PUTTING IT ALL TOGETHER: AGREEMENT, INCORPORATION, COORDINATION AND EXTERNAL POSSESSION IN WUBUY (AUSTRALIA)

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Abstract

In this paper we examine the interaction of a number of grammatical phenomena in Wubuy, a polysynthetic language from northern Australia, and show how they can be given a comprehensive analysis within the framework of LFG. While each of these phenomena – noun incorporation, verbal agreement, coordination and external possession – has received various treatments within the LFG literature, no one study has addressed the compatibility of these analyses under interaction, despite the fact that they frequently co-occur in the world's languages. We use data from Wubuy to showcase the effects of this interaction, and investigate the implications for LFG and for LFG analyses of polysynthetic languages more generally.

1 Introduction

In this paper we examine the interaction of a number of grammatical phenomena in Wubuy, a polysynthetic language from northern Australia, and show how they can be given a comprehensive analysis within the framework of LFG. While each of these phenomena – noun incorporation, verbal agreement, coordination and external possession – has received various treatments within the LFG literature, no one study has addressed the compatibility of these analyses under interaction, despite the fact that they frequently co-occur in the world's languages. We use data from Wubuy to showcase the effects of this interaction, and investigate the implications for LFG. We show how standard LFG treatments of agreement and coordination combine effortlessly with the analysis of incorporation presented in Nordlinger and Sadler (2008) (henceforth NS08) to account for the complex Wubuy data. We also provide an analysis of the external possession construction (building on earlier work in LFG, e.g. Schrock 2007, Lødrup 2009) that can likewise interact appropriately with the rest of the grammar, providing a single unified account of a range of empirical facts. As well as accounting for the Wubuy data, this work has implications for LFG analyses of polysynthetic languages more generally.

2 Wubuy

Wubuy (previously known as Nunggubuyu (Heath 1980, 1981, 1984)) is an Australian language of the Gunwinyguan family (Alpher, Evans, & Harvey 2003) which also includes Bininj Gunwok, Ngalakgan, Jawoyn, and others. It is spoken as a primary means of communication by adults over the age of 50 in the small remote community of Numbulwar, NT (c. 60 L1 speakers). It has not been fully acquired by children since the 50s, though many children and young adults understand and use it to varying degrees.[1]

[1]The data reported here come from Brett Baker and Kate Horrack's fieldnotes from fieldwork carried out with speakers in Darwin and Numbulwar between July-Sept 2009 and during Baker's previous field trips. (Brett Baker is working on a new grammar of the language.) Examples given here may not be used at the moment without seeking additional permission from Baker, and then giving explicit acknowledgement of the source. Many thanks to Galiliwa Nunggarrgalu, Didamain Uibo, Leonie Murrungun, and especially Ginyibuwa Murrungun for sharing their insights

3 Incorporation in Wubuy: overview

Wubuy, like many polysynthetic languages, allows for productive incorporation of body parts, as shown in the following examples[2] in which we see *-l̲anarr-* 'nail' (1), *-yarrga-* 'flipper' (2, 3) and *-yirr-* 'foliage' (4) incorporated into the verbal word:[3]

(1) *na-l̲anarr ngayawinyinyung nga-ni-l̲anarr-wawayuwaa*
MASC.TOP-nail 1SG.GEN 1SG-3MASC-nail-cut.PC
'I was cutting off my nails (MASC)' IPC

(2) *nga-wu-yarrga-nagiina yii-ngarruga l̲ij-*(inyung)*
1SG-NEUT-flipper-cook.PR FEM.OBL-dugong-GEN
'I'm cooking the dugong's (FEM FLIPPER (NEUT)' IPC

(3) *nga-ngu-yarrga-gambana (ngarra-ngarruga l̲ij)*
1SG-3FEM-flipper-roast.PR FEM.TOP-dugong
'I'm roasting the dugong's (FEM) flipper (NEUT)' EPC

(4) *niini-ma-yirr-mangi mana-wuluru mana-ma-manjarr-gadhuwa*
1DUMASC-VEG-foliage-get.PC VEG.TOP-*acacia.sp* VEG.TOP-VEG.REL-leaves-new
'We two (excl.) got new leaves (NEUT) of the acacia sp. (VEG)' EPC

In fact, incorporated body parts participate in two different construction types, as these examples demonstrate.[4] The relevant distinction is between the **Internal Part-Whole or Possession Construction** (IPC) in which the possessum or whole is in construction with the part (and so the possessor is coded solely as an argument of the possessum), and the **External Whole/Possessor Construction** (EPC) (or Possessor Raising) in which both the whole/possessor and the part/possessee are arguments of the verb. Thus the possessum-possessor relationship can be expressed in two different syntaxes and in both of these it is possible to incorporate the possessum or body part.

In the Internal Possession Construction in (1) and (2), the incorporated body part is itself the direct object argument: the verb agrees with it directly (showing MASC or NEUT, respectively,

into the language.

[2]Unless otherwise specified, all of the examples cited here come from (a subset of) the authors' fieldnotes.

[3]Abbreviations: FEM, MASC, NEUT, RESID, VEG, COLL: noun classes feminine, masculine, neuter, residual, vegetable, collective, TOP: topic form of noun class prefix, OBL: oblique form of noun class prefix, REFL: reflexive, REL: relative ('part') form of noun class prefix (a type of oblique marking), LOC: locative, DAT: dative, GEN: genitive, PC: past continuous, PP: past punctual/present perfective, PR: present, PROX: proximate.

