Tongan noun incorporation: Lexical sharing or argument inheritance

Douglas Ball
Stanford University

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Abstract

As has been shown in other Polynesian languages, in Tongan, adnominal elements can modify incorporated nouns in the noun incorporation construction. Two analysis are considered in this paper for understanding this construction within HPSG. The first, lexical sharing (Kim and Sells, this volume), views the verbs that include incorporated nouns as being single words corresponding to two syntactic atoms. However, this analysis makes incorrect predictions on the transitivity of incorporation clauses. A second analysis, extending Malouf (1999), views these words as verbs, but with some of the combinatorial properties of nouns. This offers both a better account of the data, and preserves the more restrictive theory of the morphology-syntax interface.

1 Introduction

In recent years, research into the morphosyntax of noun incorporation constructions in Polynesian languages has yielded several empirical advances.[1] In particular, Massam (2001) and Chung and Ladusaw (2004) have noted that noun incorporation in Niuean and Maori, respectively, does not always include just a verb and an incorporated noun, but can also include semantic modifiers of the incorporated noun. Thus, incorporation constructions in these languages are not simple verb-noun compounds or juxtapositions of verbs and nouns as earlier work (Mithun, 1984; Gerdts, 1998) claimed.

Thus, an element of this paper is to show that similar facts hold for another Polynesian language: Tongan. However, as I have noted elsewhere (Ball, to appear), the facts in Tongan are problematic both for analyses that try to analyze this construction purely in syntactic terms and for those that try to analyze this construction in purely morphological terms. Thus, I want to consider how this construction could be best understood within Head-driven Phrase Structure Grammar, where a one-sided analysis is not such a theoretical imposition, and where the mixed properties of this construction can easily be modeled.

This paper will proceed as follows: the next section will look in-depth at the facts surrounding noun incorporation in Tongan. At the same time, I will also give arguments for a particular configuration for this construction. I will then present two proposals for understanding this configuration. The first, to be presented in §3, is the Lexical Sharing analysis, which extends the work of Wescoat (2002). After offering some arguments against the Lexical Sharing analysis, I will discuss a second analysis in §4, one I will call the Argument Inheritance Analysis, which extends the work of Malouf (1999). The last section will give my conclusions.

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[1]Although there is a semantic effect in noun incorporation, as pointed out by Mithun (1984), and Tongan is no exception, I have yet to study the semantics systematically enough to discuss them in-depth here.

2 Data

2.1 Basics of Tongan Morphosyntax and Noun Incorporation

Tongan is a head-initial language and has an isolating morphological profile. The general pattern of linear order in phrases is as in (1):

(1) Function Word(s) $\prec$ Lexical Head $\prec$ Adjuncts & Arguments

An example of this pattern is shown in (2a). Here, the verb *inu*, 'drink,' is preceded by a function word, the tense-aspect-mood (TAM) marker, *na'e*, 'PAST' and followed by its arguments, *'a e kava*, 'the kava,' and *'e Sione*, 'Sione.' Example (2a) also shows that a similar pattern exists within noun phrases: the prenominal function words *'a e*, 'ABS the' and *'e*, 'ERG,' precede their nouns, *kava* and *Sione*, respectively.

(2) a. Ordinary Transitive Sentence
Na'e inu 'a e kavá 'e Sione.
PAST drank ABS DET kava.DEF ERG (name)
'Sione drank the kava.' (Churchward, 1953, 76)

b. Sentence with Incorporation
Na'e **inu kava** 'a Sione.
PAST drink kava ABS (name)
'Sione drank kava.' (Churchward, 1953, 76)

The examples in (2)[2] also illustrate the alternation between ordinary transitive clauses and those with incorporation. From the sentence in (2b), one can observe the two basic properties of noun incorporation in Tongan. First, case markers or determiners do not appear before the incorporated noun in noun incorporation. Second, the external argument is marked by the absolutive case in the noun incorporation construction. This contrasts with the external argument in (2a), which is marked by the ergative case.

2.2 Beyond the Verb and Noun in Tongan Noun Incorporation

As noted in the introduction, adnominal elements appear with and modify incorporated nouns in the Tongan noun incorporation construction. Examples (3)–(6) show some of these elements. These examples serve to illustrate the variety of categories that can appear as well as the fact that these adnominals can be quite phrasal. Above each example is the kind of adnominal appearing with the incorporated noun, while the actual adnominal in the example appears in italics.

(3) Adjective
Na'e **tā kītā** ***fo'ou*** 'a Sione.
PAST hit guitar new ABS (name)
'Sione played a new guitar.'

[2] All examples, unless otherwise noted, come from a Tongan speaker born in Tonga, now residing in the San Francisco Bay area.

(4) Noun Conjunct
Na‘e **to** **manioke** ***mo e talo*** ‘a Sione.
PAST plant cassava and taro ABS (name)
‘Sione planted cassava and taro.’

(5) Prepositional Phrase
Na‘e **fakama‘a sea** ***‘i fale*** ‘a Sione.
PAST clean chair in house ABS (name)
‘Sione cleaned chairs in the house.’

(6) *ke*-clause
...ke **kumi me‘a** ***ke*** ***nau nonofo ai***.
SBJV seek thing SBJV 3PL settle there
‘...to seek a place to settle.’

In (4), the adnominal is a noun conjunct. However, the coordinator for NP conjunction, *mo*, is diachronically related to the preposition meaning ‘with.’ Given this connection, it seems reasonable to assume (as I will in this paper), that the structures and semantics of the adnominal PPs and noun conjuncts are reasonably similar. In (6), I refer to the adnominal as a *ke*-clause. This is a kind of relative clause that begins with the non-finite TAM marker, *ke*. This TAM marker is glossed as subjunctive (SBJV) following the traditional classification for this word (and its cognates) in the Polynesianist literature.

