
Conditions on Agreement in Yimas*

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1. Introduction

This paper is concerned with a “trading relation” between the syntax of *phrases* and the syntax of *heads*. A central concern in the study of polysynthetic languages has been to explain the connection between two of the most striking features of these languages: highly articulated systems of argument agreement marking on the one hand, and very free ordering and omission of independent phrases expressing the arguments of a clause on the other. One of the oldest answers to this question has been one of the most lasting: Wilhelm von Humboldt (Humboldt 1836) claimed that in Nahuatl it is the affixes on the verb which fill the argument positions of the verb, and that independent expressions are only loosely linked to these affixes.

Jelinek’s analysis of Warlpiri (Jelinek 1984) is a revival of this tradition in a generative framework. Most importantly, Jelinek also poses the question from a new perspective: why is it that independent expressions *cannot* appear in argument positions in polysynthetic languages? Her suggestion is that both thematic roles and abstract Case are assigned to the verbal affixes themselves, and hence are unavailable to license independent phrases in argument positions. Baker’s study of Mohawk (Baker 1991) pursues Jelinek’s question, but delivers a new twist. He concludes that independent phrases *can* appear in argument positions in Mohawk, but that only if they are either phonologically null or clausal, that is, if they are not subject to the *Case Filter* (Rouveret & Vergnaud 1980). The reason for this, Baker argues, is that abstract Case is assigned to agreement affixes, making it unavailable to independent phrases.

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In sum, then, Jelinek claims that pronominal affixes in polysynthetic languages are *arguments*, whereas Baker claims that they are *agreement* with null arguments. This paper presents a detailed analysis of the system of argument agreement marking in Yimas, a Papuan language of New Guinea described in Foley (1991)¹. I argue that Yimas - a ‘split Ergative’ language - is a mixed system. Nominative-Accusative affixes are arguments which have incorporated into V⁰; Ergative-Absolutive affixes are functional heads, which agree with arguments in their specifier positions. A range of asymmetries in the language are shown to follow from the argument/agreement distinction, including the Ergative split.

I also argue that the split between argument marking and agreement marking in Yimas need not, in fact *cannot* be encoded directly in the grammar of the language. The contrast usually distinguishes 1st and 2nd person arguments (‘local’) from 3rd person arguments (‘non-local’)², but this is not an accurate generalization. Local arguments are usually marked by Nominative-Accusative affixes, and non-local arguments by Ergative-Absolutive affixes. But a condition that at most one affix from the Nominative-Accusative class is possible in any word entails that additional local arguments are treated like 3rd person arguments, and can only be marked in the Ergative-Absolutive (agreement) system. I derive these effects in terms of conditions on Case-motivated Noun Incorporation.

Examination of patterns of extraction in Yimas shows that (i) extraction possibilities in Yimas are sensitive to the person of non-extracted arguments, (ii) [Spec,IP] in Yimas has ‘mixed’ properties like those proposed for Yiddish by Diesing (1990), despite the very different roles of this position between the two languages. In addition, Yimas exhibits ‘subject properties’ in its Ergative-Absolutive Case marking system, effects which, I argue, cannot be explained in terms of semantics or D-structure configurations. This motivates a further “Ergative split” in Yimas, between S-structure and LF.

The outline of the paper is as follows: section 2 presents the core properties of the complex verbal head in Yimas - its hierarchical structure, the split Ergative pattern of pronominal affix marking, and a left-edge effect which I dub the *Yimas Extended Projection Principle*. Section 3 presents an account of the

¹ Yimas is one of six languages of the Lower Sepik family of northern central New Guinea, and is currently spoken by around 250 people. Due principally to the influence of Tok Pisin, the Yimas language is in a state of flux, which is resulting in a simplification of the morphological system among most younger speakers (Foley, henceforth F, pp.5, 227-235). The language described here is that of men in their late thirties, the last group of speakers to grow up in an essentially monolingual environment.

² The terms ‘local’ and ‘non-local’ are borrowed from the terms used by Hockett (1966) in describing a person hierarchy in Algonquian. These correspond to the binary feature [+/- participant] also common in the literature.

factors which give rise to both the split Ergative pattern and the exceptions mentioned above, drawing on a generalized version of *Case Theory*. Section 4 discusses two bodies of further data, providing support for the main claims of section 3. First, the effects of number agreement with participial heads are sensitive to the argument/agreement distinction. Second, extraction phenomena are argued to be sensitive to the different positions in which Case licensing occurs. Section 4 closes with a discussion of the ‘subject properties’ found with arguments which are usually marked Ergative-Absolutive.

2. The Verbal Complex in Yimas

2.1 Ordering Inflection

In Yimas arguments of the verb are in general marked by prefixes to the Verb Root, which consists of the Verb Stem, tense and aspect markers, and any derivational affixes. Members of a small class of modal prefixes, marking negation or the anticipated likelihood of an event, may precede the agreement prefixes. The number and noun class of certain arguments may be marked by suffixes to the Verb Root (1)³.

1.	ta-	mpi-	kra-	tkam -r	- ~kan -~
	NEG	3dl-Erg	1pl-Dat	show PERF	PC VI-sɔ
	Modals	Agreement Prefixes	Verb Root	Number Suffixes	

"Those two didn't show us few it (the coconut)"

The agreement affixes attached to the verb Root distinguish 5 cases (Absolutive, Ergative, Dative, Nominative, Accusative), 4 numbers (singular, dual, plural, paucal (3-5 humans)), person, and membership in one of 16 noun classes⁴.

³ Abbreviations. Modals: NEG - negation; POT - potential modal; LIK - likely modal. Numbers: sg - singular; dl - dual; pl - plural; pc - paucal; upper case (eg “PC”) used for independent number affixes. Cases: Abs - absolutive; Erg - ergative; D(at) - dative; Nom - nominative; Acc - accusative. Tenses/aspects: (Nr-)Pst - (near) past; PERF - perfect. Roles: ag - agent; ob - object/patient; gl - goal. “α-” - prefix; “-α” - suffix; “α=β” - portmanteau affix.

⁴ Membership in noun classes is *not* arbitrary in the majority of cases (unlike more familiar grammatical gender systems): membership may be determined by a noun’s *meaning*, eg. Class III consists of terms for higher animals, such as pigs, dogs and crocodiles; or membership may be determined by a noun’s *phonological form*, eg. Class VII consists of nouns ending in *-mp*; or membership may be determined by both form and meaning: Class IV nouns end in *-um* and almost all refer to plants and trees. 10 of the classes have a large number of members. The remaining 6 classes have a single member each. Each noun class has a distinct set of agreement suffixes which are used in possessive, adjectival, or verbal constructions.

Affixes mark agreement with subjects, objects, and goal arguments. In addition, each of the three ‘modal’ prefixes *ta-*, *ant-*, *ka-* trigger a different set of alternations in the marking of agreement. Given the size of this set of parameters, it seems highly unlikely that a speaker of the language should simply represent the range of inflected verb forms as a list or as slots in a paradigm matrix.

Yimas clauses allow free ordering of independent nominal phrases, both with respect to one another and with respect to the verbal complex, and liberal omission of overt nominals is also possible. I will be assuming that the full nominal phrases appearing in Yimas sentences are adjuncts, coindexed with the actual arguments of the clause, which are either the null pronominal *pro* (cf. Baker 1991) or affixes in the verbal complex (cf. Jelinek 1984). Full NPs are not inflected for case⁵, and show a loss of number distinctions with respect to the verbal morphology (lack of paucal number).

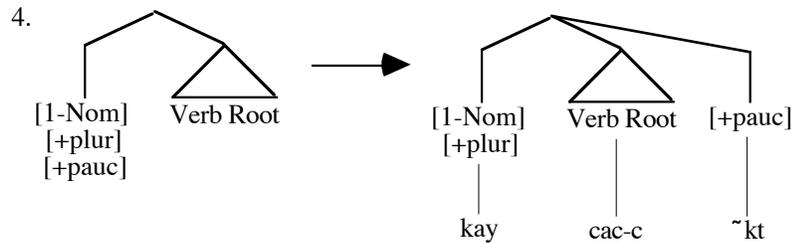
The table below shows the main pronominal affixes of Yimas.

	Abs	Erg	Nom	Acc	Dat	Pronoun
1-sing	ama-		ka-	~a-		ama
1-dual	kapa-		~kra-	~kra-		kapa
1-plur	ipa-		kay-	kra-		ipa
1-pauc	pa~kra-					
2-sing	ma-		n-	nan-		mi
2-dual	kapwa-		~kran-	~kul-		kapwa
2-plur	ipwa		nan-	kul		ipwa
2-pauc	pa~kra-					
3-sing.	na-	n-			-ak	
3-dual	impa-	mpi-			-mpn	
3-plur	pu-	mpu-			-mpun	
3-pauc	kra-	~kl-			-~kan	

Notice that whereas there is an Absolutive marker for all persons, all other Cases are confined to either local or non-local arguments. Only 3rd persons have an Ergative marker, and only 1st and 2nd persons have a Nominative or Accusative marker. Only 3rd person arguments have distinguished Dative suffixes for goal arguments.

The ordering of the different Case prefixes is fixed. Nominative/Accusative prefixes always appear at the right of the prefix string, immediately adjacent to

⁵ Except for the ‘oblique’ suffix *-nan*, used to mark locations, instruments etc. This will not be relevant to the rest of the discussion here.



3rd person Dative agreement suffixes always follow the verb root (5a). They also follow a paucal suffix associated with a 1st person Nominative prefix (5b), suggesting that Dative nodes are structurally ‘higher’ than Nominative nodes.

5. a. makaw wa- mpu- ~a -r **-mpun**
 fish-IX-sg IX-sg-Abs 3pl-Erg give PERF 3pl-D
 ‘They gave makau to them.’ (F212)
- b. ura~ k- kay- tkam -r -~kan-**akn**
 coconut-VI-sg VI-sg-Abs [1pl-Nom show PERF PC] 3sg-D
 ‘We few showed him the coconut.’ (F221)

Yimas has a small number of heads which are *always* spelled-out discontinuously. These consist of a prefix and a suffix which attach to the far ends of the verbal complex. The prefixes are *ta-* (Negation), *ant-* (Potential modality), and *m-* (Relative clause complementizer); the suffix is always a nominal concord marker, indicating the number and noun class of one of the arguments of the clause. Examples (6a-b) illustrate this: both cases involve the negative prefix *ta-*; in (6a) the concord marker references a 3rd person subject of class IV⁷, in (6b) it references a 3rd person object of class VI. (6b) is also a ditransitive construction: notice that the concord marker suffix *follows* the Dative suffix.