[4]Note that, in common with other Gunwinyguan languages, Wubuy allows noun incorporation into both verbs and adjectives. For ease of presentation, in this paper we will focus on incorporation into verbs. We have shown elsewhere that the analysis of incorporation in NS08 extends naturally to an account of incorporation into adjectives also (see Baker and Nordlinger (2008)).

object agreement in this case), and a doubled external NP appears in direct (unmarked) case, as is appropriate for (subjects and) direct objects in Wubuy. In the IPC, the possessor must be marked with the genitive case, as (1) and (2) also demonstrate. Example (5) shows that the IPC construction need not involve noun incorporation:

(5) *anaani ana-wanja wu-warra-gayiyn (ngayawinyinyung)*
NEUT.PROX NEUT.TOP-arm 3NEUT-DUMMY-ache.PP 1SG.GEN
'this arm(NEUT) of mine is aching/sore' IPC

Examples (3) and (4), on the other hand, exhibit the External Possession Construction, in which the whole (or possessor) is encoded as direct object. This is evidenced by (i) the fact that the object verb agreement (in (3), *-ngu-*) shows noun class agreement with 'dugong' (i.e. FEM) and not 'flipper' (NEUT); and (ii) the lack of genitive/oblique case marking on the external possessor NP, which shows it to be a core argument of the verb. The incorporated body part may be doubled by an external NP, which now must appear in oblique case (as in (4) above, and (6), (7) below) showing it *not* to be an object argument of the verb.[5] Example (8) shows that incorporation of the body part is not obligatory in EPC constructions – but that the external NP expressing the part remains in oblique case irrespective of whether or not it is doubled by an incorporated nominal.

(6) *ngaya nga-laan-barrlhiyn yii-laan-duj*
1SG 1SG-knee-sore.REFL.PP MASC.OBL-knee-LOC
'I have sore knee(s)/I am sore in the knee(s)/my knee(s) is/are sore.' EPC

(7) *ngu-warraga-wagiwayn, ama-rulbu-rruj*
3FEMSG/3FEMSG-upper.back-hit.PP VEG.OBL-back-LOC
'She hit her in the upper back, in the back.' (6.3) EPC

(8) *ana-ngarrgu nga-rang a-lhuganda-rruj*
RESID.TOP-'roo 1SG/RESID-spear.PP NEUT.OBL-shin-LOC
'I speared the kangaroo in the lower leg.' EPC

These two incorporation constructions are schematized in (9), in which the bolded elements are those which refer to the part:[6]

[5]The relative noun class marking exhibited on the external nominal *mana-ma-manjarr-gadhuwa* in (4) is a type of oblique marking. We discuss relative noun class marking further in 6.

[6]Note that, in the interests of clarity, we are focussing only on the incorporation of non-subject arguments in this paper. In fact, Wubuy, like many incorporating languages, allows incorporation of intransitive subjects also, in both IPC and EPC constructions, as illustrated in the following examples.

(i) *naagi, ni-yarra-wuldhiyn na-yarra*
MASC.PROX 3MASC-nail-cut.PP MASC.TOP-nail

(9) IPC + NI: SUBJ-AGR - **obj-agr** - **ni-of-part**- VERBSTEM
EPC + NI: SUBJ-AGR - OBJ-AGR - **ni-of-part**- VERBSTEM

Despite the difference in predicate-argument relations, and the morphosyntactic reflexes of this, in both types of incorporation there is no reduction in the valency of the verb (see (1) and (3)). And in both constructions, the incorporated body part can also be doubled by an external noun (see (1) and (6)). We also find external modifiers referring to the incorporated nominal, as in (10) and (11). Thus, both incorporation constructions are clearly of the classifier type (Rosen 1989).

(10) *nga-ni-l̲anarr-wawayuwaa (na-)wulawaa*
1SG-3MASC-toenail-cut.PC MASC.TOP-two
'I cut two toenails.' IPC

(11) *ngaya anaani nga-l̲anarr-wawayuwiini, ngayajbaj anaani*
1SG PROX 1SG-toenail-cut.REFL.PC, me.myself PROX
'I cut this/these toenail(s).' EPC

Part-Whole Expression Type	Syntactic	Incorporate Part	NI+ Doubling	NI + Modify
IPC	(5)	(2)	(1)	(10)
EPC	(8)	(3)	(6)	(11)

Table 1: Part Incorporation construction types

In the remainder of the paper we will show how these two different incorporation constructions and their morphosyntactic properties follow straightforwardly from analyses of classifier noun incorporation (NS08) and external possession (e.g. Schrock 2007) in the LFG literature. In section 6 we also provide an analysis of the complex interaction with coordination. Then in section 7 we provide some initial remarks on the semantics.

'The nail(s) (MASC) is/are cut' IPC

(ii) *an'-agalgi nga-ra-yilgiini*
NEUT.TOP-yesterday 1SG-tooth-poke.REFL.PC
'Yesterday I poked my tooth/I poked myself in the tooth (MASC)' EPC

The analysis we present will ultimately need to be extended to include the incorporation of intransitive subjects (e.g. through disjunctions of grammatical functions in the appropriate places). We put this aside for future work, but don't expect it to have any conceptual impact on the basic analysis presented here.

4 Incorporation and Internal Possession Construction

An analysis of incorporation in an IPC construction, as in (12) below, follows straightforwardly from standard LFG treatments of verbal agreement, and the treatment of noun incorporation presented in NS08.[7] The crucial characteristics of this construction are:

- OBJ agreement with the part/possessum
- part/possessum may undergo NI
- possessor/whole appears in an oblique case (genitive)

Consider an example such as (12). The verb involves four morphs: the first element is a subject (agreement) marker indicating that the SUBJ is 1SG. The second element is an object (agreement) marker, indicating that the OBJ is of NEUT gender. The third element is the incorporated nominal stem *yarrga* 'flipper', and the final element is the verbal stem itself. The nominal corresponding to the possessor of the (incorporated) body-part carries a feminine gender prefix (which also marks the noun as having an oblique (i.e. non-direct) case) and is obligatorily marked with GEN case, as a dependent of the (incorporated) body-part.