To talk about the parts of the noun incorporation construction, I want to define two (slightly) technical terms I will use throughout the rest of this paper. The term *adnominal* will be used, as above, for any word or phrase associated with and to the right of the incorporated noun in noun incorporation. It will also be used for the same words occurring in non-incorporated structures. The term *incorporate* will be used for the expression consisting of the incorporated noun and any adnominals with it.

2.3 Configuration of the Incorporation Construction

With adnominals potentially appearing in noun incorporation, there are a number of possibilities for dividing this construction into words and phrases. I claim that this construction has the configuration in (7):

(7) $[_{phrase}\ [_{word}$ Verb + Incorporated Noun] $[_{phrase}$ Adnominal(s)]]

This configuration is perhaps a bit striking in that it does not have the incorporated noun and the adnominal form a syntactic constituent; thus, the syntactic and semantic constituency is not isomorphic. Since this is the case, I want to motivate this configuration. I begin with motivating that the verb and the incorporated noun form a single word.

2.3.1 The Verb and Incorporated Noun Form a Word

The primary evidence for considering the verb and incorporated noun as a single word comes from the nominalization data. One of the few bits of derivation morphology in Tongan is the place nominalizer affix, -*‘anga*. Nouns with this suffix denote a place where a certain state of affairs (perhaps characteristically) occurs. Simplex verbs (as well as adjectives) can be nominalized by this affix, as shown in (8).

(8) pule-‘anga
rule-NMLZ
‘kingdom, government’ (Churchward, 1959, 420), (my fieldnotes)

Beyond these simplex verbs, -*‘anga* can also appear with verb-noun units. This is shown in the examples in (9).

(9) a. inu-kava-‘anga
drink-kava-NMLZ
‘place to drink kava’

b. tō-talo-‘anga
plant-taro-NMLZ
‘place to plant taro’

From as early as Chomsky (1970), derivational processes such as nominalization have been considered to take place in the morphological/lexical part of the grammar. Since the data above show that noun incorporation, in some sense, “feeds” nominalization, the verb-noun unit itself must be considered to be formed morpholexically, as well. Therefore, under the assumption of lexical integrity (Bresnan and Mchombo, 1995) standard in HPSG, it must be a single word in the syntax.

However, there is still an important remaining question: does this lexical unit extend to include all the incorporate? The data show that no, this lexical unit does not include all of the incorporate; instead, it only extends as far as the incorporated noun. The evidence for this comes from the behavior of verb-incorporate units in nominalization. They do not nominalize, as shown by (10).

(10) a. V-N-Adj-‘anga
*fakatau-fale-hinehina-‘anga
transact-house-white-NMLZ
Intended: ‘place for selling white houses’

b. V-N-PP-‘anga
*fakama‘a-sea-‘i-fale-‘anga
clean-chair-in-house-NMLZ
Intended: ‘place for cleaning the chairs from inside the house’

Thus, the evidence supports the configuration in (7), where the verb and the noun form one unit, to the exclusion of the adnominals.

The treatment of the verb and noun as a single word is corroborated by two other phenomena. The first is the behavior of incorporated nouns versus full NP arguments – which I will henceforth call term phrases – in scrambling.

As shown in (11), term phrases in Tongan can scramble (see Otsuka (2005) for further discussion of scrambling in Tongan).

(11) a. ABS ≺ ERG
Na‘e tō ‘a e manioke ‘e Sione.
PAST plant ABS DET cassava ERG (name)
‘Sione planted the cassava.’

b. ERG ≺ ABS
Na‘e tō ‘e Sione ‘a e manioke.
PAST plant ERG (name) ABS DET cassava
‘Sione planted the cassava.’

However, incorporated nouns cannot scramble; as (12) shows, they must be adjacent to the verb.

(12) a. Na‘e **tō** **manioke** ‘a Sione.
PAST plant cassava ABS (name)
‘Sione planted cassava.’

b. *Na‘e **tō** ‘a Sione **manioke**
PAST plant ABS (name) cassava

This is also true of multiword incorporates, where examples are acceptable when the verb and incorporate are adjacent, as in (13a), but not when the external argument appears between the verb and incorporate, as in (13b).

(13) a. Na‘e **tō** **manioke kano lelei** ‘a Sione.
PAST plant cassava good ABS (name)
‘Sione planted good cassava.’

b. *Na‘e **tō** ‘a Sione **manioke kano lelei**
PAST plant ABS (name) cassava good

This pattern further suggests the verb and incorporated noun form a single word, since the inability to scramble is a well known property of parts of words (cf. criterion (a) from Dixon and Aikhenvald (2002, 19) for a grammatical word).

A second phenomenon that corroborates the wordhood of the verb and incoporated noun is the behavior of prenominal adjectives with respect to incorporation. Though a majority of adjectives in Tongan are postnominal, some are prenominal, like *ki‘i*, ‘small,’ shown in an ordinary sentence in (14).

(14) Na‘e tō ‘e Sione ‘ene *ki‘i* manioke.
PAST plant ERG (name) his small cassava
‘Sione planted his small amount of cassava.’

Including a prenominal adjective, such as *ki‘i*, in an incorporate is unacceptable, as (15) reveals:

(15) *Na‘e **tō** ***ki‘i*** **manioke** ‘a Sione.
PAST plant small cassava ABS (name)
Intended: ‘Sione planted a small amount of cassava.’

This does not appear to be the result of purely semantic considerations, since an incorporate with the semantically similar, yet postnominal, adjective, *iiki*, 'small' is acceptable, as shown in (16).