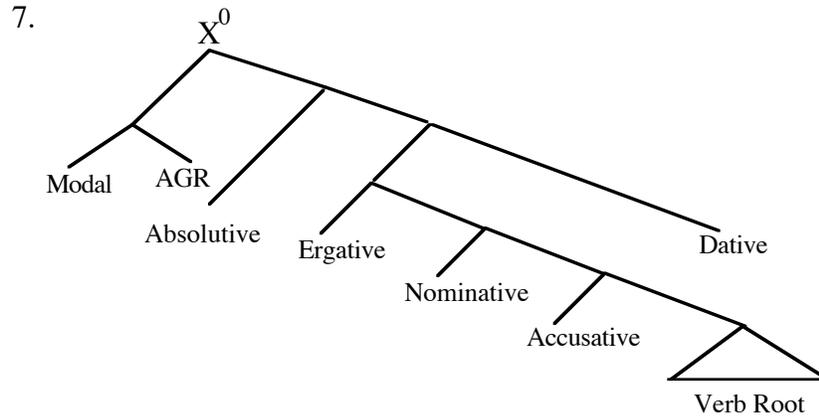
6. a. irpu~i ta- **pu**-tmuk -na -**ra**
 palm-IV-pl NEG 3 fall NrPst IV-pl
 ‘The coconut palms didn’t fall over yesterday.’ (F254)
- b. ura~ ta- ka- tkam -r -ak -~
 coconut-VI-sg NEG [1sg-Nom show PERF 3sg-D] VI-sg
 ‘I didn’t show him the coconut.’ (F259)

The placement of the two parts of the negative head further illustrate the ‘nested’ internal of the Yimas verbal complex. Anticipating somewhat my

⁷ In (6b) the 3rd person subject prefix *pu-* is identical to the normal 3rd plural absolutive prefix, but in this instance it is an instance of a ‘neutralized’ 3rd person prefix, which appears in certain negated environments. The effects of concord suffixes on the position and marking of arguments is discussed in detail in sections 4.1.2 and 4.3 below.

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conclusions below, (7) shows schematically the hierarchical structure I assume for the verb and agreement affixes in Yimas. The structure shows the relative positioning of all agreement affixes, despite the fact that they cannot all cooccur in the same head. How this complex head structure is derived, and what is the nature of the terminal nodes spelled-out as Ergative, Nominative affixes etc., is the topic of section 3 below.



2.3 Extended Projection Principle Effects in Yimas Heads?

This section focuses on an important generalization about the left edge of the Yimas verbal complex: if an agreement prefix appears in initial position in the verbal complex, it is always an *Absolutive* prefix, as shown in (8) below. Given the ordering facts presented in section 2.1 above, it comes as no surprise that an Absolutive prefix should be the leftmost agreement prefix *when it occurs*. What is surprising is that an Absolutive prefix should always occur in prefix strings, marking subjects and objects, local and non-local arguments alike⁸.

8. a. **pu-** n- tay *3rd person object*
 3pl-Abs 3sg-Erg see
 'He saw them.' (F195)
- b. **pu-** nan- tay *3rd person transitive subject*
 3pl-Abs 2sg-Acc see
 'They saw you.' (F198)
- c. **pu-** tmuk-t *3rd person intransitive subject*
 3pl-Abs fall PERF
 'They fell down.' (F197)

⁸ There is one exception: when a clause has a 1st person agent and a 2nd person object special forms appear. These will be discussed in detail below (section 4.1.3).

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Second, it should be stressed that the alternations in (8) and (9) are *not* the result of ‘competition’ between Absolutive and modal prefixes for a slot in a word-template. Modal prefixes are not in complementary distribution with Absolutive prefixes. Absolutive prefixes mark an intransitive subject and a transitive object respectively in (9b) and in example (11a-b), which are prefixed with the modal *ant-* (potential modality).

11. a. a- **pu-** tmuk-r -um
 POT 3pl-Abs fall PERF PL
 ‘**They** almost fell down’ (F197)
- b. a- **pu-** ka- tay
 POT 3pl-Abs 1sg-Nom see
 ‘I almost saw **them.**’

I interpret these alternations as the consequences of a requirement of the Absolutive assigning head I^0 , which must be satisfied by S-structure. The requirement is that I^0 stand in some local relation to a *nominal* category, and there are two ways in which it can be satisfied. The first is if an NP occupies the specifier of IP, presumably entering into an agreement relation with I^0 , and triggering an Absolutive agreement prefix - this is what we see in (8). The second is if I^0 raises and incorporates into a higher ‘nominal’ head - assuming that the nominal inflection suffixes associated with many of the modal prefixes discussed above reflect the nominal nature of these heads. This second option is what is used in (9-11) above.

The requirement just described is reminiscent of the *Extended Projection Principle* (Chomsky 1982, 10) of English-type languages, especially when we consider that the EPP may be satisfied in more than one way. Branigan (1992) points out that locative PPs in ‘locative inversion’ constructions appear to obviate the need for an argumental subject or expletive, as usually demanded by the EPP (12).

12. a. In the distance was heard a plaintive howling.
 b. To Gillian was left the bulk of her aunt’s estate.

Recall that in approaches which try to ‘decompose’ categorial labels into matrices of primitive features [+/-N] and [+/-V] (eg. Chomsky 1986), nouns and prepositions form a natural class in being [+N]. Here we may speculate that exactly the same requirement on the satisfaction of I^0 applies in both English and Yimas, with the contrasts between the two languages being the result of independent factors, such as the unavailability of the head-raising option for English I^0 . As a reminder of the similarity between the English and the Yimas, I refer to the Yimas condition as the *Yimas Extended Projection Principle*

(YEPP). A further property which the YEPP and the EPP share is that they are both probably irreducible requirements of the language, not to be derived from more general considerations.

An alternative which I do not pursue here is the possibility that the effects which I am comparing to EPP effects in English should more properly be seen as ‘Wackernagel’ effects, or V2 phenomena like those found in Germanic languages - where either C^0 (den Besten 1983) or I^0 (Diesing 1990) must be preceded by a single maximal projection - or the similar requirement in Papago (Pranka 1983) that the *Aux* element appear second in the clause, followed by *either* an NP or by some other terminal element from the Aux-complex. The main reason for not pursuing this option is that these effects do not require that a specific XP or head be initial: in a simple transitive sentence in German, for example, either the subject or the object may appear sentence initially. In Yimas, on the other hand, there is no choice regarding which argument of a clause is marked Absolutive: notice that despite the alternations between different affixes marking the same argument in the examples above, the YEPP *never* causes a reordering of the agreement affixes.

2.4 Split Ergativity

Only when the effect of the YEPP is controlled for does the split Ergative system of agreement become evident. The examples below show that when an argument is not marked by the initial affix of the verbal complex, *local* intransitive subjects pattern with transitive subjects in being marked by Nominative affixes, whereas transitive objects are marked by Accusative affixes; *non-local* intransitive subjects and transitive objects are marked by Absolutive affixes, even when preceded by a modal prefix, but transitive subjects are marked by Ergative affixes.

13. a. ant- **ka-** tmuk-t *1st person intransitive subject*
 POT **1sg-Nom** fall PERF
 ‘I almost fell down.’ (F197)
- b. pu- **ka-** tay *1st person transitive subject*
 3pl-Abs **1sg-Nom** see
 ‘I saw them.’ (F201)
- c. pu- **~a-** tay *1st person transitive object*
 3pl-Abs **1sg-Acc** see
 ‘They saw me.’ (F201)
14. a. a- **pu-** tmuk-r- um *3rd person intransitive subject*
 POT **3pl-Abs** fall PERF PL
 ‘They almost fell down.’ (F197)

local and non-local arguments. Markers for (most) local arguments follow a Nominative-Accusative system, while markers for non-local arguments follow an Ergative-Absolutive system. The section also addresses a range of effects which Foley attributes to the interaction of the split Ergative Case marking system with a person hierarchy.

3.1 3rd-Person Arguments and Ergativity

I assume that the structure of the Yimas clause includes argument positions for both subject and object within the VP, plus a series of functional projections above VP. These include at least IP and TrP ('transitivity', cf. Murasugi 1992a,b), each of which may agree with its specifier and potentially Case license it.

3rd person arguments are not overtly spelled-out in Yimas. They are marked by independent phrases adjoined to the clause, and by agreement affixes on the verb. Following Baker (1991), I assume that the arguments themselves cannot be overtly spelled-out for Case theoretic reasons. Baker shows that Mohawk shows a lack of asymmetries between subject and object *NPs* on well-known tests of disjoint reference ('Condition C effects'), extraction from NP (CED, Huang 1982), and weak crossover. This lack of structural asymmetries presents a strong argument for a 'flat' clause structure. Remarkably, though, the asymmetries found in English reemerge in Mohawk when *clausal* or *phonologically empty* arguments are involved. Condition C effects are found between matrix and embedded arguments; CED effects are found - extraction from sentential complements is possible, but extraction from sentential subjects is impossible; the sensitivity of *wh*-traces to normal island effects shows that they too may appear in argument positions.

Baker (1991) concludes from the contrast between overt NP arguments on the one hand, and phonologically empty and clausal arguments on the other hand, that the inability of overt NPs to appear in argument positions follows from the impossibility of *Case assignment* to these positions. Baker assumes that the blocking of Case assignment to argument positions in Mohawk is the result of Case assignment to the agreement affixes on the verb, which 'uses up' the licensing properties of the Case assigning heads. Therefore, the only nominal arguments which may occupy argument positions in Mohawk, besides *wh*-traces, are *pro*. We can summarize this argument as the condition in (16), which applies to those languages in which agreement heads are Case marked.

16. *The little pro theorem*
- a. Overt nominal arguments require Case licensing under agreement.
 - b. Case is unavailable to argument positions.
- Only non-overt nominals may appear in argument positions.