(12) *nga-wu-yarrga-nagiina* *yii-ngarruga<u>l</u>ij-*(inyung)*
1SG-NEUT-flipper-cook.PR FEM.OBL-dugong-GEN
'I'm cooking the dugong's flipper' IPC

Building on the analysis of classifier incorporation provided by NS08, we assume that the lexical entry associated with the (fully derived and inflected) verb in (12) is that provided in (13), and that the (simplified) f-structure corresponding to the clause is that in (14). Because this is a case of classifier incorporation, the verb maintains its valency (hence the PRED value in the first line of the lexical entry). The incorporate has the grammatical function status of an OBJ but we allow for the OBJ itself to be a set, which allows for doubling (and for coordination). The PRED value of the IN indicates that the incorporated nominal subcategorises for a POSS function (the 'whole').[8]

(13) *nga-wu-yarrga-nagiina*
(↑ PRED) = 'cook< (SUBJ)(OBJ) >' verb maintains its valency

[7] Previous work in LFG on both valence reducing (compounding) and valence preserving (classifier) incorporation includes Ball (2004); Asudeh (2007); Duncan (2007); Nordlinger and Sadler (2008); Baker and Nordlinger (2008) as well as Mohanan (1995); Wescoat (2002) on Hindi and (Manning, 1996; Bresnan, 2001) on West Greenlandic. Discussion of the relationship between our analysis and these alternative approaches is provided in NS08. We build especially on Asudeh (2007) in section 7.

[8] Of course the lexical description in (13) could equally well describe a (monomorphemic) verb with the specific lexical meaning 'cook a flipper': we provide here the full form lexical entry for simplicity but assume that this is the result of some lexical process operating in the morphology to combine the nominal and verbal stems in the case of NI.

(↑ OBJ (∈)) = ↓	NI
(↓PRED) = 'flipper <(POSS)>'	a PRED value for the IN
(↓INDEX PERS) = 3	
(↓INDEX NUM) = SG	
(↓INDEX GEND) = NEUT	
(↑ OBJ INDEX GEND) = NEUT	from the OBJ agr marker
(↑ SUBJ INDEX PERS) = 1	
(↑ SUBJ INDEX NUM) = SG	
(↑ SUBJ PRED) = 'PRO'	

(14)
$$\begin{bmatrix} \text{SUBJ} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 1 \\ \text{PRED} & \text{'PRO'} \end{bmatrix} \\ \text{PRED} & \text{'COOK}< (\text{SUBJ})\ (\text{OBJ})> \text{'} \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{'FLIPPER}< (\text{POSS}) > \text{'} \\ \text{INDEX} & \begin{bmatrix} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \\ \text{GEND} & \text{NEUT} \end{bmatrix} \\ \text{POSS} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 3 \\ \text{GEND} & \text{FEM} \\ \text{CASE} & \text{GEN} \\ \text{PRED} & \text{'DUGONG'} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The fact that the lexical entry for the verb optionally constructs a set-valued OBJ allows for the doubling of the incorporated noun in examples like (1) (as per the NS08 apposition analysis), and will also allow for coordination of the incorporated noun with an external noun (see section 6 below).

Thus, using existing analyses of classifier incorporation, we can account for the IPC incorporation constructions without further modification required.

5 External Possession Construction

Recall that in the external possession construction, it is the whole/possessor which is coded as a direct argument of the verb, and the incorporated (part) noun can be doubled with an external noun in oblique case (as in (6)).

(15) *ngarra-ngarrugal̪ij, nga-ngu-yarrga-gambana*
FEM.TOP-dugong, 1SG-3FEM-flipper-roast.PR
'I'm roasting the dugong's flipper' EPC

The crucial characteristics of this construction are of course a combination of the characteristics of the EPC and NI of body-parts, namely:

- OBJ agreement is with the whole
- the whole appears in direct (unmarked) case
- OBJ agreement with the whole/possessor suggests that *dugong* raises to occupy the grammatical function otherwise associated with the whole phrase *dugong's flipper*
- the part/possessum optionally undergoes NI
- the part/possessum is optionally doubled by a noun with oblique case or in an oblique noun class/case form

5.1 Analysis of EPC in Wubuy

The syntactic part of our analysis of the EPC builds on earlier syntactic analyses in LFG by Schrock (2007) and Lødrup (2009). These accounts treat EPCs as arising from alternative semantic forms for verbs (which satisfy the appropriate semantic restrictions) in which the verb in question is taken to subcategorise for an additional syntactic argument, with structure sharing between the OBJ and the POSS function in the f-structure of the part/possessum. Lødrup (2009) makes explicit the fact that this analyis extends the LFG treatment of control and raising to the nominal domain (using functional control). A key issue which arises for syntactic accounts is whether the OBJ in an EPC construction is thematic or not (neither Schrock (2007) not Lødrup (2009) provide any semantic analysis of the construction). For present purposes we follow Schrock (2007) in assuming that the OBJ in EPC constructions from transitive verbs is non-thematic, so that it is not a semantic argument of the verb itself. But nothing in the analysis hinges on this particular assumption.[9] Lodrup is less explicit about the thematicity of the OBJ in the standard possessor raising construction from transitive verbs, but he is also concerned with the productive possessor raising construction from agentive (unergative) intransitive verbs in Norwegian, and here he notes that the OBJ will be non-thematic.[10]

The data that we are primarily concerned with here involves an alternation between an OBJ part-whole construction (IPC) and an EPC in which the whole (possessor) raises to OBJ function while the part or possessum is assigned to a less central function (we are not concerned here

[9] Although he takes the possessor as non-thematic wrt the verb, Schrock (2007) also considers that the semantic restrictions on the EPC (namely, that it is usually restricted to inalienable or part/whole possession) may suggest that it may be better to treat both elements as semantic arguments of the verb so that these restrictions can be captured. However, it seems to us that these restrictions on the distribution of the construction should in fact be captured at a more abstract, semantic level.