(16) Na'e **tō manioke *iiki*** 'a Sione.
PAST plant cassava small ABS (name)
'Sione planted a small amount of cassava.'

The evidence above shows that the verb and incorporated noun must be adjacent. This supports the view that the verb and incorporated noun form a single word, since strict adjacency is a necessary (though not sufficient) morphological property (a corollary of criterion (b) from Dixon and Aikhenvald (2002, 19) for a grammatical word).

Having argued that the verb stem and the incorporated noun form a single word, I will henceforth refer to this single word as the *incorporating verb*.

2.3.2 Adnominals Form a Constituent with the Incorporating Verb

Following insights from Massam (2001), I want to argue that the modifiers still form a phrase with the incorporating verb. The evidence for this comes from "verbal particles" – a class of adverbs – and their interaction with incorporation. The particles will be exemplified by *nai*, 'maybe,' here.

In transitive clauses, the particle appears between the verb and the first term phrase (cf. (Churchward, 1953, 207)), as shown in (17).

(17) Na'e kai *nai* 'a e ika 'e Sione?
PAST eat maybe ABS DET fish ERG (name)
'Sione ate the fish, didn't he?'

In incorporation, the verbal particles must appear to the right of the whole incorporate, as in (18).

(18) Na'e **kai ika lahi** *nai* 'a Sione?
PAST eat fish big maybe ABS (name)
'Sione eats a lot of fish, doesn't he?'

Nai cannot appear inside the incorporate, as shown by (19).

(19) a. *Na'e **kai** *nai* **ika lahi** 'a Sione
PAST eat maybe fish big ABS (name)

b. *Na'e **kai ika** *nai* **lahi** 'a Sione
PAST eat fish maybe big ABS (name)

From this data, I conclude that modifiers form a constituent with the incorporating verb that the "verbal particles" respect.[3]

Having argued for the structure in (7), the question then is how to understand the relationship between the adnominals and the incorporating verb. The next two sections will consider two proposals that do this.

[3] I also have very preliminary prosodic data that suggests the end of the incorporate is boundary of some sort, which also suggests this constituency, although these data need closer examination.

3 The Lexical Sharing Analysis

The first proposal I will consider is one I will refer to as the Lexical Sharing Analysis. This extends the work of Wescoat (2002), who first introduced this idea within LFG, and Kim et al. (2004), who first proposed it within HPSG (also see Kim and Sells (this volume)). I will first consider the details of this analysis, then offer arguments against it for Tongan noun incorporation.

3.1 Analysis

The Lexical Sharing Analysis views incorporating verbs as an instance of a mismatch between morphological words and syntactic structure. Incorporating verbs are still regarded as single words, but, informally, such verbs are simultaneously linked to both a verb and noun "node" in the syntactic structure, which, in turn, licenses both the nominal and verbal behavior.[4]

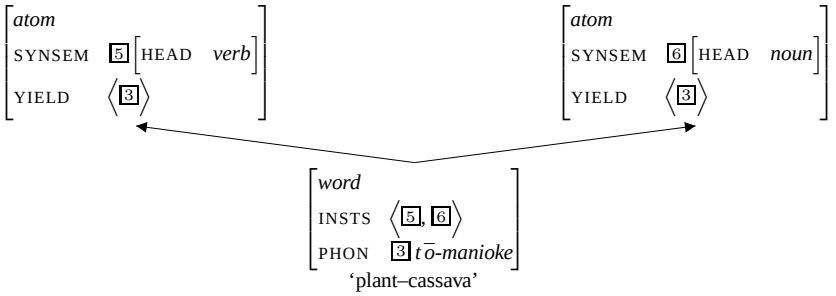
To implement this idea, a few architectural changes must be made. First, instead of building phrases directly out of words, under Lexical Sharing, phrases are built up from the analog of preterminal nodes in other theories, units I will call *atoms*, following Kim et al. (2004). Second, the atoms must be linked to the words. Following Kim and Sells (this volume), this relationship will be mediated by two features. Declared for the type *word* is the feature INST(ANTIATE)S. It takes as its value a list of SYNSEMs that are linked to that word. This creates a correspondence between the words and the "nodes." For most words, the INSTS list will be a singleton list; for lexically shared words, it will be a non-singleton list.

Declared for the supertype of *atom* and *phrase* – *sign* – are the attributes SYNSEM and YIELD. For SYNSEM, I will take the standard view on this feature, following Pollard and Sag (1994). The YIELD feature, on the other hand, takes a list for its value, and points to the PHON value(s) that the phrase or atom is related to, thus linking the "nodes" to the words. However, since the YIELD values for different signs are not necessarily unique (as is shown in (20) below), a mother's YIELD value is not just the YIELD values of the daughters appended together. Rather, the mother's YIELD value is related to those of its daughters by the function, *unique*. *Unique* is a function on lists and contracts a list to its unique members. It will eliminate one member of any two adjacent, identical occurrences of a given list element (Kim and Sells, this volume). If the identical members are not adjacent, then *unique* is undefined. A concrete example of how *unique* works will be given in example (21) and in the discussion thereafter.

Turning to an example, the structure for the incorporating verb from (13a) is given in (20).

[4]This analysis is conceptually very similar to a linearization-style analysis (e.g. Kathol (2000)) that would have compaction of a verb and noun in the phenogrammar (the linear precedence component) while the verb and noun would be part of separate phrases in the tectogrammar (the immediate dominance component).