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More accurately, Baker argues that the distinction between overt NPs and all other arguments is relevant only for S-structure, where the version of the Case Filter proposed by Rouveret & Vergnaud (1980) applies:

17. * NP without Case, if NP has phonetic features and is in an A-position (S-structure)

This is only half the story, however. There are well-known reasons for adopting a Case Filter for which the crucial property of NPs is *argumenthood* rather than phonological content (Lasnik & Freidin 1981). Baker assumes that at LF the agreement morphemes are deleted and therefore irrelevant for Case assignment. At this level all argument NPs are treated alike and are subject to the Case Filter. This two level approach to the Case Filter is unified as in (18), following closely Shlonsky (1987).

18. *The Generalized Visibility Condition* (Baker 1991, 570)
An NP X can be interpreted at level α only if X receives Case at level α .

What it means to be ‘interpreted at α ’ depends on the function of the level in question. For S-structure the relevant property is phonological content, for LF it is receipt of a θ -role. Here I will be adopting a further generalization of the Case Filter, according to which Case assignment to *heads* is not unexpected (as it is under Baker’s formulation of the filter). Following Chomsky (1992) I assume that Case licensing is a condition on heads and maximal projections alike. This is achieved by substituting *element* for *NP* in the *Generalized Visibility Condition* above.

I will therefore be assuming that affixes marking 3rd person arguments are agreement morphemes, which prevent the arguments themselves from being overtly realized. We are now almost in a position to show how the Ergative-Absolutive pattern of non-local agreement marking is derived, but first we must dwell for a moment on the effects of another very general constraint assumed here, the condition on *Economy of Derivation* (Chomsky 1991,1992).

From the standpoint of much work in the government-binding framework, there is no sense in which syntactic movement operations have any ‘function’. The operation *move α* applies freely, unless it violates constraints, generally on the well-formedness of representations. This ‘functionlessness’ of syntactic operations was not a characteristic of the earliest work on transformational grammar, in which transformational rules were explicitly associated to the constructions they created; it is also less obviously a property of recent theories which include constraints on derivational economy, such that operations apply if and only if they absolutely must. For an operation to be forced to apply, there must be some condition which needs satisfaction. Therefore, there is a sense in which syntactic operations have ‘functions’. An important implication of this is

noticed by Murasugi (1992a,b): conditions on economy of derivation are typically assumed to apply to both the number and length of operations. The most common way of implementing conditions on *shortest movement* is as a requirement that no element move farther than it absolutely must. But another approach would be to take account of the ‘function’ of an operation, what condition it satisfies, and to require that the shortest movement possible be applied *for the satisfaction of that condition*.

To be more concrete, imagine the *Generalized Visibility* condition as it applies to S-structure in Yimas. For reasons already discussed, 3rd person arguments have no way of being Case licensed at S-structure, therefore they must be phonologically empty, and do not require Case licensing at S-structure. The inflectional heads which agree with these arguments, on the other hand, *are* overtly spelled-out at PF, and are subject to Case-licensing at S-structure. Let us assume that their licensing requirement is satisfied by means of agreement with an NP in their specifier position. So, the condition which must be satisfied is a condition on a head; it is satisfied by movement of a maximal projection. Based on the considerations just discussed, shortest movement is computed from the perspective of the head. This means that the closest NP must be moved which can license the head^{10,11}. If we further assume that representations are constructed cyclically, such that the requirements of lower elements are satisfied before those of higher elements, we are led to the ‘nested paths’ effect which Murasugi (1992a,b) associates with Ergative Case systems, for 3rd person arguments in Yimas.

Applying this to real clause structures of Yimas, another factor must be taken into account, namely the YEPP condition from section 3. This adds a licensing condition on I⁰ to any others predicted by the *Generalized Visibility* condition as

¹⁰ This amounts to the *Closest Available Source* condition of Murasugi (1992a, 24).

¹¹ Note that I differ here from Baker (1991), who claims that since *pro* is not subject to Case licensing requirements at S-structure, it does not need to raise from its D-structure position at S-structure. Baker’s account has the disadvantage that it does not explain what syntactic configurations, if any, set up agreement relations between argument *pros* and X⁰ agreement morphemes. His position is, however, motivated by empirical evidence, namely the *absence* in Mohawk of the following Binding Condition C contrast. Subject pronouns in English (ii) must be disjoint in reference from non-pronominal NPs inside a matrix adjunct clause, but object pronouns are not subject to the same restriction (i)(Reinhart 1983; cf. Baker 1991, 571-2 for Mohawk data):

- i. The chairman hit **him_i** on the head before **the lecturer_i** had a chance to speak.
- ii. ***He_i** was hit on the head before **the lecturer_i** had a chance to speak.

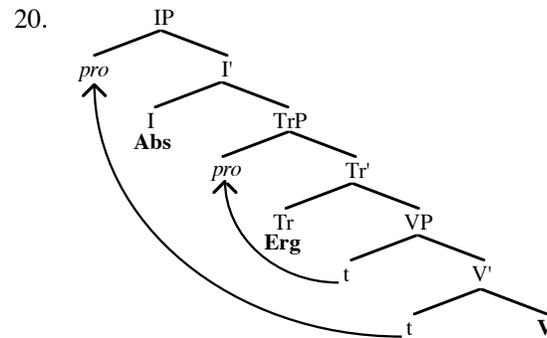
I do not know the status of equivalent sentences in Yimas. But I do present evidence from extraction processes below (section 5.2) which supports the assumption that *pro* does move to a Case position at S-structure.

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set out here. Consider the examples in (19a-b). The intransitive subject in (19a) is marked by an Absolutive prefix. The argument itself is *pro*, so it requires no Case licensing at S-structure. However, it is the only element in the clause capable of satisfying the YEPP by entering into an agreement relation with I^0 , so it raises to [Spec,IP]. In (19b) on the other hand, the transitive subject is marked by an Ergative affix, with the Absolutive affix going to the object. This corresponds to the ‘nested paths’ effect predicted: proceeding cyclically, the lowest element in the structure which requires S-structure licensing is the Ergative assigning head Tr^0 . It is satisfied by the movement of the closest available NP, the subject. The next element requiring satisfaction is I^0 , for which purpose the object raises. This movement both ensures that the features of the object are overtly marked, and satisfies the YEPP. A derivation for (19b) is shown in (20).

19. a. na- wa-t
 3sg-Abs go PERF
 ‘He went.’ (F195)

b. na- n- tay
 3sg-Abs 3sg-Erg see
 ‘He saw him.’ (F202)



The nested paths effect illustrated here contrasts with the ‘crossing paths’ pattern which has been associated with Nominative-Accusative Case systems. That pattern, however, is what we expect when it is arguments themselves which require Case-licensing at PF, and therefore drive conditions on shortest movement from their perspective. Affixes marking local arguments in Yimas do essentially follow a Nominative-Accusative system.

3.2 Local Arguments

Throughout section 3.2 I assumed the following reason for why 3rd person arguments cannot appear overtly in argument positions in Yimas: movement to Case positions (specifiers of functional heads) triggers the agreement which would standardly license Case, but agreement on the functional head itself is assigned Case, making S-structure Case unavailable to the NPs. Case does become available at LF, however, at which level agreement morphemes are not subject to *Generalized Visibility*.

This line of argument assumes, however, that raising from a VP-internal θ -position to the specifier of a functional head is the *only* way in which an argument may satisfy the Case Filter. In this section I address the effects of assuming a further possibility for Case-licensing of arguments, incorporation into V^0 (cf. Baker 1988). I claim that local arguments are able to incorporate directly into V^0 from their θ -positions, enabling them to be Case licensed both earlier (i.e. at S-structure rather than LF) and by shorter movements than if they behaved like 3rd person arguments.

But once this option is made available, we are led to ask a question which is almost the inverse of Jelinek's question with which we began. Why *must* 3rd person arguments appear in argument positions? Why can't they incorporate?

I cannot offer a definitive answer to this question, but offer the following as a possible explanation. It relies on the richness of the noun class and concord system for 3rd person arguments (see section 1). The content of a third person argument position includes, minimally, number features and the information which determines the noun class membership of the head of the argument¹², and possibly much more besides. This contrasts with local arguments, whose content is exhausted by person and number features. In addition, it is a fact about Yimas that it allows only very limited noun incorporation, generally only in idiomatic expressions (cf. Foley, 319-321). Capitalizing on this observation, I assume that person and number features alone (ϕ -features) may incorporate into V^0 . This restriction may be related to well-known contrasts between *structural* and *inherent* Case marking properties of heads in more familiar languages. i.e. the ability to license only ϕ -features may be a similar property to the ability to license only specific thematic roles (Chomsky 1986) or arguments lacking inherent quantificational force (Belletti 1988; de Hoop 1991,1992). This has the effect that the heads of local arguments may incorporate into the verbal complex, but that this is not an available option for non-local arguments¹³.

¹² This 'information' could just be a class diacritic, but since class membership is not arbitrary, but syntactically and phonologically conditioned, the class diacritic could be omitted (unlike the situation in many more familiar languages, cf. Harris 1991 on Spanish). Noun class distinctions do not to my knowledge correlate with any syntactic distinctions in Yimas.

¹³ The connection between lexical incorporation and pronominal agreement has been the subject of debate in the recent literature. Yimas is similar to Navajo in having extensive

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Given the possibility that local arguments *may* incorporate into V^0 for Case licensing, shortest movement considerations imply that they *must* incorporate wherever possible. Thus local subjects and objects incorporate into V^0 and go on to be spelled-out as Nominative and Accusative affixes respectively (21a-b).

