# Aspect, Agreement and Measure Phrases in Scottish Gaelic

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## 1 Introduction

The goal of this paper[1] is to defend an extended version of the Visibility Criterion (Chomsky 1986) whereby the link between theta-theory and Case theory is generalised. We will argue that the Case theoretic requirement in the formulation of Visibility should be replaced with a requirement of coindexation with a functional head; the relevant functional heads being Agreement (Agr) and Tense (T). We will argue that Tense involves two functional heads which are composed into a single chain via the mechanism of selection. This allows the incorporation of aspectual information into the licensing condition. By aspectual we mean the indirect relationship between the utterance time and the time of the event denoted by the verb.

Scottish Gaelic (SG) is particularly relevant to both the extended version of Visibility and to the composition of tense information into a single chain because of two factors: firstly, coindexation with Agr in SG correlates with word order and secondly composition of tense information is transparently reflected in the morphological form of tense and aspect particles. Given these two factors, the extended version of Visibility predicts that certain word orders in SG will be forced or ruled out. This phenomenon is particularly clear with respect to the syntax of measure phrases in the language, which we show to be sensitive to aspectual information.

## 2 Generalised Visibility

Typically argument NPs have to be licensed in two ways: they must be licensed by theta theory and they must be licensed by Case. The link between these is made explicit in the Visibility Condition, credited to Aoun by Chomsky 1986:

(1) **Visibility:**
An NP chain can be interpreted as an argument iff it has structural Case.

This condition can be read as a licensing condition, given that an NP chain must be licensed at LF in order to receive an interpretation:

(2) **Visibility:** (revised)
An NP chain can only be interpreted if it is theta-theory licensed and Case-theory licensed.

Quasi-Arguments (see Chomsky 1981) generally seem to engender problems for this conjunctive formulation of Visibility, since they are theta-marked but don't seem to need Case. We can illustrate this with the behaviour of Measure Phrases. These appear to be licensed by argument structure, since they are obligatory:

(3) a. Anson weighs 70 kilos
b. The conference lasted two weeks
c. The book cost a dollar

(4) a. *Anson weighs
b. *The conference lasted
c. *The book cost

and they are NPs in as much as they are projections of N. Note, however, that they seem to be Case-resistant, so they can never be marked by the inserted case-marking preposition *of* in gerundive nominals. Thus compare:

(5) Anson's constant devouring of cakes

(6) *Anson's constant weighing of 70 kilos

Further evidence comes from the behaviour of measure phrases in agreement contexts. Chomsky 1992 argues that Case checking is a reflex of being in a spec-head relationship with an Agreement head. In an earlier paper (Adger 1993) we showed that measure phrases never raise to this position; we review some of this evidence below. Given these facts the question arises as to how measure phrases escape Visibility.

Two options are possible: either they are only theta-licensed, and need no Case licensing to count as legitimate LF objects or they are licensed in some other fashion. The former option involves showing that measure phrases are exceptions to Visibility for some principled reason, or that Visibility is in some way falsified by the behaviour of these elements. The latter option involves generalizing Visibility so that it takes into account other modes of licensing, rather than just Case theory. It is this latter option we will defend here.

Consider the first option. To argue that measure phrases are exceptions to Visibility we could show that they project only to NP rather than DP and provide evidence that abstract Case is assigned only to DPs, reformulating Visibility minimally to take account of this. Measure phrases do in fact only allow a restricted set of determiners, as we show below (see the examples in (36)). However, it would seem theoretically more attractive to allow all nominals to project the full functional structure associated with them and to rule out certain projections to D for independent reasons. Also allowing certain verbs to select NP rather than DP seems to place to great a burden on the theory of selection since it allows selection for functional as well as lexical categories (see Grimshaw 1991 for discussion and for a theory that rules this out in principle).

Discarding this option then, we would like to show that measure phrases are licensed in some other way. We provided an argument to this effect in Adger 1993 where we showed that measure phrases never raise to the specifier of AgrP to receive structural Case. We argued that they are instead unselectively bound by the tense head of the sentence, which also binds the event argument of the verb (Higginbotham 1985). This has empirical support in that it predicts that measure phrases are not extractable from weak islands and cannot occur with quantificational determiners. We review how these predictions follow below.