[10] Under the assumptions of Lexical Mapping Theory, it then follows that for intranstives, possessor raising is restricted to unergatives. The single argument of an unaccusative would be marked [-r]. However (by the assumptions of LMT) a non-thematic argument can only be [-r]. Since languages are generally assumed to have only one intrinsically assigned [-r] argument, intransitive possessor raising will be found only with unergative verbs.

with possessor raising from/to SUBJ). The oblique case marking on the unincorporated part noun in Wubuy suggests that OBL is the appropriate grammatical function for the part noun in these Wubuy EPC constructions. Thus, we can capture the syntax of the (OBJ) EPC in Wubuy in terms of a lexical rule that effects the alternation shown in (16).[11]

(16) a. (↑ PRED) = '<(SUBJ) (OBJ)>' INPUT

b. (↑ PRED) = '<(SUBJ) (OBL)> (OBJ)'
(↑ OBL POSS) = (↑ OBJ) OUTPUT

The f-structure associated with the EPC construction in (17) is therefore that provided in (18):

(17) *ana-ngarrgu* *nga-rang* *a-lhuganda-rruj*
RESID.TOP-'roo 1SG/RESID-spear.PP NEUT.OBL-shin-LOC
'I speared the kangaroo (RESID.) in the shin (NEUT)'

(18)
$$\begin{bmatrix} \text{OBJ} \quad [1] \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 3 \\ \text{GEND} & \text{RESID} \\ \text{PRED} & \text{'KANGAROO'} \end{bmatrix} \\ \text{SUBJ} \quad \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 1 \\ \text{PRED} & \text{'PRO'} \end{bmatrix} \\ \text{PRED} \quad \text{'SPEAR} < (\text{SUBJ}) \ (\text{OBL}) > \text{OBJ'} \\ \text{OBL} \quad \begin{bmatrix} \text{PRED} & \text{'SHIN} < (\text{POSS}) > \text{'} \\ \text{CASE} & \text{LOC} \\ \text{POSS} & [1] \end{bmatrix} \end{bmatrix}$$

5.2 Incorporation and External Possession Construction

With this analysis of the EPC in place, the analysis of an EPC combined with nominal incorporation of the part then follows straightforwardly. An example of this construction is given in (19). In this example, the OBJ agreement marker on the verb codes a VEG argument, indicating that the OBJ is *-aalburrunggu* ('turkey') and not the incorporated nominal *-laga-* ('leg'). The information associated with the verb in (19) is provided in (20). The effects of the EPC lexical rule are shown in the first two lines. The effect of NI are the same as those for the IPC construction in (13).

[11] Ultimately, we assume that the lexical rule itself can be dispensed with given a more articulated view of the syntax-lexicon interface in which lexically governed argument structure alternations are captured using some version of linking theory, but we leave that matter to one side for the moment.

(19) *man'-aal̲burrunggu, nga-ma-l̲aga-wagiwaa*
VEG.TOP-turkey, 1SG-VEG-leg-break.PC
'I broke the turkey's (VEG) legs (NEUT)'

(20) (↑ PRED) = 'break< (SUBJ)(OBL) > (OBJ)'
(↑ OBJ) = (↑ OBL POSS) by EPC
(↑ SUBJ INDEX PERS) = 1
(↑ SUBJ INDEX NUM) = SG
(↑ SUBJ PRED) = 'PRO'
(↑ OBJ INDEX GEND) = VEG
(↑ OBJ INDEX PERS) = 3
(↑ OBJ INDEX NUM) = SG?
(↑ OBL (∈)) = ↓ by NI
(↓PRED) = 'LEG< (POSS) >''
(↓INDEX PERS) = 3
(↓INDEX NUM) = SG
(↓INDEX GEND) = NEUT

(21)
$$\begin{bmatrix} \text{OBJ} \quad [1] \begin{bmatrix} \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 3 \\ \text{GEND} & \text{VEG} \end{bmatrix} \\ \text{PRED} & \text{'TURKEY'} \end{bmatrix} \\ \text{SUBJ} \quad \begin{bmatrix} \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 1 \end{bmatrix} \\ \text{PRED} & \text{'PRO'} \end{bmatrix} \\ \text{PRED} \quad \text{'BREAK< (SUBJ) (OBL) > OBJ'} \\ \text{OBL} \quad \begin{bmatrix} \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 3 \\ \text{GEND} & \text{NEUT} \end{bmatrix} \\ \text{PRED} & \text{'LEG< (POSS) >'} \\ \text{POSS} & [1] \end{bmatrix} \end{bmatrix}$$

Thus, by way of summary, the EPC construction maps the second argument onto OBL, while the NI construction incorporates the second argument into the verb (independent of whether its function is OBJ or OBL):

EPC maps 2nd argument to OBL

(↑ PRED) = 'break< (SUBJ)(OBJ) >'	IPC
(↑ PRED) = 'break< (SUBJ)(OBL) > (OBJ)'	EPC
(↑ OBJ) = (↑ OBL POSS)	EPC

NI incorporates 2nd argument into verb (here denoted by GF):

(↑ GF (∈)) = ↓	by NI
(↓PRED) = 'LEG< (POSS) >''	
(↓INDEX PERS) = 3	
(↓INDEX NUM) = SG	
(↓INDEX GEND) = NEUT	

As noted above, interesting issues arise concerning how such sub-generalizations over sets of lexical elements should be captured, both in the case of 'possessor raising' and in cases of nominal incorporation. In the latter case, we may assume (as in NS08), that a morphological operation attaches a nominal stem into a verbal stem and adds some f-structure information. There are clear restrictions on the set of nominals which can be incorporated, but we see from the interaction of bodypart NI with both the EPC and the IPC constructions that it is not restricted to a particular GF. Using sublexical trees to schematize the relationship between verbal and nominal stem, we see that at least the following possibilities are attested in Wubuy.

