who know
 how to speak Niuean.’ (Massam, 2020: p. 222)

Massam notes that Niuean does not have agreement, nor is there a distinction between singular and plural demonstratives. Niuean does, however, possess pluractional agreement as shown in (30d) (Haji-Abdolhosseini, Massam & Oda 2002). Taken together, these facts strongly suggest that Niuean has projecting number.

Turning to PNI, Massam observes that the PNI object is phrasal and is the result of pseudo incorporating an NP. Consider the following examples. (Massam 2001 ex 5a, 5b, 6b).

- (32) a. Takafaga tūmau nī e ia e tau ika.
 hunt always EMPH ERG he ABS PL fish
 ‘He is always fishing.’
- b. Takafaga ika tūmau nī a ia.
 hunt fish always EMPH ABS he
 ‘He is always fishing.’
- c. Ne holoholo kapiniu kiva fakaeneene a Sione.
 PST wash dish dirty carefully ABS Sione
 ‘Sione washed dirty dishes carefully.’

Crucially, a plural marker (or other higher functional material) cannot appear in an PNI construction in Niuean (Massam 2001 ex 14d).

- (33) *Kua holoholo tau kapiniu a Mele.
 PERF wash PL dishes ABS Mele.
 (Mele washes the dishes.)

Thus, PNI in Niuean takes place by pseudo incorporating a *nP*.¹⁹ We predict, then, that PNI constructions should be number neutral in Niuean. Consider the data in (31). Observe that the third example has a plural interpretation, despite the fact that no plural marking is otherwise found. The plural interpretation likely holds from the fact that activity of washing the dish typically involves washing several dishes, not just one. Note also that the first two examples have the same interpretation. The full KP object has plural marking, while the PNI object does not.

To summarize Niuean has projecting number, and PNI constructions are formed by pseudo incorporating a *nP*. As a consequence, number neutrality is observed in PNI constructions. We turn now to Nepali.

4.3. Nepali

Nepali has optional number marking as Wiltschko described for Halkomelem. If the plural marker is present in Nepali a plural interpretation holds; however, if the plural marker is absent the expression is number neutral (Acharya 1991; Poudel 2012). This is shown in the following example.

- (34) a. *suntalaa* b. *suntalaa-haru*
 orange orange-PL
 ‘orange(s)’ ‘oranges’

Furthermore, number agreement with predicates and demonstratives is optional in spoken Nepali (Matthews 1998: 29). Consider the following data.²⁰ Observe that

¹⁹ In her original 2001 proposal Massam had proposed the PNI in Niuean involves the pseudo incorporation of an NP. In that paper she did not consider the *nP* projection. In her 2020 monograph she does state that the PNI object is possibly an *nP*, but does not elaborate on this point. Crucially for the current discussion PNI in Niuean does not involve NumP.

²⁰ Note that the source document is a textbook on Nepali. I have confirmed the facts with a native speaker as noted in the citation at the end of example (34). The transliterations are my own and

plural marking on the verb and on the demonstrative is optional. Taken together, these facts strongly suggest Nepali has adjoining number rather than projecting number (like Halkomelem in the previous section).

- (35) a. *tyo maanche-haru kahãã chan*
 DEM.PL person-PL where be.3PL
 ‘Where are those men?’
- b. *yo maanche-haru kahãã cho*
 DEM.SG person-PL where be.3SG
 ‘Where are those men?’
- c. *mero choraa-haru vidyaarhi hun*
 my son-PL student COP.3PL
 ‘My sons are students.’
- d. *mero choraa-haru vidyaarhi ho*
 my son-PL student COP.3SG
 ‘My students are sons.’ (Rabi Gurung, speaker)

Caseless objects in Nepali share many properties with PNI (Paudyal 2009; Schikowski 2012; Barrie & Jung 2019). Such objects obligatorily take low scope and tend to be close to the verb.²¹ Consider the following data. Observe that the bare object cannot be separated from the verb. If a demonstrative appears with the object, however, then it does not have to be verb-adjacent. Observe in (35d) that the demonstrative is necessary if the direct object is separated from the verb.

- (36) a. *Bibek-le Aashmi-laai kitaab di-eko-thiyo.*
 Bibek-ERG Aashmi-DAT book give-PART-AUX.3SG
 ‘Bibek gave Ashmi a book.’
- b. *Aashmi-laai Bibek-le kitaab di-eko-thiyo*
 Aashmi-DAT Bibek-ERG book give-PART-AUX.3SG
 ‘Bibek gave Ashmi a book.’
- c. **kitaab Aashmi-laai Bibek-le di-eko-thiyo*
 book Aashmi-DAT Bibek-ERG give-PART-AUX.3SG
 (‘Bibek gave Ashmi a book.’)

were also checked with a native speaker. Nepali verbs also inflect for several level of honorific status; however, these are not indicated here.

²¹ Note that inanimate objects often do not appear with case marking – a feature reminiscent of differential object marking (DOM) (Bossong 1991). Disentangling DOM from PNI in Nepali will have to wait for future research.

- d. Aashmi-laai *(tjo) kitaab Bibek-le di-eko-thiyo
 Aashmi-DAT *(DEM) book Bibek-ERG give-PART-AUX.3SG
 'Bibek gave Ashmi that book.'
 (Suman Gurung, Dambar Gurung, speakers)

Bare objects also take narrow scope with respect to modals as the data in (36) show. Taken together, these facts strongly suggest a PNI analysis for bare nouns in Nepali (although see the caveat in footnote 17.)