This argument actually contains a hidden assumption: that is that measure phrases must be licensed in some other way than by Case Theory. It therefore implicitly assumes a disjunctive version of Visibility, along the lines of:

(7) **Visibility:**
An NP chain can only be interpreted if it is theta-theory licensed and either Case-licensed or coindexed with Tense

This formulation of Visibility resolves the problem engendered by measure phrases, but we would like to eliminate the disjunction in the consequent since it undermines the generalisation.

Consider what 'Case-licensed' means. The type of Case we are interested in here is structural. Chomsky 1992 has proposed that structural Case assignment for subjects and objects is unified under Specifier-Head agreement (see Mahajan 1990 for empirical argument to this effect). Essentially the idea is that an NP in the specifier of an agreement head at LF will count as structurally Case licensed. Specifier-Head agreement is a standard coindexation relationship, which allows us to reformulate Visibility as:

(8) **Visibility:**
An NP chain can only be interpreted if it is theta-theory licensed and either coindexed with Agr or coindexed with Tense

We can now eliminate the disjunction in this formulation of Visibility by defining a notion of F-Licensing[2]:

(9) **F-Licensing:**
An NP chain is F-licensed if it is coindexed with a functional head

We then define a generalised version of Visibility as:

(10) **Generalised Visibility:**
An NP chain can only be interpreted if it is theta-theory licensed and F-licensed

So far the motivation for this formulation of Visibility has been to provide a missing step in an argument about the licensing of measure phrases. The rest of this paper is devoted to showing that this condition also explains some peculiar further facts about the licensing of measure phrases.

# 3 Licensing Measure Phrases in Scottish Gaelic

## 3.1 Fronted Object Phrases

Scottish Gaelic is a VSO word order language related to Modern Irish (most closely to the Ulster dialects) spoken by about 80,000 speakers, mainly on the West Coast and Isles of Scotland. We will assume that the underlying order is SVO and that the VSO order is derived via V-raising to T or some higher functional head (see Sproat 1985). We therefore expect to see VO orders where this raising has not taken place; for example in infinitival constructions, or where an auxiliary verb realises tense. This is the case in the progressive construction below:

(11)

| | | | | | |
|---|---|---|---|---|---|
| Tha | mi | a' | bualadh | na | cait |
| be-PRES | I | ASP | hit-VN | det-GEN | cat-GEN |

'I am striking the cat'

Here, an auxiliary appears in the initial tense slot and the theta-role assigning verb is nominalised and occurs as the complement of an aspectual particle *a'*. The complement of the verb occurs postverbally and is marked with the genitive Case when it is definite[3]. However, there are also cases where we find an OV order and where the VO order is ill-formed:

(12) a.

| | | | | | | |
|---|---|---|---|---|---|---|
| Tha | mi | air | an | cat | a | bhualadh |
| be-PRES | I | ASP | the-COM | cat-COM | Prt | close-VN |

'I have struck the cat'

b.

| | | | | | | |
|---|---|---|---|---|---|---|
| *Tha | mi | air | a | bhualadh | an | cat |
| be-PRES | I | ASP | Prt | close-VN | the-COM | cat-COM |

'I have struck the cat'

In these examples the object is obligatorily preposed, a particle *a* appears, and the object is marked with the common case (the case assigned to cannonical subjects and objects in non-periphrastic constructions). We will term the part of this construction from the object *an cat* to the nominalised V *bhualadh* a Fronted Object Phrase (FOP). This same construction is found as the complement of modals, attidudinal predicates, certain adjectives and in a passive construction. In each case the fronting is obligatory:

(13) a.

| | | | | |
|---|---|---|---|---|
| Feumaidh | mi | [Daibhidh | a | bhualadh] |
| Must | I | David | Prt | strike-VN |

'I must hit David'

b.

| | | | | | |
|---|---|---|---|---|---|
| 's | toigh | leam | [Daibhidh | a | bhualadh] |
| COP | liking | with-1sg | David | Prt | strike-VN |

'I like hitting David'

c.

| | | | | | |
|---|---|---|---|---|---|
| Tha | e | doirbh | [Daibhidh | a | bhualadh] |
| Be-PRES | it | difficult | David | Prt | strike-VN |

'It is hard to hit David'

d.

| | | | |
|---|---|---|---|
| Chaidh | [Daibhidh | a | bhualadh] |
| Go-Past | David | Prt | strike-VN |

'David was struck'

There is evidence that FOP is a maximal phrasal constituent since it may right-node-raise, cleft and pseudo-cleft (we give only the adjectival constructions here):