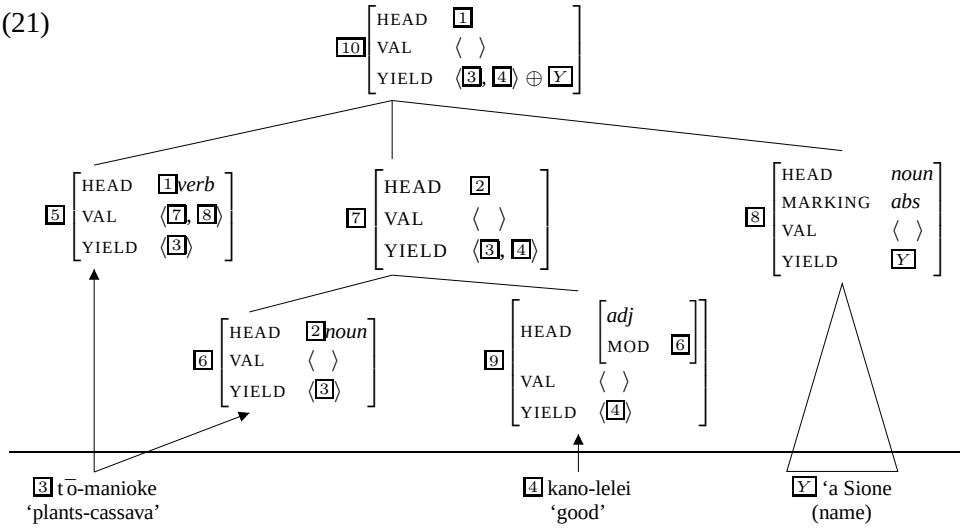
(20)



As (20) shows, *tō-manioke*, 'plant cassava,' is a lexically shared word. The PHON values of the two parts, *tō*, 'plant', and *manioke*, 'cassava,' are combined in the lexicon to form a compound. *Tō-manioke* is also specified, in this resulting lexical description, to have a two-element INSTS list, connecting this word with a verbal SYNSEM (5) and a nominal SYNSEM (6). As (20) shows, on the other side of the structure, the two atoms both have the same YIELD value: a list containing 3, which identifies both of them as having the PHON value *tō-manioke*.

With the incorporating verbs having the structure in (20), the structure of the clause from (13a) – minus the clause-initial TAM marker – is as in (21):

(21)



Building the tree in (21) from the bottom up, the nodes labeled 5 and 6 are present and adjacent due to *tō-manioke*'s lexical description. Beyond this, no other atoms are lexically-shared. All the atoms are combined using nothing more than schemata from Pollard and Sag (1994). The phrase labeled 7 is created when the head-modifier schema combines 6 and 9 together, due to 9's MOD feature. Then, the head-complements schema or head-subject-complements schema,[5] combines the valents of the verb (7 and 8)[6] together to form the phrase, 10. Thus, under

[5] I won't take a stand on which one at this point, but the issue is whether Tongan has a SUBJ category or not. I will offer some further comments on this issue in §4.3.

[6] Here and elsewhere, I assume the MARKING theory of Abeillé et al. (to appear) for the syntax of the case markers in Tongan, although nothing crucial hinges on it.

Lexical Sharing, the geometry is a bit non-standard at the lexical level, but above that level, the syntax works in an ordinary fashion.

Looking at the YIELD values of the daughters of [10], observe that there are two instances of [3]. However, they are adjacent. This, then, fulfills *unique*'s adjacency requirement, so, only one [3] is passed up to node [10]. Thus, lexically shared words are mutually constrained: first, from the lexicon via their INSTS value and, second, from the syntax, by the *unique* function's restriction to just apply to adjacent, identical YIELD list members.

3.2 Arguments Against a Lexical Sharing Analysis

The Lexical Sharing Analysis, however, suffers from a significant empirical problem: it incorrectly predicts how incorporating verbs will behave with respect to case marking and relativization, two phenomena sensitive to the number of arguments a verb has. Furthermore, corrections to fix this problem lead to other problems. Let us more closely examine these empirical facts and their theoretical ramifications below.

3.2.1 Evidence for Intransitivity

The first bit of evidence for intransitivity comes from the kind of case marking the external argument has. As mentioned earlier, in the discussion of example (2b), the external argument is in the absolutive case in the noun incorporation construction. This follows the pattern of other intransitive verbs, such as the one in (22), where the only (core) argument is marked with the absolutive.

(22) Na'e 'alu nai 'a Sione?
PAST go maybe ABS (name)
'Sione went, didn't he?'

So, case marking shows that incorporating verbs pattern with intransitives. Furthermore, there is a second syntactic phenomenon that also shows that incorporating verbs pattern in the same way as intransitives: relativization.

In Tongan, transitive and intransitive clauses behave differently with respect to relativization. Transitive clauses require a resumptive pronoun (*ne* in (23)), and not a gap, if their subject is relativized. This is shown in (23).[7]

(23) Kuo u sio ki he tangata na'a ne/*__ tō 'a e talo.
PERF 1SG see to DET man PAST 3SG/(gap) plant ABS DET taro
'I saw the man who planted the taro.'

In contrast, intransitive clauses require gap if their subject is relativized, as shown in (24):

(24) Kuo u sio ki he tangata na'e __/*ne tangi.
PERF 1SG see to DET man PAST (gap)/3SG cry
'I saw the man who cried.'

[7]The location of the gap is not critical in this and the following examples.

In clauses with incorporation, a gap is also required, just like the intransitives.

(25) Kuo u sio ki he tangata na‘e __/*ne **fakatau kahoa**.
PERF 1SG see to DET man PAST (gap)/3SG sell necklace
‘I saw the man who sold necklaces.’ (cf. (Mithun, 1984, 851))

So, again, the data shows that clauses with incorporation pattern with intransitive clauses.

Additionally, there are a few bits of circumstantial evidence for the intransitivity of basic clauses with incorporation.[8] First, there is no possibility for doubling, as shown by (26).