21. a. pu- **ka-** tay
 3pl-Abs 1sg-Nom see
 ‘I saw them.’ (F196)
- b. pu- **˜a-** tay
 3pl-Abs 1sg-Acc see
 ‘They saw me.’ (F196)

Baker (1988, 105ff.) argues that incorporation exempts a noun from the Case Filter. In the discussion above I adopted a variant of this position, in which incorporation allows a noun to *satisfy* the Case Filter, that is, incorporation may facilitate Case *assignment*. Although indistinguishable on the examples so far discussed, these two formulations make very different predictions. If incorporation exempts nouns from the Case Filter, then we expect that provided that any number of nouns can incorporate into a head, they can all escape the Case Filter in this way. But if incorporation does not actually exempt a noun from the Case Filter, we predict that at most one noun can incorporate for Case licensing. This is what appears to be the situation in Yimas. At most one local argument has the option of being licensed and spelled-out at PF as a result of incorporation into V^0 . If a clause has two local arguments, it must always be the *lowest* which incorporates. In a clause with an agent and a patient, the patient argument will be the lowest argument; in ditransitive clauses with a local agent and a local goal¹⁴, the goal argument will be the lower. [See section 4.1.4 below for discussion of the relative height of goals and themes.]

What, then, if anything, can license a second local argument? There appear to be two ways in which a second local argument may be marked in the verbal complex. Each is available to *either* 1st-person *or* 2nd-person arguments, but neither is available to both. One of the options will turn out to allow spell-out of the argument itself; the other allows the argument to be referenced by an

pronominal agreement morphology, but no noun incorporation, whereas Mohawk has both. Jelinek (1989) argues that the dissociation of the two properties in languages like Navajo and Yimas implies that NI and pronominal agreement should be unconnected properties. Baker (1992) argues that the properties should be connected, and points out that they appear not to be ‘doubly dissociated’ - i.e. NI implies pronominal agreement. The Yimas facts further support Baker’s position, insofar as they suggest that the pronoun vs. lexical noun split is not a rigid contrast: the fact that a language may make the split somewhere else, but preserving the same implicational relation, motivates the reduction of the NI/pronominal agreement distinction to more primitive features.

¹⁴ Foley claims that local objects are impossible in Yimas ditransitive constructions.

agreement morpheme. Consider the examples in (22) below, in which both arguments are local: in the first the agent is 2nd person and the patient is 1st person; the roles are reversed in (22b).

22a. ma- ~a- tay
 2sg-Abs 1sg-Acc see
 ‘You saw me.’ (F206)

23. kampan- tay
 1ag=2sg-ob see
 ‘I saw you.’ (F207)

In (22a) the subject is marked by the Absolutive prefix. Although it is *pro*, and therefore exempt from *Generalized Visibility* at S-structure, by raising to [Spec, IP] it satisfies the Case requirement of I⁰ (YEPP).

In (22b), on the other hand, the 1st person agent and 2nd person singular patient are marked by the portmanteau prefix *kampan-*. I assume that this spells-out the result of morphological *merger* (cf. Marantz 1988) of the two local pronominal arguments. This shows that a second local argument has another means of being marked overtly. Rather than agreeing with a Case-assigning functional head, as in (22a), the 1st person agent in (22b) merges with a Case-licensed pronominal element, presumably inheriting the licensed status of that pronominal. The portmanteau spell-out option is not available for all combinations of 1st person agent and 2nd person patient (or goal, in ditransitives): *kampan-* is only available for combinations with 2nd person *singular* patients/goals. There is a portmanteau form *pa~kul-* for combinations of [1ag-2obj] in which the 2nd person object is *paucal*. In cases where the 2nd person object is dual or plural, however, no portmanteau is available, and just the normal Accusative prefix is spelled-out¹⁵ (23).

23. kapa kul- cay
 1dl 2pl-Acc see
 ‘We two saw you all.’ (F207)

¹⁵ I leave it as an open question what is the status of portmanteau forms with respect to the YEPP. The fact that portmanteau forms such as *kampan-* are still available in modalized contexts, where Ergative-Absolutive prefixes are typically ‘suppressed’ (cf. section 4.1.2 below), suggests that I⁰ is not involved in the Case-licensing of the heads spelled-out by the portmanteaux (i).

i. ipa ta- mpan- tpul
 1pl NEG 1ag=2sg-ob hit
 ‘We didn’t hit you’

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So, while 1st, 2nd, and 3rd person *intransitive* subjects may all be marked by Absolutive prefixes, only 2nd and 3rd person *transitive* subjects may be marked Absolutive. No 1st person transitive subjects may be marked in this way, even if they are not marked by a portmanteau. To capture this, I assume that the merger of 1st person agents with 2nd person objects occurs generally, regardless of the availability of portmanteau spell-outs.

3.3 Mixed Arguments

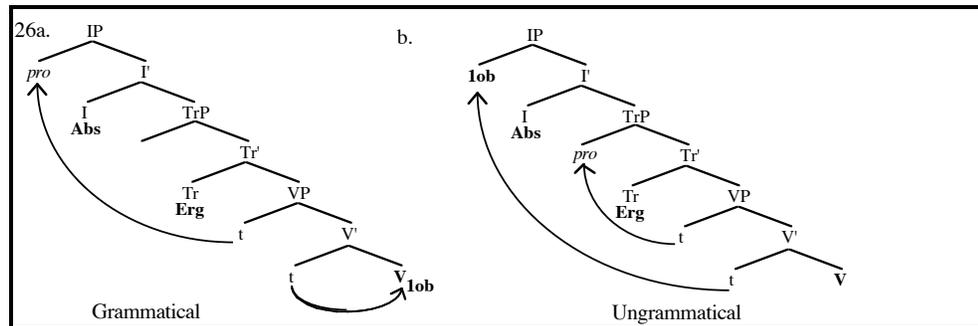
So far only clauses with uniformly local or non-local arguments have been discussed. This section looks at what happens when a clause has a combination of local and non-local arguments. An important generalization to be captured is that when a verb has both local and non-local arguments, affixes marking *local* arguments always appear closer to the verb root than affixes marking non-local arguments. This holds regardless of the semantic roles of the arguments, as can be seen in (21a-b) repeated as (24a-b).

24. a. pu- ka- tay
 3pl-Abs 1sg-Nom see
 'I saw them.' (F205)

b. pu- ~a- tay
 3pl-Abs 1sg-Acc see
 'They saw me.' (F205)

Why is it that these forms are required, rather than the alternative in (25)? (26) shows the grammatical and ungrammatical derivations of a sentence like (24a) with a 3rd person agent and a 1st person patient.

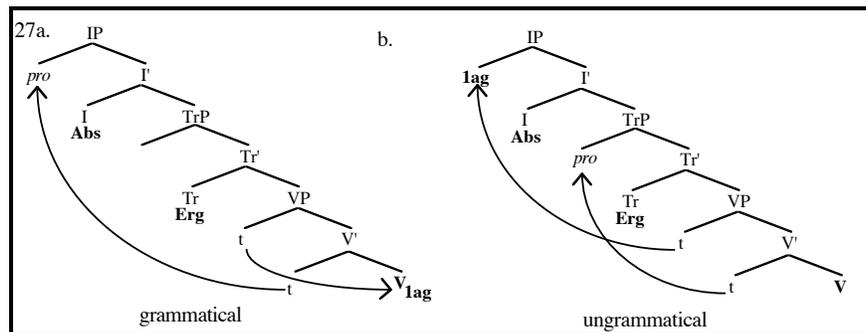
25. * ama- mpu- tay
 1-Abs 3-Erg see
 'I saw them/they saw me.'



Recall the two conditions which we are assuming to apply to derivations: (i) features which are spelled-out at PF must be Case licensed by S-structure; (ii) the operations which enable such licensing are subject to conditions on shortest movement. In addition, the cyclic derivation of syntactic structures has the effect that the licensing of elements proceeds in an ordered fashion, starting from the lowest point in the syntactic tree.

The features which must be satisfied in the derivation of (24a) are the features of the *argument* 1obj, and the features of the *head* which agrees with 3ag. In addition, the YEPP applies, requiring satisfaction of I^0 . The lowest of these is the argument 1obj. The shortest movement which satisfies it involves incorporation into V^0 . The next higher features requiring licensing are those of I^0 . The shortest movement of an XP which satisfies this requirement is movement of the 3ag specifier in VP. This corresponds to the derivation in (26a). In the impossible derivation (26b), neither the features of 1obj nor the YEPP are satisfied by shortest movement.

(27a-b) shows a grammatical and an ungrammatical derivation of a sentence with a 2nd person agent and a 3rd person patient, similar to (24a).



In this instance it is the features of the argument in [Spec,VP] and the features of the head agreeing with the underlying object which need to be satisfied by S-structure, in addition to the YEPP. Despite the fact that the agent is *not* the lowest argument at D-structure, it remains the lowest position requiring Case licensing by PF. It takes the shortest movement available, incorporating into V^0 . The YEPP is then satisfied by raising of the closest available XP to its specifier, i.e. the underlying object. This operation automatically licenses the object agreement features. This again corresponds to the correct form (27a). (27b) shows a derivation of the impossible (25). In this case the YEPP is satisfied by movement of a closer argument than in (27a), but the features of the 1st person agent undergo longer movement. Since the agent is the lowest position in the tree requiring S-structure licensing, its requirements take priority, and derivation (27a) is preferred to (27b).

4. MS & LF: Number, Extraction, Subjecthood

The two central proposals used in section 3 to derive the basic patterns of pronominal agreement in Yimas were:

- i. There is a distinction between *argumental* affixes and *agreeing* affixes.
- ii. The difference between the affix types is correlated with syntactic positions.

In addition, these contrasts were argued to derive from the interaction of constraints on noun incorporation with a highly generalized version of Case theory. Sections 4.1 and 4.2 present further motivation for proposals (i) and (ii) respectively, based on evidence from the marking of number, and the effects of extraction processes on agreement marking. Section 4.3 examines ‘subject properties’ associated with the phenomena treated in sections 4.1 and 4.2, and argues that these data reflect the ‘switch’ of the structural case system of Yimas from Ergative-Absolutive at S-structure to Nominative-Accusative at LF.

4.1 Number Suffixes and their Consequences

As briefly discussed already, in certain environments suffixes are used to mark the number of an argument, in addition to or instead of the normal prefixal marking. There are two contexts in which this happens: (i) 1st and 2nd person paucal arguments are marked by both a prefix and the paucal suffix *-ʔt*; (ii) in modally inflected verbal complexes, one argument is marked by a number/concord suffix, possibly in conjunction with a prefix. An important generalization to be explained is why suffix type (i) requires the *presence* of an associated pronominal prefix, whereas suffix type (ii) generally requires the *absence* of an associated prefix.