- (37) a. Bibek-laai maanche-laai maar-na man-laag-ya-cha.
 Bibek-DAT man-DAT kill-INF mind-stick-PERF-3SG.PRS
 'Bibek wants to kill the/a man.' $\exists > \forall$, $*\forall > \exists$
 b. Bibek-laai maanche maar-na man-laag-ya-cha.
 Bibek-DAT man kill-INF mind-stick-PERF-3SG.PRS
 'Bibek wants to kill a man.' $*\exists > \forall$, $\forall > \exists$
 (Suman Gurung, Dambar Gurung, speakers)

The facts presented here suggest that Nepali has PNI. Furthermore, the data above suggest that a PNI is a *nP*. If the conclusion that Nepali has non-projecting number as discussed above is correct, then Num can adjoin to *nP*, and we predict the possibility for Num to appear in a PNI construction. The following examples support this conclusion.

- (38) a. Aashmi-le keeraa-haru khaa-idyo
 Aashmi-ERG banana-PL eat-PST.3SG
 'Ashmi ate bananas.'
 b. Bibek gaaḍi-haru bec-na chah-yo
 Bibek car-PL sell-PURP want-3SG.M
 'Bibek wants to sell some cars.'
 [speakers' comment: He has no specific cars in mind.]
 c. Bibek gaaḍi-haru-laai bec-na chah-yo
 Bibek car-PL-DAT sell-PURP want-3SG.M
 'Bibek wants to sell some (of his) cars.'
 [speakers' comment: He has specific cars in mind.]
 (Suman Gurung, Dambar Gurung, speakers)

To conclude, Nepali has adjoining number and has PNI in which the PNI object is a bare *nP*. As the plural marker adjoins to *nP*, it may optionally appear

in PNI constructions.

4.4. Predictions and Further Issues

The proposal here makes two strong, testable predictions. Crucially, among languages that pseudo incorporate an *nP* only we find two types. In both cases the pseudo incorporated nominal is expected to exhibit number neutrality. However, only languages with non-projecting number should be able to have an overt plural marker on the pseudo incorporated noun. Since there are independent diagnostics for projecting and non-projecting number, the viability of this proposal can be tested among languages that allow PNI. The second prediction is that in PNI languages in which a plural marker is not available on the PNI noun, the PNI noun should always exhibit number neutrality. That is among the following logical possibilities, where NP indicates the pseudo incorporated nominal, only the first three are expected to be found.

- | | | | | |
|------|----|-----------------------|------------------|------------------------|
| (39) | a. | V NP (general number) | | Niuean |
| | b. | V NP (general number) | V NP-pl (plural) | Nepali |
| | c. | V NP (singular) | V NP-pl (plural) | Hindi |
| | d. | V NP (singular) | | predicted not to exist |

This discussion has touched on only a few aspects of number and its relationship to PNI. I leave for future research how the system here interacts with dual number and other number categories. One aspect of Wiltschko's discussion I did not delve into is the location of adjoining number. Here for Nepali I have assumed that it adjoins to *nP*, in line with Wiltschko's proposal; however, she notes that number could adjoin in different locations. Specifically, she proposes that for Halkomelem Num adjoins to the root rather than to *nP*. This increases the range of possible languages. For instance, if a language pseudo incorporates *nP*, but Num adjoins to a projection above *nP*, then it is predicted that PNI constructions in this language can never appear with Num (like Niuean). Unlike Niuean, of course, number marking will pattern with Halkomelem and Nepali in terms of optionality as Num adjoins rather than projects.

5. Conclusion

I have reviewed various proposals calling into question the necessity of labels in syntax. Specifically, I discussed work by Collins, who proposes that labels are not necessary at all, and work by Takita, who proposes that labels are necessary at PF only. I have argued that labels are necessary for selection (contra Collins's argumentation), but have shown that selectional restrictions can be satisfied at LF. Given that movement to create labels is overt, I proposed that labels are necessary both at LF and at PF. They are necessary at LF for the reason just stated, namely, to satisfy selectional restrictions. I assume the basic tenets of Match Theory, which requires reference to labels at PF to assign prosodic structure. I suggested, then, that movement to create labels must be overt, so that the label is available both at PF and at LF.

I then discussed Wiltschko's theory of phrase structure as it is applied to grammatical number. Wiltschko proposes that number (and other categories) can project (as in English) or adjoin (as in Halkomelem). Such a theory crucially relies on the notion of a label to distinguish between the two manners of association (projection versus adjunction).

Finally, I showed that selection understood as obeying sisterhood combined with Wiltschko's theory of number makes interesting predictions regarding PNI. Specifically, we predict that for projecting languages, PNI could select either a NumP or a *n*P. A PNI object headed by Num will make the same kind of number distinctions as found in full KP (although, as Dayal showed, aspect may affect the interpretation of number). Hindi is such a language. A PNI object headed by *n* is predicted to be number neutral, as was shown to be the case for Niuean. A language with non-projecting number can only pseudo incorporate a *n*P. In such a case, the number marker may optionally appear. Nepali was shown to be such a language.

To conclude I have argued that labels are necessary at LF and at PF, hence movement to create labels is overt. Selection is understood as a strictly local relation (obeying sisterhood). PNI was shown to be constrained by selection in this manner in that languages with PNI select either a NumP or a *n*P. The predicted patterns were illustrated with various languages known for PNI. Given the typology suggested here, namely that some languages with PNI select a *n*P whereas others select a NumP it seems clear that the grammar must make labels available, *contra* Collins (2002, 2017). Finally, this proposal predicts that in a language where Num adjoins, PNI that requires a plural object is impossible.

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