(26) *Na‘e **kaiha‘a lole** ‘e Sione ‘a e M&M’s
PAST steal candy ERG (name) ABS DET (kind of candy)
Intended: ‘Sione candy-stole the M&M’s.’

There is also no possibility of “discontinuous stranding” (considering the adnominals discussed earlier as a kind of “continuous stranding”), as shown in (27).

(27) *Na‘e **kai ika** ‘a/‘e Sione ‘a e lahi
PAST eat fish ABS/ERG (name) ABS DET big
Intended: ‘Sione fish-ate the big (one).’

These properties of doubling and discontinuous stranding are frequently found with valence-maintaining noun incorporation (Rosen, 1989; Runner and Aranovich, 2003), and, as far as has been researched, have never been found with valence-reducing noun incorporation. To the extent that these trends reflect actual universals of human language, these also suggest that Tongan noun incorporation is valency-reducing.

Overall, these findings from the above match the claims by Runner and Aranovich (2003) and Rosen (1989) that Tongan has valence-reducing noun incorporation

3.2.2 Problems for Lexical Sharing

Given standard assumptions in HPSG about case marking (Przepiórkowski, 1999; Runner and Aranovich, 2003) and relativization (Bouma et al., 2001; Sag, this volume), both these phenomena must be constrained on the ARG-ST list and not on the VAL list. Since, as (21) shows, the crux of the Lexical Sharing analysis is that incorporating verbs are bivalent – and, by the argument realization principle, two-termed (transitive) on the ARG-ST list – the Lexical Sharing Analysis makes the wrong predictions about the behavior of the incorporating verbs.

Yet, there seems to be a possible fix. Under this possible alternative, the incorporated noun is realized as an argument of type *non-canonical* on the ARG-ST list (as suggested by Malouf (1999); also Runner and Aranovich (2003) for valence-maintaining incorporation). The constraints done on ARG-ST would then just need

[8] Clauses with incorporation are not universally intransitive in Tongan: they can be transitive if an oblique is “promoted” to object.

to treat the *non-canonical* argument as invisible for their purposes. However, regardless of how feasible such constraints may or may not be, this proposal suffers from a more fundamental, though theory-internal problem: If the incorporate is realized on the ARG-ST list, but not on the VAL list, there is no way to lexically integrate it into a schema – the incorporating verb will not select for the incorporate and it will hang there, unattached. Thus, these problems lead me to reject the Lexical Sharing Analysis and to seek an analysis that treats this construction as intransitive.

4 The Argument Inheritance Analysis

Having argued against the Lexical Sharing Analysis, I want to next consider an analysis that fixes the above problems. I will term this analysis the Argument Inheritance Analysis.[9] This analysis takes as a starting point Malouf (1999)'s analysis of West Greenlandic denominal verbs (arguably a kind of noun incorporation), and extends it to handle the facts surrounding Tongan noun incorporation. The key idea, as in Lexical Sharing, is that the incorporating verbs are a kind of "mixed category." However, in the Argument Inheritance Analysis, this is implemented in a slightly different way: the incorporating verbs are categorically verbs, but, are special kinds of verbs with some of the combinatorial properties of nouns and as well as the combinatorial properties of verbs.

4.1 Background Assumptions

Critical to this analysis is how to analyze the relevant combinatorics of nouns: that is, how nouns combine with adnominal modifiers. I will follow recent work (Bouma et al. (2001), Przepiórkowski (1999), and especially Malouf (1999)) in viewing heads as the selectors of so-called adjuncts, in contrast to the proposal in Pollard and Sag (1994), where the adjuncts select for their heads. However, instead of straightforwardly following the "adjuncts-as-complements" analysis, I will assume that adnominals are selected via an ADJ(unct) feature,[10] which has a list as its value, and this list, in turn, is an value of the VAL feature. Thus, the geometry is closer to that presented in Sag et al. (2003), where modifiers are selected through a particular VAL feature.[11]

Turning now to the question of how adnominals appear on a given noun's ADJ list, I assume that are placed there via the optional lexical rule given in (28), which closely follows the adjunct lexical rule of Malouf (1999, 56):

[9] A conceptually similar analysis would be to take the incorporating verbs as a mixed category that could be modified by adjectives. Due to space limitations, I won't consider this analysis here.

[10] This bears a superficial resemblance to the theory of modifiers presented in Pollard and Sag (1987).

[11] I will assume that the elements on the ADJ list do not appear on the ARG-ST list, although this does not seem to be a critical assumption.

(28)

$$\left[\begin{array}{ll} \text{RESULT} & \left[\begin{array}{ll} \text{HEAD} & \textit{noun} \\ \text{VAL} & \left[\begin{array}{ll} \text{COMPS} & \boxed{C} \\ \text{ADJ} & \left\langle \left[\text{CONT} \quad \boxed{5}\right] \right\rangle \end{array}\right] \\ \text{CONT} & \boxed{5}\left[\text{ARG} \quad \boxed{4}\right] \end{array}\right] \\ \text{SOURCE} & \left\langle \left[\begin{array}{lll} \text{HEAD} & & \textit{noun} \\ \text{VAL} \mid \text{COMPS} & & \boxed{C} \\ \text{CONT} & & \boxed{4} \end{array}\right] \right\rangle \end{array}\right]$$

In short, (28) says that any syntactic unit that is a semantic functor of a noun can appear on that noun's ADJ list. Observe that (28) keeps the modifier-noun relationship as a functor-argument one in the semantics, even while the relationship is dependent-head in the syntax. Also, (28) is very general – it could be constrained further; for instance, to capture more fine-grained semantic relationships.