4.1.1 Paucal Number

The number category *paucal* is typically used in referring to groups of roughly 3-5 humans¹⁶. Its expression in verbal morphology involves another split between local and non-local arguments. There are dedicated paucal prefixes for Ergative and Absolutive agreement, but no such Nominative or Accusative forms are available. In this respect the Nominative and Accusative paradigms parallel the inflection of independent nominal phrases in Yimas, which only distinguishes the numbers singular, dual, and plural. Nominative or Accusative

¹⁶ The exact range of numbers can vary considerably, depending on the context of utterance. cf. Foley p.216 for discussion.

paucal arguments are marked by the combination of a plural prefix and the paucal suffix *-ʔkt* (28).

28. a. pu- **kay-** cay-c -ʔkt
 3pl-Abs 1pl-Nom see PERF PC
 ‘We few saw them.’ (F220)

b. uraʔ k- ʔkl- **kra-** tkam -r -ʔkt
 coconut-VI-sg VI-sg-Abs 3pl-Erg 1pl-Acc show PERF PC
 ‘Those few showed us few the coconut.’ (F221)

An important fact to notice about the distribution of the paucal suffix is that it is only used when it has an overt *associate*, i.e. when there is a prefix marking other features of the same argument. In the cases discussed above (sections 3.2-3) in which a second local argument cannot appear at PF because it cannot be Case-licensed at S-structure, paucal number suffixes are ‘suppressed’ along with plural prefixes (29).

29. paʔkt ʔkul- cpul-(ʔkt)
 1pc 2dl-Acc hit PC
 ‘We few hit you two.’ (F223)

This cooccurrence *requirement* on Nominative-Accusative prefixes and paucal suffixes calls for a distinction between paucal suffix marking and concord suffixes in general in Yimas, since it is certainly not the case that all agreement suffixes in Yimas verbs demand the overt marking of their “associate”.

I suggest that the restriction follows straightforwardly if we assume that the number features of a paucal argument are represented as [+plural, +paucal] (cf. (4)). These features are Case-licensed as a single bundle in the syntax, together with the person features of the argument. They are then spelled-out by two separate vocabulary items, due to the absence of a single vocabulary item to spell out all of the features of the bundle¹⁷. If the failure of certain local arguments to be marked on the verb is due to a failure of syntactic Case licensing, and all features of an argument are Case licensed together, it will never be the case that just the suffix feature [+paucal] is licensed to appear at PF, and the prefix features [+1, +plural] are not, nor vice versa.

There are, however, situations in which all of the ϕ -features of a local argument with paucal number *can* be spelled-out by a single affix. These are precisely the situations where local arguments behave like 3rd person arguments, and are marked by *agreement* affixes. There is an Absolutive paucal prefix *paʔkra-*,

¹⁷ This entails a theory of terminal node splitting which may be driven by the structure of the vocabulary, in line with Noyer (1992), and contra Halle & Marantz (1992).

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which is used for 1st and 2nd person arguments alike. When this prefix is used the paucal suffix *-~kt* optionally appears¹⁸.

30. pa~kra- wa-r -(~kt)
 1/2pc-Abs go PERF PC
 ‘We/you few went.’ (F218)

4.1.2 Modal Inflection & Number Suffixes

Consider now the number suffixes which appear when the negative prefix *ta-* is prefixed to the verbal complex. As a preliminary generalization, the prefix which would otherwise appear *leftmost* in the verbal complex is deleted, and its number is marked by a suffix (31-32). (For 3rd person arguments this suffix is the nominal inflection for the noun class of the argument, cf. Foley, chapter 4)

31. a. tpuk **ku-** ka- am-wat
 sago-pancake-X-sg X-sg-Abs 1sg-Nom eat HAB
 ‘I usually eat sago.’
- b. tpuk ta- ka- am-war **-u~**
 sago-pancake-X-sg NEG 1sg-Nom eat HAB X-sg
 ‘I don’t usually eat sago.’
32. a. **pu-** ~a- tay
 3pl-Abs 1sg-Acc see
 ‘They saw me.’
- b. ta- ~a- tay -c **-um**
 NEG 1sg-Acc see PERF PL
 ‘They didn’t see me.’

Appealing as it may seem at first sight, it is probably incorrect to *directly* correlate the ‘prefix suppression’ effect of modal prefixes seen here with the case alternations triggered by modal prefixes and discussed in Section 3 above. There are two reasons for this. First, the two effects are dissociated - all modal prefixes undo the *Absolutive first* generalization, but only *ta-* (negative) and *ant-* (likely) trigger deletion of the leftmost agreement affix. Second, as illustrated by (32b), the deletion effect seems to involve more than just the ‘usurping’ of one particular position in the word, since it can involve the suppression of Ergative affixes as well as Absolutive affixes, and I have assumed these to not occupy any specific ‘position’ in the verbal complex. A further effect which is associated only with the negative prefix *ta-*¹⁹. Compare the table below.

¹⁸ The optional appearance of this suffix is not predicted by the analysis presented.

¹⁹ This idiosyncrasy of *ta-* is that it doesn’t induce the full deletion of the highest agreement affix. Rather, in a number of environments the 3rd person affix which would

	Blocks <i>First</i>	<i>Abs</i> Suppresses Leftmost Affix	Number Suffixes for...	Neutralized 3rd Person <i>pu-</i>
NEG - <i>ta-</i>	Yes	Abs, Erg	Abs, Erg, Nom, Acc	Yes (limited)
POT - <i>ant-</i>	Yes	Abs, Erg	Abs, Erg, Nom, Acc	-
LIK - <i>ka-</i>	Yes	-	-	-

As an alternative, I suggest that it is the presence of the number suffix that leads to the suppression of Absolutive and Ergative markers. I assume that it is just a lexical property of the heads NEG and POT that they contain a number-agreement feature. This agrees with the syntactically highest number feature in the verbal complex. Assuming that the licensing of agreement features involves some kind of ‘checking’ in the Yimas verb, entailing at most one spell-out of agreement with any given feature²⁰, the number agreement feature of NEG and POT prevents further spell-out of the next highest number agreement feature. In the absence of vocabulary items specified for all *but* the number features of an argument, functional heads agreeing with specifier *pros* cannot be spelled-out. This derives the ‘leftmost affix suppression’ effect.

An important exception to the generalization that a number concord suffix “suppresses” its associated prefix is found when the concord suffix agrees with a *Nominative* or *Accusative* prefix. The result of this is that the number of certain local arguments may be doubly marked in modally inflected verbs. (33a) shows a Nominative intransitive subject and (33b) an Accusative transitive object, each with an associated concord suffix.

33. a. ta- **ˀkra-** wa -r **-m**
 NEG 1dl-*Nom* go PERF DL
 ‘We two didn’t go.’
- b. ta- **ˀkul-** cpul-c **-rm**
 NEG 2dl-*Acc* hit PERF DL
 ‘I didn’t hit you two.’

be deleted in the presence of *ant-* is ‘neutralized’ to the plural absolutive form *pu-*. This neutralized form is not always used, however. It is used when (i) the neutralized feature bundle is an intransitive subject, (ii) in negated transitive verbs *pu-* is used when the *following* agreement marker is phonologically ambiguous for person-number features. This is one of a number of effects of homophony of affixes in Yimas, which I will not address here.

²⁰ I do not assume this to be a universal mechanism. Concord processes which entail multiple realization of agreement with a given feature are well attested. The option ‘+/- unique spell-out’ may presumably be selected by individual languages for individual constructions (cf. Noyer 1992).

transitive subjects may not. 1st person subjects either fail to be marked at all by verbal inflection (35a), or they are marked by a portmanteau prefix, if the second person object is either singular or paucal (35b-c)²².

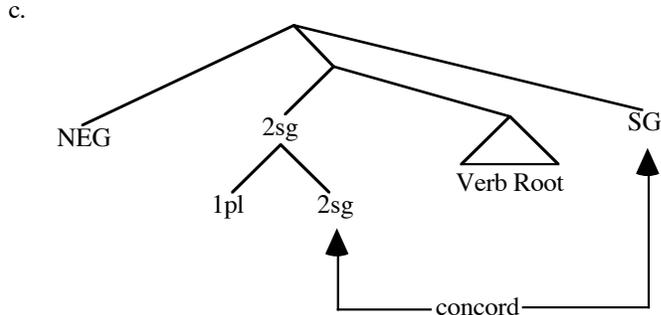
35. a. kapa kul- cay
1-dl 2pl-Acc see
'We two saw you all.' (F207)
- b. kapa **kampan-** tay
1-dl 1ag=2sg-obj see
'We two saw you.' (F207)
- c. kapa **pa[~]kul-** cpul-c -**kt**
1-dl 1ag=2pc-obj hit PERF PC
'We two hit you few.' (F222)

Notice that even when a portmanteau prefix marks the first person agent, no number distinctions are made for this argument. These can only be supplied by independent pronouns, such as *kapa-* (1-dual) in the examples in (35). *Concord suffixes* also fail to mark the number of 1st person agents in these clauses, regardless of the number of the 2nd person object and the use of a portmanteau or not. (36a) repeats (33b), and shows that concord suffixes agree with the overtly marked *object*, rather than the unmarked *subject*. This example also contrasts with (34b), in which the 2nd person subject is not overtly marked, but shows concord with the suffix, showing that although both the 1st and 2nd person subjects are unmarked in the surface form, they are distinguished at some level of representation, probably the input to 'Morphological Structure'. (36b) shows that even when a portmanteau is used, the concord suffix agrees with the 2nd person theme rather than the 1st person agent. This is, in fact, expected, if the 1st person subject pronoun *adjoins* to the 2nd person object pronoun, resulting in a structure like (36c).

36. a. ta- **ktul-** cpul-c -**rm**
NEG 2dl-Acc hit PERF DL
'I didn't hit you two.'
- b. ipa ta- mpan- tpul
1-pl NEG 1ag=2sg-obj hit
'We didn't hit you.' (F259)

²² 1st person arguments are *not* uniformly excluded from the ergative-absolutive Case marking system in Yimas. Section 2.3 showed that 1st person *intransitive* subjects are marked by absolutive prefixes in the absence of modal inflection.