V	⟶	N	V
		(↑ OBL|OBJ(∈)) = ↓	↑ = ↓

6 Interactions with Coordination

NS08 (and also BN08) note that their analysis of NI allows in principle for an interaction of noun incorporation with coordination - the theory would allow an external (bodypart) NP to be coordinated with the incorporated noun, which heads a GF at f-structure. The two different incorporation constructions (IPC and EPC) predict that, if such coordination is possible, the form of the coordinated external noun should reflect the different functions of the incorporated nominal: in an IPC construction, where the incorporated noun is an OBJ, the external noun should be unmarked. In an EPC construction, in which the incorporated noun is an OBL, the external coordinand should be marked with an oblique case form. In fact, this is exactly what we find in the data.

In (22) (the IPC), the part is the OBJ argument and so coordinates with other direct (unmarked) NPs, despite being incorporated:

(22) *wirri-wudu-miyn, marri andhiri, marri bagal̲ang wirri-ma-ngarrgiwayn*
3PL/3NEUT-liver-get.PP and heart and eye 3PL-3VEG-cut.out.PP
'They got the liver (NEUT), and heart (NEUT), and the eye (VEG) they cut out.' (IPC)

In the EPC construction in (23), on the other hand, the part is an OBL and so coordination must be with other oblique NPs for the construction to be grammatical. This is shown by the fact that

the external part nouns in the following example cannot be in direct (unmarked) form, but must be in 'relative' noun class form, in which part nouns take double noun class prefixation to agree with the noun class of the possessor. Although these nouns do not take an overt oblique case suffix, we regard these forms as obliques since part nouns in relational noun class cannot control verb agreement (in contrast to part nouns in the IPC construction). There is persuasive evidence that forms in 'relative' noun class form are not OBJ in this construction, as nouns prefixed with relative noun class appear never to occupy direct argument positions. As the following constrasting pair shows, an unmarked NP conjunct would be ungrammatical here.

(23) *man'-aal̲burrunggu, nga-m'-an̲ja-wagiwaa marri mana-ma-l̲aga*
VEG.TOP-turkey, 1SG-VEG-arm-break.PC and VEG.TOP-VEG.REL-leg
'I broke the wings (lit. 'arms' NEUT) and the legs (NEUT) of the turkey (VEG)' (EPC)

(24) **man'-aal̲burrunggu, nga-m'-an̲ja-wagiwaa marri ana-l̲aga*
VEG.TOP-turkey, 1SG-VEG-arm-break.PC and NEUT-leg
'I broke the wings (lit. 'arms' NEUT) and the legs (NEUT) of the turkey (VEG)' (EPC)

The coordination of incorporated body parts with external NPs has received almost no mention in the literature (although Van Geenhoven (1998, 792) provides withouth further discussion the Greenlandic example in (25) from Sadock (1991, 20)), and would seem to violate many standard accounts of coordination based on constituent structure.

(25) *Marlu-raar-p-u-q affar-mik-lu*
two-catch-IND-[-TR]-3SG half-INS-and
'He caught two and a half.'

However, it follows directly from the interaction of NS08's analysis of nominal incorporation, and standard LFG analyses of coordination (e.g. Dalrymple 2001) as developed to accommodate various types of discontinuous coordination in Sadler and Nordlinger (2010).

Example (26) provides the lexical entry for the (first) IPC verb in (22), showing the analysis of the incorporated body part as projecting either the OBJ or a member of the OBJ (NS08). Following assumptions laid out in NS08, external NPs are also annotated with $(\uparrow \text{OBJ} \ (\in)) = \downarrow$ in the c-structure, resulting in the (partial) f-structure in (27) for the first clause in (22). Note that case agreement amongst the coordinands is enforced by the fact that case is a distributive feature.[12]

(26) *wirri-wudu-miyn*
$(\uparrow \text{PRED}) =$ 'get$<$ (SUBJ)(OBJ) $>$'
$(\uparrow \text{OBJ} \ (\in)) = \downarrow$
$(\downarrow \text{PRED}) =$ 'liver'

[12]We use NOM here to refer to the direct (unmarked) case that is found on subjects and objects in Wubuy.

(↓INDEX PERS) = 3
(↓INDEX NUM) = SG
(↓INDEX GEND) = NEUT
(↑ OBJ INDEX GEND) = NEUT

(27)
$$\begin{bmatrix}
\text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`PRO'} \\ \text{INDEX} & \begin{bmatrix} \text{PERS} & 3 \\ \text{NUM} & \text{PL} \end{bmatrix} \end{bmatrix} \\
\text{PRED} & \text{`GET}\langle(\text{SUBJ})\ (\text{OBJ})\rangle\text{'} \\
\text{OBJ} & \begin{bmatrix} \text{INDEX} & [\text{GEND} \quad \text{NEUT}] \\ \left\{ \begin{bmatrix} \text{PRED} & \text{`LIVER'} \\ \text{INDEX} & \begin{bmatrix} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \\ \text{GEND} & \text{NEUT} \end{bmatrix} \\ \text{CASE} & \text{NOM} \end{bmatrix} \right. \\ \left. \begin{bmatrix} \text{PRED} & \text{`HEART'} \\ \text{INDEX} & \begin{bmatrix} \text{PERS} & 3 \\ \text{NUM} & \text{SG} \\ \text{GEND} & \text{NEUT} \end{bmatrix} \\ \text{CASE} & \text{NOM} \end{bmatrix} \right\} \end{bmatrix}
\end{bmatrix}$$

In the EPC construction, the 'raised' possessor is a non-thematic object of the verb, and is identified with the possessor selected by the incorporated nominal (which is itself an OBL) (28). As shown in the associated (partial) f-structure (29), the POSS will distribute appropriately across all members of the coordinated set.