(14) 's e a' cheist sin a fhreagairt a tha doirbh
It's that question Prt answer-VN Comp be-PRES difficult
'It's anwering that question that's difficult'

(15) 's e tha doirbh ach a' cheist sin a fhreagairt
It's be-PRES difficult but that question Prt answer-VN
'What's difficult is to answer that question'

(16) Tha e doirbh ach tha e math a' cheist sin a fhreagairt
be-PRES it difficult but be-PRES it good that question Prt answer-VN
'It is hard, but it is good, to answer that question'

We argued in Adger 1993 that the relationship between the preposed DP and the particle *a* is one of agreement. This claim was based on the behaviour of subject agreement in SG. We provide here an argument to the same effect based on the prepositional agreement construction in SG.

### 3.2 Fronted Object Phrase as AgrP

It is well known that the Celtic languages display a predicate argument agreement phenomenon whereby there is a complementarity between overt agreement and overt arguments[4]. The following paradigm for objects of prepositions is illustrative:

(17) a. 's toigh leam/leat/leis/leatha/leinn/leibh/leotha coffaidh
COP liking with-1sg/2sg/3sg.m/3sg.f/1pl/2pl/3pl coffee
'I/you/he/she/we/you/they like coffee'

b. 's toigh le Mairi coffee
COP liking with Mary coffee
'Mary likes coffee'

c. *'s toigh leatha Mairi coffaidh
COP liking with-3sg.f mary coffee

d. *'s toigh leatha i coffaidh
COP liking with-3sg.f she coffee

The generalisation we would like to make here is the following (for further defense of this generalisation, its application to agreement in Celtic generally and how it derives from Checking Theory (Chomsky 1992), see Adger forthcoming)

(18) The $\phi$-feature set of the agreeing element is the complement set of the $\phi$-feature set of the argument that is agreed with.

The $\phi$-feature set refered to here is {person, number, gender}. We can assume that the $\phi$-features of X are determined by the morphological paradigm of X. This has obvious advantages in terms of learnability over simply stipulating $\phi$-feature specifications as part of UG.

We can reify this generalisation by appealing to the internal structure of the functional head Agr in SG. Whereas most languages appear to require or allow the specification of agreement features on both the predicate and the argument, SG allows each feature to only appear once. Thus Agr in SG differs from Agr in other languages in that it has slots for $\phi$-features which can only be specified once. Further specification leads to ill-formedness.

Nouns in SG are therefore specified for the $\phi$-features number and gender since they inflect for only these categories. Pronouns are specified for this same set of features plus person. Under this view *pro* would have a null $\phi$-feature set, since it has no morphological paradigm. The generalisation in (18) predicts then, that *pro* will show up with full agreement, and that pronouns will show up with no agreement[5]. It also predicts that overt DPs will show up with agreement for only person features, but since overt DPs are always 3rd person we expect no variation in inflection.This generalisation seems to capture perfectly the situation in the above SG prepositional paradigms. If non-agreeing forms of these prepositions are not morphologically available, then pronouns will be unable to cooccur with them. In contrast, *pro* will force full agreement and DPs will show an uninflecting form reflecting the generalisation in (18). The structures with *pro* are as follows:

(19) a. 's toigh leam *pro* coffaidh
COP liking with-1sg *pro* coffee
'I like coffee'

b. *'s toigh le *pro* coffaidh
COP liking with-3 *pro* coffee
'I like coffee'

Here (b) violates (18), since *le* is specified for person features, but *pro* is specified as having a null $\phi$-feature set. Overt DPs also follow (18):

(20) a. *'s toigh leatha Mairi coffaidh

| | | | | |
|---|---|---|---|---|
| *'s | toigh | leatha | Mairi | coffaidh |
| COP | liking | with-3sg.f | mary | coffee |

b. 's toigh le Mairi coffee

| | | | | |
|---|---|---|---|---|
| 's | toigh | le | Mairi | coffee |
| COP | liking | with | Mary | coffee |

'Mary likes coffee'

Here (a) violates (18), since *leatha* is specified for person, number and gender, but *Mairi* is specified for number and gender. Example (b), in contrast, conforms to (18) since *le* contains just person features. Finally, (18) explains the ill formedness of pronominals:

(21) a.

| | | | | |
|---|---|---|---|---|
| *'s | toigh | leatha | i | coffaidh |
| COP | liking | with-3sg.f | she | coffee |

b.

| | | | | |
|---|---|---|---|---|
| *'s | toigh | le | i | coffaidh |
| COP | liking | with-3 | she | coffee |

Both are ruled out since pronouns are specified for person number and gender, but both *le* and *leatha* are specified for at least one of these features.