Having discussed how the adnominals appear with the noun, let me next discuss how they appear with incorporating verbs, and how the incorporating verbs are put together.

4.2 Analyzing Incorporating Verbs

The key analytic device of the Argument Inheritance Analysis is a descriptive lexical rule that says that for any transitive verb and semantically appropriate noun in Tongan, there can potentially be an incorporating verb, with a specific relationship to these two sources. The formal version of this rule is shown in (29):[12]

(29)

$$\left[\begin{array}{ll} \text{RESULT} & \left[\begin{array}{ll} \text{FORM} & \left\langle \boxed{1} + \boxed{2} \right\rangle \\ \text{HEAD} & \textit{verb} \\ \text{VAL} \mid \text{ADJ} & \boxed{B} \oplus \boxed{C} \\ \text{ARG-ST} & \boxed{A} \end{array}\right] \\ \text{SOURCE} & \left\langle \left[\begin{array}{ll} \text{FORM} & \left\langle \boxed{1} \right\rangle \\ \text{HEAD} & \textit{verb} \\ \text{VAL} \mid \text{ADJ} & \boxed{B} \\ \text{ARG-ST} & \boxed{A} \bigcirc \left\langle \text{XP: } \boxed{3} \right\rangle \\ \text{CONT} & \left[\begin{array}{ll} \textit{act\_und\_rel} & \\ \text{ACT} & \textit{index} \\ \text{UND} & \boxed{3} \end{array}\right] \end{array}\right], \left[\begin{array}{ll} \text{FORM} & \left\langle \boxed{2} \right\rangle \\ \text{HEAD} & \textit{noun} \\ \text{VAL} \mid \text{ADJ} & \boxed{C} \\ \text{CONT} & \boxed{3} \end{array}\right] \right\rangle \end{array}\right]$$

This lexical rule accomplishes four different things. First, it combines the FORM values of the source verb and noun. I will remain vague about precisely how this is

[12] The semantics are more complicated than just the linking shown here, but I will not discuss them in-depth here.

done, but I assume that the analysis would be no different that any other compounding construction in Tongan – incorporating verbs are head-initial, just as other compounds in the language – and that it wouldn't be that different from compounding in other languages.

Second, (29) creates a verb, with the clausal syntax thereof. Third, it reduces the argument structure of the resulting verb, by not allowing the nominal argument functioning as the semantic undergoer to appear on the incorporating verb's ARG-ST list.[13,14] This leaves one core argument on the incorporating verb's ARG-ST list. This creates the right number of arguments for the analyses of the case-marking and relativization data discussed earlier. Fourth, the incorporating verb inherits any members of the noun's ADJ list. Like in Malouf (1999)'s analysis, the incorporating verb not only inherits the adnominal dependents, but also inherits them in the same kind of valency function (in this case, ADJ) as they had with the noun.

4.3 An Example

To illustrate and further specify the elements of this analysis, let us consider an example. Given in (30) is yet another instance of the phrasal noun incorporation construction in Tongan, with an adjectival adnominal.

(30) Na'e **kai ika lahi** 'a Sione.
PAST eat fish big ABS (name)
'Sione ate big fish.'

To be accompanied by the adjectival modifier, *lahi*, 'big,' the noun *ika*, 'fish,' must have undergone the lexical rule in (28). This puts *lahi* on *ika*'s ADJ list. Then, this lexical description must have entered into the lexical rule in (29) with the verb, *kai*, 'eat.' This allowed *lahi* to be inherited by *kai-ika*, 'eat-fish,' and disallowed *kai*'s undergoer from being realized on *kai-ika*'s ARG-ST list. Finally, the argument realization priniciple (Manning and Sag, 1998) permitted the NP[*abs*] to be realized on the COMPS list.[15] This yields the lexical description given in (31):

(31)
$$\begin{bmatrix} \textit{word} & \\ \text{FORM} & \langle \text{kai-ika} \rangle \\ \text{SYN} & \begin{bmatrix} \text{HEAD} & \textit{verb} \\ \text{VAL} & \begin{bmatrix} \text{COMPS} & \langle \text{NP}[\textit{abs}] \rangle \\ \text{ADJ} & \langle \text{AP} \rangle \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

[13] As Runner and Aranovich (2003) suggest, this "removal" may be a consequence of the semantic mode of composition of the incorporated noun with the verb. Verifying this and making it precise I leave as open question for future research.

[14] This rule, though it restricts incorporation to semantic undergoers, doesn't go quite far enough – Tongan does not allow any kind of subject to incorporate. A possible solution would be to have a constraint like LFG's Subject Condition (Bresnan, 2001, 311) on possible verbal ARG-ST lists. Due to raising verbs, this constraint may need to apply to a verbal subtype, instead of to all verbs.

[15] Why this verb has no SUBJ value will be discussed below.

To put together (30), a pair of schemata will be needed. Like Dukes (2000), I will assume a flat structure for clauses in Tongan (putting aside the clause-initial TAM marker) to account for the VSO/VOS order. As far as I'm aware, there does not seem to be any evidence in Tongan for distinguishing between subjects and other grammatical relations among the non-pronominal arguments (see Dukes (1998) for an in-depth discussion of grammatical relations in Tongan). Therefore, I will not declare a SUBJ valent attribute. Instead, I will consider all verbal arguments as complements of the verb and have them combine with the verb all at once, through the *head-complements-schema*, given in (32) below:

(32)
$$\left[\begin{array}{ll} \textit{head-complements-schema} & \\ \text{MTR} & \left[\begin{array}{ll} \text{HEAD} & \boxed{1} \\ \text{COMPS} & \langle\ \rangle \end{array}\right] \\ \text{HD-DTR} & \boxed{2}\left[\begin{array}{ll} \text{HEAD} & \boxed{1} \\ \text{VAL} & \left[\begin{array}{ll} \text{COMPS} & \boxed{A} \\ \text{ADJ} & \langle\ \rangle \end{array}\right] \end{array}\right] \\ \text{DTRS} & \langle\, \boxed{2}\,\rangle \bigcirc \boxed{A} \end{array}\right]$$

As I will discuss further below, a key element of this schema is that the ADJ list of the HD-DTR is empty – this is what captures the verb-adjacent position of the adnominals. Although it is a non-standard assumption to have the adjuncts combine first (that complements combine first is usually a corollary of the fact that complements are seen to make a phrase semantically complete, while adjuncts just make a phrase a subtype of the same kind of phrase, see Dowty (2003) for a recent discussion), this part of the analysis has empirical support from the fact that all postverbal adverbs – prepositional phrase adverbials excepted – appear immediately after the verb in Tongan (Churchward, 1953, 146–149,193–208).

To add adnominals, the incorporating verb must enter into the *head-adjunct-schema*, given below in (33).

(33)
$$\left[\begin{array}{ll} \textit{head-adjunct-schema} & \\ \text{MTR} & \left[\begin{array}{ll} \text{HEAD} & \boxed{1} \\ \text{ADJ} & \langle\ \rangle \end{array}\right] \\ \text{HD-DTR} & \boxed{2}\left[\begin{array}{ll} \textit{word} & \\ \text{HEAD} & \boxed{1} \\ \text{VAL} \mid \text{ADJ} & \boxed{B} \end{array}\right] \\ \text{DTRS} & \langle\, \boxed{2}\,\rangle \bigcirc \boxed{B} \end{array}\right]$$

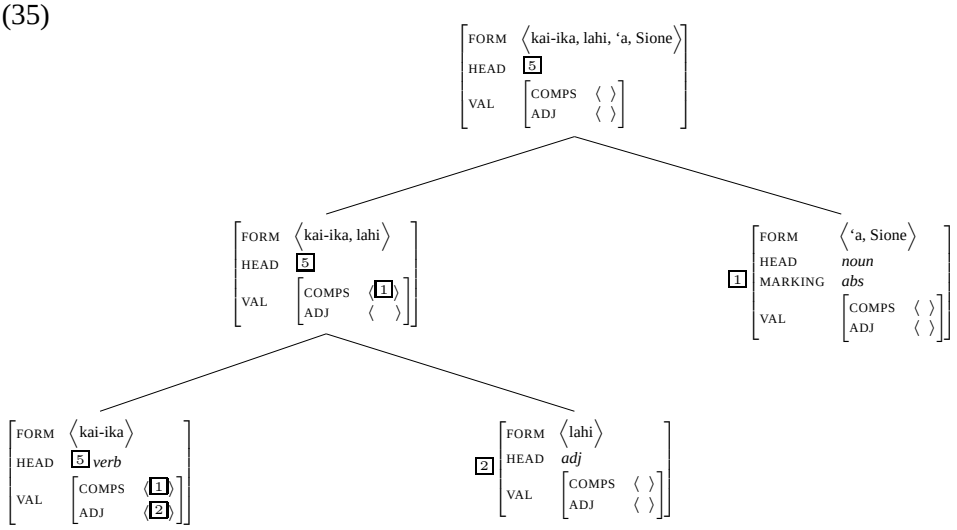
Finally, since there is no ordering constraints on the above schemata, I propose the linear precedence constraint in (34), where head daughters precede anything else within their phrases:

(34) HEAD-DTR $\prec$ X

Given Tongan's head-initial profile, this is likely a constraint on all headed-schemata, and is just inherited by (32) and (33).

Putting together the lexical description in (31), the schemata in (32) and (33), and the constraint in (34) gives the tree in (35).

(35)



In (35),[16] the verb *kai-ika* and the adjective *lahi* combine to form a kind of verbal phrase via the *head-adjunct-schema*. This verbal phrase then combines with the term phrase *'a Sione* to make the top node of (35) via the *head-complements-schema*.

The interaction between the *head-complements-schema* and the *head-adjunct-schema* forces the adnominals to appear next to the verb. Reversing the order of combination would create a non-empty ADJ list in the HD-DTR of the *head-complements-schema*. This would violate the *head-complements-schema* in (32). In addition to getting the desired adjacency, this part of the analysis also allows for a straightforward analysis of the syntax of the verbal "particles."

4.4 The Syntax of "Particles"

Recall from the discussion in §2.3.2 that there is a class of adverbs I'm calling verbal "particles," which appear after the verb in ordinary transitive clauses, and after the incorporate in the noun incorporation construction, as shown by (36).

(36) Na'e **kai ika lahi** *nai* 'a Sione?
PAST eat fish big maybe ABS (name)
'Sione eats a lot of fish, doesn't he?' (repeats (18))

Under the Argument Inheritance Analysis, capturing the syntax of these "particles" is straightforward. If the verbal "particles" are to be analyzed as elements

[16] I (largely) use the framework of Sag (to appear) for (35), but, with slightly and noncrucial revisions, this tree is compatible with many different versions of HPSG.

selected via the verb's ADJ list, the *head-adjunct-schema* (or perhaps just the specific schema that puts together incorporating verbs and modifiers) would need the linear precedence constraint in (37) to constrain the "particles" after the modifiers and the incorporating verb.

(37) X $\prec$ [HEAD *adverb*]

If the "particles" are to be analyzed as being selected by the verb via the COMPS list as complements of the verb, then the *head-complements-schema* must be subject to the following LP constraint.