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Although *concord* suffixes can never agree with 1st person subjects in this type of clause, due to their structural position, the number of these arguments can be marked by *paucal* suffixes, provided the 1st person argument is marked in a portmanteau morpheme (37a), i.e. if the 2nd person object has either singular or paucal number. If, on the other hand, the 2nd person object has dual or plural number, and no portmanteau is available, just the 2nd person Accusative is overtly spelled-out, and a paucal suffix *cannot* mark the 1st person subject (37b).

37. a. ura[~] pa[~]kt k- **mpan-** tkam-r -[~]kt
 coconut-VIsg 1pc VIsg-Abs 1ag=2sg-goal show PERF PC
 ‘We few showed you a coconut.’ (F223)
- b. **pa[~]kt** [~]kul- cpul
 1pc 2dl-Acc hit
 ‘We few hit you two.’ (F223)

We saw that 1st person subjects could not be marked by concord suffixes, due to the hierarchical condition on agreement; but as claimed in section 4.1.1, the only condition on the spell-out of paucal suffixes is the Case licensing of the whole argument feature bundle. 1st person subjects ‘exceptionally’ satisfy this requirement when they adjoin to incorporated 2nd person objects, and are spelled-out by the portmanteaus *kampan-* and *pa[~]kul-*, which is why they may be marked by paucal suffixes in examples like (37a). The contrast between (37a) and (37b) presumably results from the lack of ‘exceptional’ Case licensing of 1st person arguments when no portmanteau is available.

4.1.4 A Note on the Structure of Ditransitives

Using the generalization from section 4.1.2 that concord suffixes agree with the *highest* terminal node in the complex verbal head, we can test the relative height of different affixes in ditransitive constructions. (5b) and (6b) are repeated as (38a-b) respectively. Agreement with 3rd person goal arguments is marked as a *suffix* to the verb, which is structurally higher than Nominative-Accusative

prefixes, as the bracketing in (38a) shows. The fact that number concord is with the Absolutive *theme* in (38b), however, suggests that the Dative suffixes are structurally lower than Absolutive prefixes.

38. a. ura[~] k- kay- tkam -r -[~]kan-**akn**
 coconut-VI-sg VI-sg-Abs [1pl-Nom show PERF PC] 3sg-D
 ‘We few showed him the coconut.’
- b. ura[~] ta- ka- tkam -r -ak -[~]
 coconut-VI-sg NEG [1sg-Nom show PERF 3sg-D] VI-sg
 ‘I didn’t show him the coconut.’

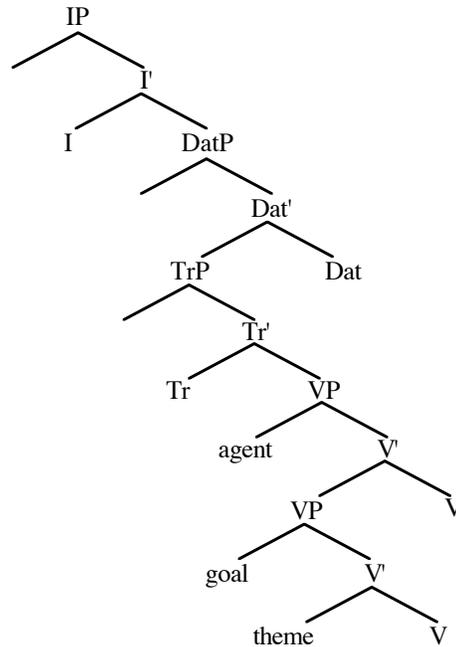
Since the 3rd person theme argument of a ditransitive verb is always marked by the highest agreement affix in the verbal complex, the concord test used in (38b) is not available to distinguish the relative height of Dative and Ergative affixes.

Now recall what we have seen above, that among *local* arguments, both goals and themes take priority over agents for the incorporation into V^0 : I argued that this reflected the relative positions of these arguments inside VP in D-structure. Since clauses with both a local goal and a local theme argument are impossible in the language, it is not possible to test the relative height of goals and themes in D-structure by this test.

Although neither test offers a complete ‘ranking’ of agents, themes, and goals, we can combine the results of each to achieve a full ordering. It was pointed out in section 3.4 that the θ -roles which are marked by *higher* affixes in the Ergative-Absolutive system are also those which have priority for incorporation when local. Therefore, the observations that (i) agreement markers for themes are higher than those for goals when the arguments are 3rd person, and (ii) goals have priority over agents for incorporation when both are local, can be combined to give a complete clause structure for ditransitive clauses, as in (39), in which goal arguments occur between agents and themes at D-structure, and an extra functional projection which assigns Dative Case is between the Absolutive assigning projection IP and the Ergative assigning projection TrP. The structure of the VP assumed follows Marantz (1992); the location of a Dative assigning projection between the Absolutive and Ergative projections is similar to Cheng & Demirdash’s (1990) proposal for Basque²³.

²³ My structure differs from Cheng & Demirdash in the relative ordering of the ergative and absolutive assigning projections.

39.



4.2 Extraction: Relatives and Questions

So far I have only considered processes of head movement and A-movement in Yimas. This section focuses on A-bar movement in two constructions in Yimas: *wh*-questions and relative clauses. I will be assuming that both of these constructions involve at least the movement of an argument from an A-position to an operator position such as [Spec,CP].

4.2.1 Forms

Finite relative clauses in Yimas are morphologically very similar to the modally inflected verbs discussed in section 4.1.2²⁴. A fully inflected verb is circumfixed by (i) the prefix *m-*, which I will refer to as *Comp*²⁵ and (ii) a number/noun class concord suffix, as also found on adjectives and modally inflected verbs. The concord suffix agrees with the relativized argument, and with the ‘head’ of the relative clause (40a). The relative positioning of the head of the relative clause and the relative clause itself is free. The head most commonly precedes the relative clause, but it may follow it, and need not even

²⁴ For discussion of *non-finite* relative clause structures in Yimas (which do not involve any agreement marking) the reader is referred to Foley pp. 403-407.

²⁵ More accurately, this prefix is the Near Distal prefix, as in *m-n/Nr Dist - I-Sg*, ‘That near you’.

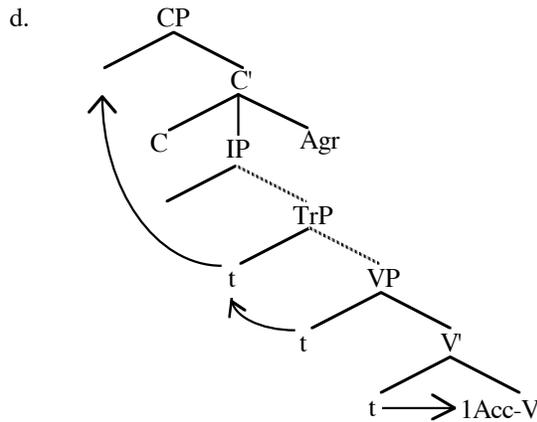
be adjacent to it (40b). Agreement prefixes on the verb mark all of the arguments of the verb *except* the relativized argument, which is never marked by a normal agreement prefix.

In the relative clauses in (40a-b) there is no overt material other than the inflected verbal complex. As usual, I assume that this word spells out a complex syntactic head, C^0 in this instance. Relative clauses may also contain independent nominals (40c), which are freely ordered with respect to the verbal complex. (40d) shows schematically the structure I assume for a relative clause like (40a).

40. a. kray~ [m- ~a- tay-nc ~]
 frog-VI-sg Comp 1sg-Acc see PRES VI-sg
 ‘the frog watching me’ (F413)

b. napntuk tu-k kawk [m-kay-μana~tmi-aw~kcpa-ntuk-u~]
 chant-X-sg X-sg-Prox COP-X-sg [Comp 1pl-Nom DUR say bathe]
 RmPast X-sg
 ‘It was this chant which we sang while bathing.’ (F420)

c. panmal patn na- ka~a-r -akn
 man-I-sg betelnut-V-sg V-sg-Abs give PERF 3sg(Dat)
 [manpa m- tu -t -Ø]
 crocodile-III-sg Comp kill PERF 3-sg
 ‘I gave betelnut to the man who killed the crocodile.’ (F422)



I assume that the presence of *Comp* and the concord suffix is sufficient to satisfy the YEPP. This means that there is no requirement that inflected verbs in relativization structures have an Absolutive affix.

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In contrast to relativization structures, which are all formed in a very similar way, *wh*-questions assume a range of different forms, depending on which argument is being questioned.

Wh-questions in which the object is the questioned argument have what I will be treating as the unmarked form. This construction looks just like a normal declarative clause, except that one of the independent nominals is a *wh*-expression (eg. *nawn*, ‘who-sg’), and the verbal complex contains no prefixal marking of the questioned argument (41).

41. nawn pu- tpul
 who-sg 3sg-Abs hit
 ‘Who did they hit?’ (F431)

A second form which *wh*-questions adopt looks very much like the relativization constructions already seen. The *wh*-expression plays the role of the head of the relative clause, agreeing with C^0 , which contains the verbal complex. The verbal complex lacks a pronominal prefix for the questioned argument (42). I assume that this type of question is a *reduced cleft* (cf. McCloskey 1979, Cheng 1991)²⁶.

42. a. wara m- na- tmuk-nt -ra
 what Comp DEF fall PRES V-pl
 ‘What is falling down?’ (F430)
- b. [CP [DP wara_i]] [CP OP_i m-na-tmuk-nt-ra [IP t_i]]

The third form of *wh*-question is just like the first type, in that the verb is not circumfixed by a relative clause complementizer. The difference is that all arguments of the clause are marked by the normal agreement prefixes, including the extracted argument (43).

43. nawn pu- n- tpul
 who-sg 3pl-Abs 3sg-Erg hit
 ‘Who hit them?’ (F431)

Sections 4.2.2 and 4.2.5 attempt to explain the contrasts between relative clauses and questions on the one hand, and between the different forms of *wh*-questions. A question which it is important to answer in what follows is: do extraction facts show evidence of movement *via* the Case positions already discussed at length?

4.2.2 Subject-Object Asymmetries in *wh*-Questions

²⁶ In all of the cases discussed, there is no optionality as to which question form is used. i.e., if a reduced cleft is used, then *only* a reduced cleft may be used.