Now note that the generalisation in (18) predicts the behaviour of the FOP in precisely the same way:

(22) a.

| | | | |
|---|---|---|---|
| Feumaidh | Daibhidh | mo/do/a/a/ar/ur/am | b(h)ualadh |
| Must | David | 1sg/2sg/3m.sg/3f.sg/1pl/2pl/3pl | strike-VN |

'David must hit me/you/him/her/us/you/them'

b.

| | | | | |
|---|---|---|---|---|
| Feumaidh | Daibhidh | am balach | a | bhualadh |
| Must | David | the boy | Prt | strike-VN |

'David must hit the boy'

c.

| | | | | |
|---|---|---|---|---|
| *Feumaidh | Daibhidh | na balaich | am | bhualadh |
| Must | David | the boys | Prt | strike-VN |

'David must hit the boys'

d.

| | | | | |
|---|---|---|---|---|
| *Feumaidh | Daibhidh | tu | a | bhualadh |
| Must | David | you | Prt | strike-VN |

'David must hit you'

The empty object *pro* results in a marker that inflects for person, number and gender; an overt DP object results in a marker that inflects for only person (so *a* is analogous to *le*) so overt DPs cannot occur with agreeing forms and pronominals are ill formed.

The only difference between the paradigms is that is that the particle *a* serves a dual purpose as an agr head with a full $\phi$-feature set and as an agr head with only person features. So the following structure is licensed:

(23) Feumaidh Daibhidh *pro* a bhualadh
Must David *pro* Prt strike-VN
'David must hit him'

The relationship between *a* and the preposed DP is governed by the generalisation about agreement in (18), which provides motivation that *a* is Agr, the preposed DP is in its specifier and FOP is AgrP.

However, there is another way of interpreting this data. We could assume that *a* is agreement but that it is merely a feature on V and does not project syntactically. The preposing of the object is then either movement to the specifier of VP or adjunction to VP and FOP is of the category VP. However, there is strong empirical evidence that such an interpretation is incorrect.

In SG there are two clefting particles: *'s e* and *'s ann*. The former of these typically clefts DP or CP (non-predicates) while the latter clefts predicates such as AdvP or AspP:

(24) a. 's e/*'s ann am ministear a tha mi a' ceilidh a-nochd
It's the minister that be-Pres I Asp visit-VN tonight
'It's the minister that I'm visiting tonight'

b. 's e/*'s ann gun do bhuail thu an cat a tha
It's that Past Strike-Past you the cat that be-Pres
mi a' ciallachadh
I Asp meaning
'It's that you struck that cat that I mean'

c. *'s e/'s ann a-nochd a tha mi a' ceilidh ministear
It's tonight that be-Pres I Asp visit-VN minister
'It's tonight that I'm visiting a minister'

d. *'s e/'s ann a' ceilidh ministear a tha mi a-nochd
It's Asp visit-VN minister that be-Pres I tonight
'It's visiting a minister that I am tonight'

It is possible to cleft FOP as we saw earlier, and in these cases we get *'s e*:

(25) 's e/*'s ann a' cheist sin a fhreagairt a tha doirbh
It's that question Prt answer-VN Comp be-PRES difficult
'It's anwering that question that's difficult'

However, if we cleft a bare Verbal Noun with no agreement marker then we get *'s ann*, which is a clear indication that FOP differs categorially in some way from VP[6]:

(26) *'s e/'s ann falbh a tha doirbh
It's leave-VN that be-Pres difficult
'It's leaving that is difficult'

Under the agreement as a feature of V story there is no easy explanation for this contrast, whereas if Agr projects syntactically then we have a clear categorial difference that we can appeal to.