(28) *nga-ma-l̲aga-wagiwaa*
(↑ PRED) = 'break$\langle$ (SUBJ)(OBL) $>$ (OBJ)'
(↑ OBJ) = (↑ OBL POSS)
(↑ OBL $(\in)$) = ↓
(↓PRED) = 'LEG$\langle$ (POSS) $>$ '
(↓INDEX PERS) = 3
(↓INDEX NUM) = SG
(↓INDEX GEND) = NEUT
(↑ OBJ INDEX GEND) = VEG

(29)
$$\begin{bmatrix}
\text{OBJ} \quad [1]\begin{bmatrix} \text{PRED} \quad \text{`TURKEY'} \\ \text{INDEX} \quad \begin{bmatrix} \text{NUM} \quad \text{SG} \\ \text{PERS} \quad 3 \\ \text{GEND} \quad \text{VEG} \end{bmatrix} \end{bmatrix} \\
\text{SUBJ} \quad \begin{bmatrix} \text{PRED} \quad \text{`PRO'} \\ \text{INDEX} \quad \begin{bmatrix} \text{NUM} \quad \text{SG} \\ \text{PERS} \quad 1 \end{bmatrix} \end{bmatrix} \\
\text{PRED} \quad \text{`BREAK}\langle\ (\text{SUBJ})\ (\text{OBL})\rangle\ (\text{OBJ})\text{'} \\
\text{OBL} \quad \begin{bmatrix} \text{INDEX} \quad [\text{GEND} \quad \text{NEUT}] \\ \left\{ \begin{bmatrix} \text{PRED} \quad \text{`LEG}\langle\ (\text{POSS})\ \rangle\text{'} \\ \text{INDEX} \quad \begin{bmatrix} \text{PERS} \quad 3 \\ \text{NUM} \quad \text{SG} \\ \text{GEND} \quad \text{NEUT} \end{bmatrix} \\ \text{CASE} \quad \text{OBL} \\ \text{POSS} \quad [1] \end{bmatrix}, \begin{bmatrix} \text{PRED} \quad \text{`ARM}\langle\ (\text{POSS})\ \rangle\text{'} \\ \text{INDEX} \quad \begin{bmatrix} \text{PERS} \quad 3 \\ \text{NUM} \quad \text{SG} \\ \text{GEND} \quad \text{NEUT} \end{bmatrix} \\ \text{CASE} \quad \text{OBL} \\ \text{POSS} \quad [1] \end{bmatrix} \right\} \end{bmatrix}
\end{bmatrix}$$

7 Semantics

In this section we provide a preliminary account of how the semantics of Wubuy NI might be handled in LFG, building on both NS08 and in particular on Asudeh (2007), which provides an account of the semantics of non-valency preserving Niuean pseudo-incorporation (see also Asudeh and Ball (2005),Van Geenhoven (1998), Farkas and de Swart (2003), Chung and Ladusaw (2003)).

The fundamental distinction between compounding (non-valency preserving) incorporation (as found in Niuean) and classifier incorporation (as in Wubuy), is that the latter involves a subcategorised argument of the verb - that is, there is evidence that the IN continues to bear a syntactic grammatical function subcategorised by the verbal stem, rather than being syntactically inert (as is the case in so-called compounding incorporation). The term pseudo-incorporation refers to the fact that Niuean incorporation appears to be syntactic rather than morphological (but

this is orthogonal to the semantic treatment). We begin therefore by summarising the approach taken in Asudeh (2007).

In terms of the syntax, Asudeh (2007) introduces a non-valent GF labelled INCORPORATE. Modifiers of the incorporate will occur freely in the syntax (Niuean does not exhibit doubling). The following illustrates the approach: (31) is the phrase structure rule introducing the the incorporation structure and (32) is the f-structure for the example in (30). Note that the non-thematic INCORPORATE corresponds to a semantic argument of the verb ($(\uparrow_\sigma \text{ARG}) = \downarrow_\sigma$).

(30) *Ne inu kofe a Sione.*
PAST drink coffee ABS Sione
Sione drank coffee (Niuean)

(31) $\text{V}^0 \longrightarrow$ V^0 ($\uparrow = \downarrow$) $\hat{\text{N}}$ ($(\uparrow \text{INCORPORATE}) = \downarrow$, $(\uparrow_\sigma \text{ARG}) = \downarrow_\sigma$)

(32)
$$\begin{bmatrix} \text{INCORPORATE} & \begin{bmatrix} \text{PRED} & \text{`COFFEE'} \end{bmatrix} \\ \text{PRED} & \text{`DRINK}< \text{SUBJ}>\text{'} \\ \text{SUBJ} & \begin{bmatrix} \text{PRED} & \text{`SIONE'} \\ \text{CASE} & \text{ABS} \end{bmatrix} \end{bmatrix}$$

In this approach, the incorporate is syntactically a non-projecting nominal (as in (33)), and corresponds semantically to a property: the $\hat{\text{N}}$ is derived by lexical rule from a N with no semantic change.

(33) *kofe: $\hat{N}$* $\lambda x.coffee(x)$: $(\uparrow_\sigma \text{VAR}) \multimap (\uparrow_\sigma \text{RESTR})$

A lexical process converts the unincorporating verb to an incorporating verb, that is, it relates (34) to (35).