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- b. nawn pu- n- tpul
 who-sg 3pl-Abs 3sg-Erg hit
 ‘Who hit them?’ (F431)
46. a. Elias [m- kra- pay- pra- kia- ntuk -~kt mota-nan]
 Elias Comp 1pl-Acc carry-toward Near RmPst PC 3Sg motor-obl
 ‘Elias, who brought us here with his outboard motor.’ (F414)
- b. namarawt [narma~ m-tpul]
 person-Ipl woman-IIsg Comp hit 3sg(null)
 ‘The person who hit the woman.’ (F414)

The (a) examples show that when a 3rd person subject is extracted from a clause with a *local* object, a relative clause structure must be used. The reasons for this were discussed in section 4.2.2 above. The use of agreement prefixes in these constructions conforms to the generalizations which hold of almost all extraction constructions in Yimas:

- i. The extracted argument is not marked by an agreement prefix.
- ii. Non-extracted arguments are marked by normal agreement prefixes.

When a subject is extracted from a clause with a *non-local* object, however, one of these generalizations is violated: in the *wh*-question (45b) all arguments of the verb are marked by prefixes, in violation of (i); in the relative clause (46b) neither the subject nor the object is marked by a prefix, in violation of (ii).

Assuming that the patterns of agreement shown in (45b-46b) are indeed deviations from the normal pattern, forced by the unavailability of normal extraction mechanisms, the question arises of why 3rd person subjects should extract more easily when there is a 1st or 2nd person object than when there is a 3rd person object? This person-based contrast is not expected if A-bar movement originates in VP-internal θ -positions, since the distribution of arguments to θ -positions does not distinguish between local and non-local arguments. It is less surprising, however, if we assume that A-bar movement originates in *Case* positions. If a transitive 3rd person subject first moves to [Spec,TrP] for *Case* reasons, and subsequently moves to [Spec,CP], this second step crosses [Spec,IP]. If the object argument is 3rd person, it will be occupying [Spec, IP] and triggering Absolutive agreement. If, on the other hand, there is a 1st or 2nd person object, [Spec,IP] will be empty, given the account developed here so far.

Apart from the examples in (45b-46b), all of the examples of extraction considered so far have involved extraction of the argument in the *highest filled A-position* of the clause. I will assume that the ‘exceptional’ forms in (45b-46b)

reflect responses to the presence of filled Case positions intervening between the source and target of extraction.

Section 4.2.5 below discusses the differing responses of relative clauses and *wh*-questions to extraction across filled Case positions, but those details should not obscure the main point of this section: where extraction in Yimas is sensitive to the non-extracted arguments of the clause, it is sensitive to the *Case* positions of the non-extracted arguments, rather than to θ -positions. Moreover, the assignment of local and non-local arguments to different Case positions, and the relative height of structural Case positions argued for in section 3 are supported by the extraction data.

4.2.4 The Status of [Spec,IP]

Section 4.2.3 claimed that extraction of a subject from the ‘Ergative’ position [Spec,TrP] over a 3rd person object in [Spec,IP] is an impossible operation in Yimas, probably due to some kind of ‘intervention’ effect. The precise nature of this violation, and the ways in which it is avoided, were passed over. This subsection aims to clarify the first of these issues.

To begin with, it would be incorrect to generalize that filled [Spec,IP] always creates an ‘island’ for extraction, for *wh*-questions involving *object* extraction have subjects marked by Absolutive prefixes (47):

47. a. *naw*~kt pu- tpul?
 who-*pc* 3pl-Abs hit
 ‘Who did they hit?’ (F432)
- b. *wara* ipa- na- am-n?
 what 1pl-Abs DEF eat PRES
 ‘What are we going to eat?’ (F432)

That subjects should be marked *Absolutive* in clauses with 3rd person objects is something we have not encountered so far. The reason for this pattern of marking is not difficult to find, however: if the extracted objects are not marked by agreement prefixes, then only the subjects are able to satisfy the YEPP. Assuming that *wh*-movement proceeds via Case positions, the extracted object in (47a-b) presumably moves first to [Spec,TrP], and from there to [Spec,CP].

What, then, distinguishes the examples in (47) from the situation we assumed to be impossible?

Notice that in the *well-formed* examples in (47), we are assuming that extraction crosses a *subject* in [Spec,IP], whereas in the presumed impossible examples, extraction crosses an *object* in [Spec,IP].

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I suggest that this generalization be accounted for in terms of the ‘mixed’ status of [Spec,IP] as an A-position or an A-bar position, along the lines suggested by Diesing (1990) for Yiddish. Diesing proposes that [Spec,IP] be considered an A-position when it is occupied by a subject, and an A-bar position when it is occupied by any other argument. Diesing proposes that [Spec,IP] is mixed, in order to account for the fact that it has properties of a focus position when occupied by a non-subject (eg. pronouns must be stressed), but can be treated as a ‘neutral’ position when filled by a subject. A natural extension of Diesing’s approach predicts that [Spec,IP] should constitute an island for A-bar movement when it is filled by a non-subject, but not when it is filled by a subject²⁷.

If we assume that [Spec,IP] has the same ‘mixed’ status in Yimas as it has in Yiddish, then we correctly predict that A-bar movement across a *subject* in [Spec,IP] should be possible, since the subject is in an A-position, but that A-bar movement across an *object* in [Spec,IP] should be impossible, because it crosses an A-bar position, violating *Relativized Minimality* (Rizzi 1990).

This account of the contrast between (47) and (43) has a couple of interesting consequences. First, it appears that [Spec,IP] is more topic-like than was initially claimed in section 2.3: the factors determining which argument of a clause be marked Absolutive are not so straightforward as was suggested there. However, the claim made above still holds, that [Spec,IP] in Yimas is unlike the sentence initial position in V2 languages like German, which can be filled by any argument of a clause.

Second, that [Spec,IP] should behave like an A-position when filled by a subject, and like an A-bar position when filled by an object, may come as a surprise. Diesing claimed that [Spec,IP] in Yiddish is an A-position, and therefore ‘neutral’ with respect to focus structure, when it is filled by a subject, the unmarked occupant of this position. At an intuitive level, then, we might expect that in an Ergative system like Yimas, [Spec,IP] will be a ‘neutral’ A-position when filled by a 3rd person object, the unmarked occupant of that position in normal declarative clauses. But here intuitions fail, and the facts are quite the opposite. Whether a position is given a neutral interpretation and has A-position properties or not appears to be independent of the way the position is most commonly used in a language.

4.2.5 Questions vs. Relatives

In this section I briefly sketch an account of why relative clauses and *wh*-questions adopt different strategies for the avoidance of the *Relativized Minimality* violation discussed in 4.2.4. Recalling the facts from above, when a subject is *relativized* in a clause with a 3rd person object, neither the subject nor

²⁷ Rizzi (1991) makes an essentially identical proposal with respect to [Spec,CP], which he assumes to have the same ‘mixed’ status Diesing attributes to [Spec,IP].

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the object are marked by normal agreement prefixes (48a); when a subject is *questioned* in a similar clause, however, both the subject and the object are marked by agreement prefixes (48b).

YEPP are filtered out, we find that transitive subjects switch to being marked by Ergative affixes, whereas intransitive subjects and transitive objects stubbornly remain marked by Absolutive affixes. This is the core Ergative-Absolutive paradigm.

49. a. a- **pu-** tmuk-r -um *3rd person intransitive subject*
 POT **3pl-Abs** fall PERF PL
 ‘They almost fell down.’ (F197)
- b. ta- **pu-** n- tpul-c -um *3rd person transitive object*
 NEG **3pl-Abs** 2sg-Nom hit PERF PL
 ‘You didn’t hit them.’ (F256)
- c. na- **mpu-** tay *3rd person transitive subject*
 3sg-Abs **3pl-Erg** see
 ‘They saw him.’ (F201)

But in section 4.2 it was shown that transitive and intransitive subjects behave alike with respect to *wh*-questions. When either of these arguments occupies the highest filled A-position and is extracted to [Spec,CP] a reduced cleft form must be used. I suggested that the use of the cleft strategy follows from the need to satisfy the YEPP in the absence of an argument in [Spec,IP]. I am assuming at least, then, that intransitive subjects do not extract from the Case position which they are normally occupy in non-extraction contexts. This is the first ‘subject property’ of 3rd person agreement that we have seen in Yimas.

50. a. nawn m- na- ya -n? *intransitive subject*
 who-sg Comp DEF come PRES
 ‘Who is coming?’ (F430)
- b. nawn m- kul- cpul-um *transitive subject*
 who-pl Comp 2pl-Acc hit PL
 ‘Who hit you all?’ (F431)
- c. nawn impa- tpul *transitive object*
 who-sg 3sg-Abs hit
 ‘Who did he hit?’ (F431)

A further subject property is found in the patterns of concord with *singular* 3rd person arguments. Section 4.1.2 showed that the concord suffixes associated with modal prefixes and relative clause complementizers can mark the number of both Absolutive (51a) and Ergative (51b) arguments.

51. a. ta- Ø- mpu- tpul-c -rm
 NEG Ø_{3dl}-Abs 3pl-Erg hit PERF DL
 ‘They didn’t hit those two.’ (F255)

(Murasugi 1992a,b)²⁹. All of these accounts of subject properties in Ergative systems share the assumption that subjects form a natural class in *non-Case* positions.

If this is the only possible explanation of subject properties, then we face a serious problem with the Yimas data. For notice that the accounts of both number agreement patterns in modally inflected verbs, and of extraction phenomena crucially relied on the distribution of arguments in *Case*-positions. The ranking of arguments for marking by concord suffixes is: 3rd person object > 3rd person subject > local (Nominative) subject, i.e. it follows the hierarchical order of *Case* positions in the Yimas clause. We claimed that extraction originated in *Case*-positions, due to the sensitivity of subject extraction to the person (and hence *Case*-position) of the object.

To summarize the dilemma: it appears that Yimas has phenomena which show *both* subject properties *and* sensitivity to *Case*-positions, in a *Case* system which is unmistakably Ergative (14). This problem is not obviously resolvable by recourse to D-structure argument positions.