The structure of FOP is then[7]:

(27) a. Feumaidh Daibhidh [$_{AGRP}$ *pro*$_i$ [$_{AGR'}$ mo [ bhualadh t$_i$]]]
Must David Isg strike-VN
' David must hit me'

b. Feumaidh Daibhidh [$_{AGRP}$ [ am balach]$_i$ [$_{AGR'}$ a [ bhualadh t$_i$]]]
Must David the boy Agr strike-VN
'David must hit the boy'

### 3.3 Measure Phrases and Fronted Object Phrase

Turning to measure phrases we note that these never raise into the spec AgrP position:

(28) a. Feumaidh a' cho-labhairt mairsinn seachdainn
Must the conference last-VN week
'The conference must last a week'

b. *Feumaidh a' cho-labhairt seachdainn a mhairsinn
Must the conference a week Agr last-VN

(29) a. Feumaidh a' cho-labhairt cosg tri mile not
Must the conference cost three thousand pounds
'The conference has to cost 3000 pounds'

b. *Feumaidh a' cho-labhairt tri mile not a chosg
Must the conference three thousand pounds Agr cost-VN

In these examples with modals the measure phrase remains in its base position and preposed measure phrases are ungrammatical. In the following examples the progressive construction which allows VO order is well formed but the perfective construction which forces OV order is ungrammatical.

(30) a.

| | | | | |
|---|---|---|---|---|
| Tha | a' cho-labhairt | a' | mairsinn | seachdainn |
| be-PRES | the conference | ASP | last-VN | week |

'The conference is lasting a week'

b.

| | | | | | |
|---|---|---|---|---|---|
| *Tha | a' cho-labhairt | air | seachdainn | a | mhairsinn |
| be-PRES | the conference | ASP | a week | Agr | last-VN |

'The conference has lasted a week'

(31) a.

| | | | | |
|---|---|---|---|---|
| Tha | a' cho-labhairt | a' | cosg | tri mile not |
| be-PRES | the conference | ASP | cost | three thousand pounds |

'The conference is costing 3000 pounds'

b.

| | | | | | |
|---|---|---|---|---|---|
| *Tha | a' cho-labhairt | air | tri mile not | a | chosg |
| be-PRES | the conference | ASP | three thousand pounds | AgrO | cost-VN |

'The conference has cost 3000 pounds'

Under the account we argued for in Adger 1993, the measure phrase in the grammatical instances is part of a T(ense)-chain (Guéron and Hoekstra 1988, Bennis and Hoekstra 1989, Guéron 1992). T-chains are formed by the binding of an event variable in the VP by a temporal operator, thus temporally anchoring the event denoted by the verb:

(32) $\mathrm{Op}_i \ldots \mathrm{V}\langle e_i \rangle$

We argued that measure phrases are syntactically part of a T-chain and are therefore mapped denotationally into events. A corollary of this is that measure phrases cannot denote individuals, which are participants in events. This proposal immediately accounts for the well-known fact that measure phrases are not extractable across weak islands (Rizzi 1990):

(33) *What$_i$ do you wonder whether Anson weighs t$_i$

(34) *What$_i$ do you regret that the book costs t$_i$

This data is explained since there is substantial agreement in the literature that only individual-denoting elements may extract from weak islands (see Rizzi 1990, Cinque 1990, Dobrovie-Sorin 1990, Frampton 1991, Szabolcsi and Zwarts to appear and Manzini 1992 among others)[8]. The extraction data discussed in the above references is replicated in SG:

(35) a. Dé bha thu ag àicheadh gun do bhuail Daibhidh
What be-PAST you Asp deny-VN Comp PAST-strike David
'What did you deny that David struck?'

b. *Dé bha thu ag àicheadh gun do chosg an leabhar
What be-PAST you Asp deny-VN Comp PAST-cost the book
'What did you deny that the book cost?'

Here the weak island is induced by the factive verb *àicheadh*, and extraction of the measure phrase is much worse than extraction of a canonical argument.

Given that the formation of a tense chain is contingent on the ability of Tense to govern the measure phrase, we expect that tense chains are unable to be formed when we have a closer governor. This is the case when the measure phrase has a quantificational determiner:

(36) a. The conference lasted many weeks

b. The conference lasted three weeks

c. *The conference lasted every week

d. *The conference lasted most weeks

*many* and *three* here are cardinal determiners while *every* and *most* are quantificational (see Milsark 1977, Partee, Bach and Kratzer 1987 and references therein). Only the latter create a minimality barrier by counting a closer governors. This means that (c) and (d) are ruled out because no Tense chain can be formed but also the measure phrase cannot raise to SpecAgrP for Case. Visibility in its generalised form is then violated. Again, this data is replicated in SG:

(37) a. Tha a' cho-labhairt a' mairsinn grunn seachdainnean
be-PRES the conference Asp last many weeks
'The conference lasted many weeks'

b. *Tha a' cho-labhairt a' mairsinn a h-uile seachdainn
be-PRES the conference Asp last all/every week
'The conference lasted every week'

## 3.4 A Puzzle

We noted above that preposing of measure phrases into the spec AgrP position is ungrammatical in SG, but that they can remain in base position when the AgrP is a complement of a modal or of progressive aspect. We also noted that preposing of measure phrases is ill-formed in the perfective construction. Here, however, an interesting difference arises: the measure phrase is also ungrammatical in *base* position in the perfective construction. Thus:

(38) a. *Tha a' cho-labhairt air seachdainn a mhairsinn

| | | | | | |
|---|---|---|---|---|---|
| *Tha | a' cho-labhairt | air | seachdainn | a | mhairsinn |
| be-PRES | the conference | ASP | a week | Agr | last-VN |

'The conference has lasted a week'

b.

| | | | | | |
|---|---|---|---|---|---|
| *Tha | a' cho-labhairt | air | a | mhairsinn | seachainn |
| be-PRES | the conference | ASP | Agr | last-VN | week |

'The conference has lasted a week'

That such an aspectually sensitive phenomenon occurs seems to confirm that measure phrases are in some way licensed by being incorporated into a tense chain, but obviously the notion of tense chain is not articulated enough to predict this effect. The rest of this paper is devoted to refining the notion of tense chain on independent grounds. This independent refinement will then be shown to account for this puzzle.

# 4 Aspectual Chains

In this section we will consider whether the notion of Tense chain can be made more articulate. We will argue that Tense chains are actually composed of smaller aspectual chains that instantiate the relationship between Reichenbachian temporal reference points and morpho-syntactic structure. We build on the work of Giorgi and Pianesi 1992, Drijkoningen and Rutten 1991, and Stowell 1992, Hornstein 1990, Zagona 1990.

## 4.1 Lexical Specification, Selection and Indexation

We will follow much recent work (Williams 1981, Higginbotham 1985, Zwarts 1991, Zwarts 1992) and assume that lexical categories have both an argument structure (Grimshaw 1990) (or theta-grid) and a special distinguished argument that acts as a syntactically accessible variable and specifies the denotational type of the category. We will term elements of the former theta-arguments and we will term the latter the denotational argument. We represent this type of information enclosed in angled brackets, with the denotational argument to the left and the theta-arguments, structured as a nested list (following Grimshaw 1990), to the right. Thus the lexical specification of a verb like 'kiss' has the following structure:

(39) kiss
$\langle e, (a(b)) \rangle$

The notion of theta-marking relevant for the theta-criterion involves matching elements of the argument structure with XP sisters of the theta-marking head. We will follow Zwarts 1992 and represent this as coindexation between the appropriate theta-argument and the denotational argument of the complement XP. Thus 'kiss Anson' involves the structure:

(40) kiss Anson
$\langle e, (a(b_i)) \rangle$ $\langle x_i, 0 \rangle$

where $x_i$ is the denotational argument of the head of the NP 'Anson' which has a null argument structure. We will refer to this type of indexing as 'selection indexing'. Note that this type of indexing involves the denotational argument of the N head, intervening functional categories are irrelevant. But it is well known that semantically N determines the range of the dominating determiner or quantifier, thus we expect there to be another type of indexing where the operator associated with the determiner or quantifier also binds the denotational argument of N. We will refer to this type of indexing as 'binding indexing' and represent it as super-indexation. Thus:

(41) kiss every man
$\langle e, (a(b_i)) \rangle$ $\mathrm{D}^j$ $\langle x_i^j, 0 \rangle$

Selection indices are established at whatever point in the derivation lexical insertion takes place (DS in conventional theories and on application of the generalised transformation GT in Chomsky 1992), while binding indices are established at LF.

## 4.2 Morphosyntactic Tense and Interpretation

Reichenbach 1947 provides an analysis of the tense/aspect system of English which uses three temporal reference points: the speech time (S), the event time (E) and a reference time relating the two (R). Reichenbach argues that R is implicated in the analysis of all the tenses. If R precedes S then some variety of the past tense is involved; if R and S are contemporaneous then we have a present tense variety and if R follows S then we have a variety of the future. Which particular variety is involved depends on the relationship between R and E: E preceding R results in a perfect; E following R results in a prospective and E contemporaneous with R results in a simple tense.