(34) *-inu: V* $(\uparrow \text{PRED}) = \text{drink}<(\uparrow \text{SUBJ})\ (\uparrow \text{OBJ})>$
$\lambda x \lambda y.drink(x, y)$: $(\uparrow \text{SUBJ}_\sigma) \multimap (\uparrow \text{OBJ}_\sigma) \multimap \uparrow_\sigma$

(35) *-inu: V* $(\uparrow \text{PRED}) = \text{drink}<(\uparrow \text{SUBJ})>$
$\lambda P \lambda x.\exists y[drink(x, y) \wedge P(y)]$:
$[(\uparrow_\sigma \text{ARG VAR}) \multimap (\uparrow_\sigma \text{ARG RESTR})] \multimap$
$[\,(\uparrow \text{SUBJ}_\sigma) \multimap \uparrow_\sigma\,]$

On the syntactic side, since Niuean NI is non-valency preserving, the syntactic subcategorisation properties of the verb differ in the input and output. In terms of the semantics, the input verbal stem in (34) is associated with the standard meaning constructor for a transitive verb,

defining a function from the semantics of one nominal argument (here the SUBJ) to a function from the semantics of the second nominal argument (the OBJ) to the semantics of the sentence as a whole. On the other hand, the *output* meaning constructor consumes a nominal meaning (that is, a property, rather than an NP meaning) to create a function from the SUBJ meaning to the meaning of the sentence. It uses existential closure over the properties corresponding to the incorporate and its dependents.

Our preliminary sketch of the interaction of the IPC/EPC with noun incorporation and coordination is based on this (property modification) approach. We proceed step by step, initially abstracting away from the interaction with coordination. Consider an example involving NI (of the bodypart) and the IPC, as in (36).

(36) *nga-wu-yarrga-nagiina yii-ngarrugal̲ij-*(inyung)*
1SG-NEUT-flipper-cook.PR FEM.OBL-dugong-DAT
'I'm cooking the dugong's flipper' IPC

The (relevant sub-part) of the entry for a (non-incorporating) verbal stem in an IPC construction is as in (37), while (38) shows the related verbal stem with an IN: the incorporated nominal is the head of the OBJ in the IPC.[13]

(37) *-nagiina* IPC
(↑ PRED) = 'cook< (SUBJ)(OBJ)>'
$\lambda x \lambda y\ cook(x, y)$: (↑ SUBJ)$_\sigma$ ⊸ (↑ OBJ)$_\sigma$ ⊸ ↑ $_\sigma$

(38) *-wu-yarrga-nagiina* IPC+NI
(↑ PRED) = 'cook< (SUBJ)(OBJ)>'
$\lambda P \lambda x \exists y cook(x, y) \wedge\ P(y)$: [(↑ $_\sigma$ ARG VAR) ⊸ (↑ $_\sigma$ ARG RESTR)] ⊸ (↑ SUBJ)$_\sigma$ ⊸ ↑ $_\sigma$
(↑ OBJ) = ↓
(↓PRED) = 'flipper'
$\lambda x.flipper(x)$: (↓$_\sigma$ VAR) ⊸ (↓$_\sigma$ RESTR)
(↑ $_\sigma$ ARG) = ↓$_\sigma$

The verbal meaning constructor specifies a function from a nominal property (or collection of properties) to a one-place predicate, that is a function from a nominal argument (corresponding to the SUBJ) to the semantics of the sentence as a whole. The NI introduces a nominal property. In the simplest case (that is, where there are no nominal modifiers), the verbal meaning constructor applies directly to the NI meaning constructor, resulting in the meaning constructor shown in (39).

(39) $\lambda x \exists y\ cook(x, y)\ \ \wedge\ \ flipper(y)$: (↑ SUBJ)$_\sigma$ ⊸ ↑ $_\sigma$

[13]Here we follow Asudeh (2007) in existentially quantifying over the variable associated with the nominal property, but see further below.

The EPC differs from the IPC in terms of syntax, but shares the same semantic (argument) structure, and therefore the meaning constructor is the same as above (modulo the GF labels associated with the semantic arguments the predicate consumes), as shown in (41). The reentrant f-structure (ie the non-thematic OBJ) is consumed once in producing the semantics of the OBL. Although we do not formulate it here, it is clear that the EPC construction itself is subject to a number of semantic restrictions: a familiar restriction in a number of languages is to restrict the applicability of the EPC to cases of inalienable possession and indeed a version of this restriction essentially limits it to bodyparts in Wubuy. We do not formulate this further restriction here, but assume that in a more complete account the lexical process capturing the IPC-EPC alternation would capture this semantic relation between the POSS (the whole) and its governing PRED (the part).[14]

(40) *nga-ngu-yarrga-gambana (ngarra-ngarruga<u>l</u>ij)*
1SG-3FEM-flipper-roast.PR FEM.TOP-dugong
'I'm roasting the dugong's (FEM) flipper (NEUT)' EPC

(41) (↑ PRED) = 'cook< (SUBJ)(OBL)> OBJ' EPC
(↑ OBJ) = (↑ OBL POSS)
$\lambda x \lambda y\ cook(x, y)$: $(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow \text{OBL})_\sigma \multimap \uparrow_\sigma$

The EPC can combine with NI, which incorporates the OBL bodypart. The semantics of the NI is just as described above for the IPC case: the incorporated stem consumes a property (rather than an entity):