In order to handle the problem, we must first attempt to answer the question of what is special about the environments where subject properties are and are not found. I suggest that the crucial factor which unifies the instances where subject properties are found with non-local arguments is whether the intransitive subject is marked by an overt prefix or not. When intransitive subjects are *overtly* marked as a prefix, they pattern with transitive objects (14); but when they are not overtly marked by prefixes, they pattern with transitive subjects (50, 52)³⁰.

The contrast between overt and non-overt marking of features has already figured large in this paper. The *Generalized Visibility* condition places different requirements on elements, depending on whether they are overtly marked or not: specifically, overtly spelled-out elements must satisfy the *Case Filter* at S-structure, whereas phonologically null elements do not have to satisfy the *Case Filter* until LF, and then only if they are semantically interpreted. If an argument is not marked by an agreement prefix, then we may assume that it is not subject to the *Case Filter* at S-structure³¹.

²⁹ Bobaljik (1993) suggests an alternative which does *not* tie subject properties to D-structure positions. For him subjects are distinguished by being able to occupy a functional specifier position ([Spec,TP]) *between* his two structural *Case* assigning positions. This account also differs from what I will suggest here, that subject properties are associated with *Case* positions.

³⁰ For the purposes of this discussion, I will be assuming that the presence of the neutralized 3rd person prefix *pu-* does not count as overt prefixal marking of an argument.

³¹ That an argument is not subject to the *Case Filter* at S-structure should not be taken as entailing that it is not required to move to a *Case* position at S-structure. For example,

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Recall in addition what factors contributed to creating the Ergative-Absolutive agreement system of Yimas. The *little pro theorem* together with the functional definition of shortest movement created a ‘nested paths’ pattern of A-movement among 3rd person arguments. But although this is the pattern which Murasugi claims to be *characteristic* of Ergative systems, it is independent of what actually gives an Ergative system its core ‘Ergative’ property: the treatment of intransitive subjects and transitive objects as a natural class. This property depends on the independent specification of which Case is assigned when only one structural Case is required, i.e. on which Case is ‘active’. This choice lends itself straightforwardly to statement as a binary parameter, formulated in terms of which Case is ‘obligatorily assigned’ (de Rijk 1972; Levin & Massam 1985; Bobaljik 1992,1993; Laka, this volume) or which Case features are ‘strong’ (Murasugi 1992a,b)³². But if we consider such conditions as conditions only on S-structure Case assignment, then their effects are predicted to disappear in instances where only LF Case assignment is relevant.

Applying this now to Yimas. Some correlate of a setting of the ‘Obligatory Case Parameter’ applies to S-structure in Yimas, forcing intransitive subjects to agree with the same head as transitive objects. But this requirement only has the effect of ‘overriding’ the demands of *shortest movement* at S-structure. If an argument has to move *to* or *via* a Case-position at S-structure, but neither the argument itself nor the functional head overtly realizes features of the argument overtly, idiosyncratic conditions on Case assignment at S-structure do not apply, and movement to the Case position is merely subject to general conditions on movement. In fact, conditions on shortest movement now demand that intransitive subjects satisfy the Case Filter (at LF) in the lower structural Case position [Spec,TrP], just like transitive subjects. This, I suggest, is how intransitive subjects get to show ‘subject properties’ when they are not marked by overt prefixes. On the assumption that something like the Obligatory Case Parameter is irrelevant at LF, structural Case marking in Yimas is expected to revert to a Nominative-Accusative system at that level.

5. Conclusion

wh-movement will need to proceed *via* a Case position, if the A-bar chain is to satisfy the Case Filter at LF.

³² Notice that it is probably not appropriate to formulate the requirement in terms of ‘obligatory’ Case assignment in a split ergative language such as Yimas: provided that YEPP effects are controlled for, it is quite possible for the arguments of a transitive clause to be marked *ergative* and *accusative*. For Yimas, at least, it seems that the association of intransitive subjects with absolutive case marking is an irreducible property. It is tempting to try to relate it to other properties of the absolutive assigning head, such as the YEPP, but it is not clear to me how such a unification could be implemented.

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This paper has argued that Yimas is a language in which ‘pronominal’ agreement affixes are a mixture of *incorporated arguments* and *agreement heads*. The environments where the different types of affixes appear were shown to follow from a generalized version of Case Theory, applying to both S-structure and LF. I suggested that there are in fact *two* ‘ergative splits’ in Yimas. The first distinguishes local and non-local arguments at S-structure, and follows from restrictions on Noun Incorporation. The second distinguishes S-structure from LF, and accounts for a set of ‘subject properties’ not straightforwardly attributable to semantics or D-structure positions.

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References

- Anderson, S.R. (1976) On the Notion of Subject in Ergative Languages. In: C.N. Li (ed.) *Subject and Topic*. Academic Press: New York.
- Baker, M. (1988) *Incorporation*. Chicago: University of Chicago Press.
- (1991) On some subject-object non-asymmetries in Mohawk. *Natural Language and Linguistic Theory* 9, 537-76.
- (1992) *The Polysynthesis Parameter*. ms, McGill University.
- & K. Hale (1990) Relativized Minimality and Pronoun Incorporation. *Linguistic Inquiry* 21, 289-297.
- Belletti, A. (1988) The Case of Unaccusatives. *Linguistic Inquiry* 19, 1-34.
- den Besten, H. (1983) On the interaction of root transformations and lexical deletive rules. In: W. Abraham (ed.) *On the Formal Syntax of the Westgermania*. Amsterdam.
- Bittner, M. (1992) *Ergativity, Binding and Scope*. ms. Rutgers University.
- Bobaljik, J.D. (1992) *Ergativity, Economy, and the Extended Projection Principle*. ms. MIT.
- (1993) *Ergativity and Ergative Unergatives*. ms. MIT, to appear in MITWPL #19.
- Branigan, P. (1992) *Subjects and Complementizers*. PhD Thesis, MIT. Distributed by MITWPL.
- Cheng, L.L.-S. (1991) *On the Typology of Wh-Questions*. PhD Thesis, MIT. Distributed by MITWPL.
- & H.K. Demirdash (1990) *External Arguments in Basque*. Proceedings of WCCFL IX.
- Chomsky, N. (1982) *Some Concepts and Consequences of the Theory of Government and Binding*. MIT Press, Cambridge, MA.
- (1986) *Knowledge of Language: Its Nature, Origin and Use*. Praeger: New York.
- (1991) Some Notes on Economy of Derivation and Representation. In: R. Freidin (ed.) *Principles and Parameters in Comparative Grammar*. MIT Press: Cambridge, MA.
- (1992) *A Minimalist Program for Linguistic Theory*. MIT Occasional Papers in Linguistics 1. MITWPL: Cambridge, MA.
- Diesing, M. (1990) Verb Movement and the Subject Position in Yiddish. *Natural Language and Linguistic Theory* 8, 41-79.
- Foley, W. (1991) *The Yimas Language of New Guinea*. Stanford University Press: Stanford, CA.
- Halle, M & A. Marantz (1992) *Distributed Morphology and the Pieces of Inflection*. ms, MIT.
- Harris, J.W. (1991) The Exponence of Gender in Spanish. *Linguistic Inquiry* 22, 27-62.
- Hockett, C.F. (1966) What Algonquian is really like. *International Journal of American Linguistics*, 32, 59-73.
- Huang, C.T.J. (1982) *Logical Relations in Chinese and the Theory of Grammar*. PhD Thesis, MIT. Distributed by MITWPL.
- Humboldt, W. (1836) *Über die Verschiedenheit des Menschlichen Sprachbaus und Ihren Einfluss Auf die Geistige Entwicklung des Menschengeschlechts*. Berlin: Königliche Akademie der Wissenschaften.
- Jelinek, E. (1984) Empty Categories, Case and Configurationality. *Natural Language and Linguistic Theory* 2, 39-76.

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- Jelinek, E. (1989) *Argument type in Athabaskan: evidence from noun incorporation*. ms, University of Arizona.
- Laka, I. (1993, this volume) Unergatives that assign Ergative, Unaccusatives that assign Accusative.
- Lasnik, H. & R. Freidin (1981) Core Grammar, Case Theory and Markedness. In A. Belletti, L. Brandi, & L. Rizzi (eds.), *Theory of Markedness in Generative Grammar*. Scuola Normale, Pisa.
- Levin, J. & D. Massam (1985) Surface Ergativity: Case/Theta Relations Reexamined. In: S. Berman (ed.) *Proceedings of NELS XV*. GLSA, Amherst.
- McCloskey, J. (1979) *Transformational Syntax and Model Theoretic Semantics: A Case Study in Modern Irish*. Dordrecht: Reidel.
- Marantz, A. (1988) Clitics and Morphological Merger. In: Hammond & Noonan (eds.) *Theoretical Morphology*. Academic Press.
- (1992) Implications of Asymmetries in Double-Object Constructions. Forthcoming in: S. Mchombo (ed.) *Theoretical Issues in Bantu Syntax*. CSLI, Stanford.
- Murasugi, K.G. (1992a) *Crossing and Nested Paths: NP movement in Accusative and Ergative Languages*. PhD Thesis, MIT. Distributed by MITWPL.
- (1992b) *Crossing and Nested Paths: NP movement in Accusative and Ergative Languages*. ms, Memorial University & McGill University.
- Noyer, R.R. (1992) *Features, Positions and Affixes in Autonomous Morphological Structure*. PhD Thesis, MIT. Distributed by MITWPL.
- Pranka, P.M. (1983) *Syntax and Word Formation*. PhD Thesis, MIT.
- Reinhart, T. (1983) *Anaphora and Semantic Interpretation*. University of Chicago Press: Chicago.
- Rijk, R. (1972) *Studies in Basque Syntax*. PhD Thesis, MIT.
- Rizzi, L. (1990) *Relativized Minimality*. MIT Press: Cambridge, MA.
- (1991, October) Talk presented at the MIT Linguistics Colloquium.
- Rouveret, A. & J.-R. Vergnaud (1980) Specifying Reference to the Subject. *Linguistic Inquiry* 11, 97-202.
- Shlonsky, U. (1987) *Null and Displaced Subjects*. PhD Thesis, MIT. Distributed by MITWPL.

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