We provide some examples below (⟩, ⟨, and = can be glossed as 'follows', 'precedes' and 'is contemporaneous with', respectively)[9]:

(42) a. Anson sings (S=R, E=R)
b. Anson sung (S⟩R, E=R)
c. Anson has sung (S=R, E⟨R)
d. Anson had sung (S⟩R, E⟨R)

Recently, a number of authors have argued that this system of relationships is directly instansiated in the morphosyntax. Giorgi and Pianesi 1992 (hence G & P), for example, argue that past participial morphology (the functional head Asp) in Italian represents the E⟨R relation while the finite tense (the functional head T) represents the relation between S and R (see also Drijkoningen and Rutten 1991, Stowell 1992). Thus:

(43) avevo mangiato
have-Past eat-PPart
S⟩R E⟨R
'I had eaten'

Here T is realised by an auxiliary verb while the main verb has moved into Asp. G & P argue that the denotational event arguments of the auxiliary verb and the main verb must be coindexed for the structure to be interpreted. This means that a Tense chain is established via head movement of Aux to T and V to Asp.

We will follow the thrust of G & Ps ideas, but we shall be more explicit about how the tense chain is composed. G & P provide no way of ensuring that R in T and R in Asp are coindexed, as they must be to ensure proper interpretation. Likewise, they offer no insight as to how E in Asp is coindexed with the event argument in V, another prerequisite for correct temporal interpretation. The mechanisms we have outlined above to deal with theta-marking are in fact all that is necessary.

Asp dominates and is sister to VP[10]. If the relationship between them is one of selection, then Asp takes VP as its internal argument and coindexes the denotational argument of VP with its internal theta-argument:

(44) Asp VP
$\langle R, (E_i)\rangle$ $\langle e_i, (a(b))\rangle$

We thus establish the coindexation between E in Asp and e in VP via selection indices. Now the coindexation relationship between R and E in Asp can be read off the semantics of Asp. If Asp is simple (R=E) then R and E are lexically coindexed. Otherwise they are contraindexed. The relationship between R in Asp and R in T is likewise established by selection. AspP is the internal argument of T, and therefore T coindexes its internal theta-argument with the denotational argument of Asp, establishing the coindexing relationship via selection indices. Thus we have the following representation for a simple present tense:

(45) T Asp VP
$\langle S_i, (R_i) \rangle$ $\langle R_i, (E_i) \rangle$ $\langle e_i, (a(b)) \rangle$

The indexing relationship between S and R can again be read off the semantics of S. If S is present tense then S=R and coindexing occurs; otherwise we have contraindexing.

We will refer to the substructures formed by Asp and V and by T and Asp as aspectual chains (trivially all three heads form aspectual chains singly). These are composed into a single domain via selection. The tense chain for the clause is formed, as seems semantically plausible, by binding from a temporal operator. The temporal operator associated with the utterance time is projected in the specifier of TP at LF (along the lines of Stowell 1992) and this operator binds the denotational arguments that it governs:

(46) Op T Asp VP
$\mathrm{Op}^j$ $\langle S_i^j, (R_i) \rangle$ $\langle R_i^j, (E_i) \rangle$ $\langle e_i^j, (a(b)) \rangle$

This system allows the temporal interpretation to run directly off the morphosyntactic structure with no further stipulations than are already required for canonical theta-marking. The Tense chain is composed of smaller aspectual chains via the mechanism of selection. One interesting point about this system is that it dissociates thematic structure (associated with lexical heads) from argument structure (associated with both lexical and functional heads). This is a position recently argued for by Adger and Rhys forthcoming, Rhys 1993 and Cann 1993 among others.

## 4.3 Tense and Aspect in Scottish Gaelic

### 4.3.1 Compound tenses

SG appears to reflect Reichenbach's analysis rather directly. The most common way of marking the difference between present and past tenses is to use a form of the verb *bith* 'be' as an auxiliary with a nominalised form of the main verb which occurs with an aspectual particle. The verb *bith* marks the relationship between S and R (*tha*, *bha* and *bithidh* are respectively the present, past and future forms of *bith*):

(47) a. Tha Daibhidh a' falbh
Be-Pres David Asp leave-VN
'David is leaving'

b. Bha Daibhidh a' falbh
Be-Past David Asp leave-VN
'David was leaving'

c. Bithidh Daibhidh a' falbh
Be-Fut David Asp leave-VN
'David will leave'

The particle *a'* here marks that E=R. This becomes even clearer if we inspect the perfect paradigm:

(48) Tha/Bha/Bithidh Daibhidh air falbh
Be-Pres David Asp leave-VN
'David has/had/will have left'

Here *air* marks that E$\langle$R. The paradigm is completed by the prospective:

(49) Tha/Bha/Bithidh Daibhidh gu falbh
Be-Pres David Asp leave-VN
'David is/was/will be about to leave'

where *gu* marks that E$\rangle$R.