(38) [HEAD *verb*] $\prec$ [HEAD *adverb*] $\prec$ [HEAD *noun*]

It is not clear, presently, which analysis of the verbal "particles" the data support, but under either analysis of the "particles," constraining their position is straightforward due to the configuration and dependency properties of the noun incorporation construction under the Argument Inheritance Analysis.[17]

4.5 Further Issues

As is, the lexical rule in (29) overpredicts. First, it predicts that finite relative clauses (i.e. those not headed by *ke*) should be possible, but, in fact, finite relative clauses are impossible in noun incorporation in Tongan, as shown in (39):

(39) Finite Relative Clause
*Na'e **inu** ***kofi*** ***na'a*** ***ku*** ***ngaahi*** 'a Sione
PAST drink coffee PAST 1SG make ABS (name)
Intended: 'Sione drank coffee that I made'

One solution to this problem is to treat the finite relative clauses as "true modifiers" and constrain them to only modify syntactically independent nouns, not parts of words. One such implementation would be to place this constraint as part of the schema that puts together the relative clause, given in (40):

(40)
$$\left[\begin{array}{l} \textit{finite-relative-clause-schema} \\ \\ \text{DTRS} \left\langle \boxed{1}, \left[\text{HEAD} \left[\begin{array}{ll} \text{FIN} & + \\ \text{MOD} & \boxed{1}\left[\text{HEAD} \quad \textit{noun}\right] \end{array}\right]\right] \right\rangle \end{array}\right]$$

Since there is no syntactically independent noun present in noun incorporation, the finite relative clause can't modify an incorporated noun.

It is possible, upon further semantic investigation, that the constraint given in (40) could be replaced or augmented by a semantic analysis that essentially says that the addition of a finite relative clause would make the semantics of the incorporate too "definite" (perhaps too individual-like) for noun incorporation. However,

[17] I realize this does not exhaust all the possibilities for analyzing the "particles," but this configuration seems to work with a large number of analyses. Even under a Pollard and Sag (1994)-style MOD analysis, the analysis is straightforward: "particles" select for [HEAD *verb*] via their MOD value.

the exploration of this solution awaits future research in the semantics of the incorporation construction in Tongan.

The second problem for the lexical rule in (29) comes from the prenominal adjectives. As shown in (41), they can appear before an incorporating verb, but not as a semantic modifier of the incorporated noun.

(41) Na‘e ki‘i **to̅** **manioke** ‘a Sione
PAST small plant cassava ABS (name)
#‘Sione planted small cassava.’
OK as: ‘Sione planted cassava for a short time.’

This behavior is not anomalous – as discussed by Churchward (1953, 206–207), some prenominal adjectives (including *ki‘i*) can also appear before the verb in an adverbial role in ordinary transitive clauses.

However, examples like (41) raise the question of what rules out the prenominal adjectives from undergoing (29). The solution I will sketch below is a bit speculative, since it requires a more complete picture of the syntax and semantics of adjectives in Tongan, but is consistent with the current known facts.

The idea is that there is an asymmetry between pre-head and post-head “adjuncts.” Following ideas by Iida and Sells (to appear) and Toivonen (2003), a solution would be to treat *ki‘i* as a word that does not project a phrase; that is, it is not underspecified for whether it is a word or phrase, but is specified to be a word. Then (29) could be restricted to allow only *phrasal* nominal adjuncts (including single words that can also serve as phrases) to be inherited by the incorporating verb, and not non-projecting words like *ki‘i*.

This treatment does correspond to one independent difference between the two kinds of adjectives: postnominal (and incorporate-worthy) adjectives can appear as predicates, while prenominal (incorporate-incompatible) adjectives cannot. This is shown in (42) below:

(42) a. ‘Oku iiki ‘a e talo.
PRES small ABS DET taro
‘The taro is small.’

b. *‘Oku ki‘i ‘a e talo
PRES small ABS DET taro
Intended: ‘The taro is small.’

Given this data in (42), I think that this analysis is promising. However, further work on adjectives in Tongan is needed to decide the matter.

5 Conclusions

In this paper, I have shown that Tongan has a kind of “continuous stranding,” where adnominals, as syntactically separate phrases, can appear in the noun incorporation construction in Tongan and modify the morphologically-incorporated nouns. To integrate these facts into any grammatical theory, the incorporating verbs must be treated in some special fashion. The first special treatment I considered was the

Lexical Sharing Analysis. Though this analysis is straightforward in implementing the idea that the incorporating verbs belong to a "mixed" category, I have shown that this analysis is empirically inadequate. As the data from case marking and relativization show, incorporation clauses in Tongan pattern with intransitive ones, a fact that the Lexical Sharing Analysis does not capture.

I then considered a second analysis, the Argument Inheritance Analysis, which could capture the similarity of incorporation clauses with intransitive clauses, as well as offer a straightforward analysis of verbal "particles." I then considered some of the Argument Inheritance Analysis' present overpredictions and showed how additional constraints could be added to fix these apparent problems. However, some additional research is needed to verify the analyses suggested here.

Thus, Argument Inheritance Analysis offers a more adequate analysis of Tongan noun incorporation, and shows that the significant alterations to the HPSG architecture embedded in the Lexical Sharing Analysis are not necessary to capture the Tongan construction. Furthermore, given the success of this style of analysis for both Tongan noun incorporation and West Greenlandic denominal verbs, it remains an important analysis to consider in examining other languages purported to have stranding, since they might be amenable to a similar analysis.

List of Abbreviations

ABS = absolutive; CAUS = causative; DEF = the definitive accent; DET = determiner; ERG = ergative; NMLZ = nominalizer; PERF = perfect; PL = plural; PRES = present; SG = singular; SBJV = subjunctive

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