(42) *-ngu-yarrga-nagiina* EPC+NI
(↑ PRED) = 'cook< (SUBJ)(OBL)> OBJ'
(↑ OBJ) = (↑ OBL POSS)
$\lambda P \lambda x \exists y cook(x, y) \wedge P(y)$: $[(\uparrow_\sigma \text{ARG VAR}) \multimap (\uparrow_\sigma \text{ARG RESTR})] \multimap (\uparrow \text{SUBJ})_\sigma \multimap \uparrow_\sigma$
(↑ OBL) = ↓
(↓PRED) = 'flipper'
$\lambda x.flipper(x)$: $(\downarrow_\sigma \text{VAR}) \multimap (\downarrow_\sigma \text{RESTR})$
$(\uparrow_\sigma \text{ARG}) = \downarrow_\sigma$

Again, the result of having the verbal constructor consume the NI meaning directly would be $\lambda x \exists y\ cook(x, y) \ \wedge \ flipper(y)$: $(\uparrow \text{SUBJ})_\sigma \multimap \uparrow_\sigma$. The following table summarises:

[14]Similarly, incorporation itself is subject to significant semantic restrictions of a similar sort, which would be added as additional constraints on the morphological process of NI in a more complete account.

IPC
(↑ PRED) = 'cook< (SUBJ)(OBJ)>'
$\lambda x \lambda y\ cook(x, y)$: $(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow \text{OBJ})_\sigma \multimap \uparrow_\sigma$
EPC
(↑ PRED) = 'cook< (SUBJ)(OBL)> OBJ'
$\lambda x \lambda y\ cook(x, y)$: $(\uparrow \text{SUBJ})_\sigma \multimap (\uparrow \text{OBL})_\sigma \multimap \uparrow_\sigma$
NI
$\lambda P \lambda x \exists y\ cook(x, y) \ \wedge \ P(y)$: $[(\uparrow_\sigma \text{ARG VAR}) \multimap (\uparrow_\sigma \text{ARG RESTR})] \multimap (\uparrow \text{SUBJ})_\sigma \multimap \uparrow_\sigma$
$(\uparrow \text{OBJ}\vert\text{OBL}) = \downarrow \quad (\uparrow_\sigma \text{ARG}) = \downarrow_\sigma$
$\lambda x.flipper(x)$: $(\downarrow_\sigma \text{VAR}) \multimap (\downarrow_\sigma \text{RESTR})$

The account sketched above needs further modification in order to accommodate the fact that, as we have seen in the examples above, the incorporate may potentially be a member of a coordinate structure. Thus the incorporate potentially contributes a member to the set corresponding to the grammatical function in question in the syntax, while the semantics comes from that grammatical function as a whole. The modification required is therefore rather straightforward and is along the following lines:

(43)

Change this:	$(\uparrow \text{OBL}) = \downarrow$	$(\uparrow_\sigma \text{ARG}) = \downarrow_\sigma$
Into this:	$(\uparrow \text{OBL}\ (\in)) = \downarrow$	$(\uparrow_\sigma \text{ARG}) = (\uparrow \text{OBL})_\sigma$

With this further modification, the EPC-NI would now look as follows :

(44) $\lambda P \lambda x \exists y\ cook(x, y) \ \wedge \ P(y)$: $[(\uparrow_\sigma \text{ARG VAR}) \multimap (\uparrow_\sigma \text{ARG RESTR})] \multimap (\uparrow \text{SUBJ})_\sigma \multimap \uparrow_\sigma$
$(\uparrow \text{OBL}\ (\in)) = \downarrow \quad (\uparrow_\sigma \text{ARG}) = (\uparrow \text{OBL})_\sigma$
$\lambda x.flipper(x)$: $(\downarrow_\sigma \text{VAR}) \multimap (\downarrow_\sigma \text{RESTR})$

This sketch of the lines along which an account of the semantics of the relevant constructions may be developed raises a number of issues for future work! Foremost amongst these are the following:

- The semantics of the verb in cases of NI is such that it combines with a nominal (property) meaning rather than an entity meaning. This will allow for stranded modifiers and appositions, doubling and coordination provided all of these are at the property rather than the entity level. It is an open question whether this property modification view is correct (for example, it will require the nominal coordination constructor to operate below the entity level).

- Related to the above, we have followed Asudeh (2007) here in introducing existential closure at the level of the (lexical) meaning constructor, which ultimately commits us to the existence of a particular entity. This may be incorrect, and also predicts that doubling by something with entity semantics is impossible (because the slot is already saturated). Chung and Ladusaw (2003) bind off the variable much later in the derivation, if required, which gives more wiggle room.

- An alternative (outlined in Asudeh (2007) involves type-shifting the IN to produce a nominalisation of the property (of type e). The verbal constructor would then be effectively the same as in non-incorporating cases.

(45) $\lambda x \lambda y\ cook(x, y)$: $(\uparrow_\sigma \text{ ARG}) \multimap (\uparrow \text{SUBJ})_\sigma \multimap \uparrow_\sigma$
$(\uparrow \text{OBL } (\in)) = \downarrow \quad (\uparrow_\sigma \text{ ARG}) = (\uparrow \text{OBL})_\sigma$
$\lambda x.flipper(x)$: $(\downarrow_\sigma \text{ VAR}) \multimap (\downarrow_\sigma \text{ RESTR})$
$\lambda P.^{\cap} P$: $[(\downarrow_\sigma \text{ VAR}) \multimap (\downarrow_\sigma \text{ RESTR})] \multimap \downarrow_\sigma$

8 Conclusion

In this paper we have shown how it is possible to provide a comprehensive analysis of body-part incorporation in Wubuy and in particular how existing analyses of different aspects of the grammar – external possession, incorporation, agreement and coordination – interact to provide a single analysis of the complex empirical facts - including an analysis of the coordination of external NPs with incorporated nominals. This approach highlights the strength of LFG in accommodating typologically diverse languages, and will have important implications for the analysis of polysynthetic languages cross-linguistically.

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