The analysis of the SG tense/aspect system we propose is simply that the auxiliary verb in T marks the S,R relation while the particle in Asp marks the E,R relation. The domain for the tense chain is composed as discussed above, by selection, from the smaller aspectual chains. An example of this for the present perfect is given below:

(50) Tha Daibhidh air falbh
Be-Pres David Asp leave-VN
$\langle S_i, (R_i)\rangle$ $\langle R_i, (E_j)\rangle$ $\langle e_j, (a)\rangle$
'David has left'

### 4.3.2 *a bhith*

As well as the simple compound tenses discussed above, SG allows the use of an auxiliary to carry the aspectual particle:

(51)

| | | | | | |
|---|---|---|---|---|---|
| Tha/Bha | Daibhidh | air | a bhith | a' | falbh |
| Be-Pres/Past | David | Asp | be-VN | Asp | leave-VN |

'David has/had left'

(52)

| | | | | | |
|---|---|---|---|---|---|
| Tha/Bha | Daibhidh | gu | bhith | a' | falbh |
| Be-Pres/Past | David | Asp | be-VN | Asp | leave-VN |

'David is/was about to leave'

This device allows the composition of aspectual particles:

(53) a.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tha | Daibhidh | gu | bhith | air | a bhith | a' | falbh |
| Be-Pres | David | Asp | be-VN | Asp | be-VN | Asp | leave-VN |

'David is about to have left'

b.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| Tha | Daibhidh | air | a bhith | gu | bhith | a' | falbh |
| Be-Pres | David | Asp | be-VN | Asp | be-VN | Asp | leave-VN |

'David has been about to leave'

One constraint that emerges here though is that the simple aspect marker must come finally (this was first noted by Cram 1981):

(54) a.

| | | | | | |
|---|---|---|---|---|---|
| Tha | Daibhidh | air | a bhith | a' | falbh |
| Be-Pres | David | Asp | be-VN | asp | leave-VN |

'David has left'

b.

| | | | | | |
|---|---|---|---|---|---|
| *Tha | Daibhidh | a' | a bhith | air | falbh |
| Be-Past | David | Asp | be-VN | asp | leave-VN |

Recall G & P's claim that, in order for a structure with an auxiliary and main verb to be interpreted, the denotational arguments of the auxiliary and main verb must be coindexed. If we accept this claim, we immediately provide an explanation for the contrast in (54). The relevant structure for the well formed (a) is:

(55)

| | | | | | |
|---|---|---|---|---|---|
| Tha | Daibhidh | air | a bhith | a' | falbh |
| Be-Pres | David | Asp | be-VN | asp | leave-VN |
| | | $\langle R_j, (E_i)\rangle$ | $\langle e_i(a_i)\rangle$ | $\langle R_i, (E_i)\rangle$ | $\langle e_i\rangle$ |

'David has left'

Here the denotational arguments of the auxiliary and the main verb are coindexed via the normal selection process which passes up the index through the simple aspect marker (where the denotational argument and the internal theta-argument of *a'* are specified lexically to be coindexed because of the meaning of *a'*). We can assume that the auxiliary verb *bith* adds no aspectual information, nor does it add information that there is another event taking place; it simply serves to morphologically carry the aspectual marking of the particle *air*. The auxiliary then, basically requires that its internal argument and its denotational argument carry the same information, so that the internal argument of *bith* and its denotational argument are coindexed. This is a characteristic property of auxiliaries. Now consider the structure for the other example:

| | | | | | | |
|---|---|---|---|---|---|---|
| (56) | *Tha | Daibhidh | a' | a bhith | air | falbh |
| | Be-Past | David | Asp | be-VN | asp | leave-VN |
| | | | $\langle R_j, (E_j)\rangle$ | $\langle e_j(a_j)\rangle$ | $\langle R_j, (E_i)\rangle$ | $\langle e_i\rangle$ |

Here, because the lexical specification of *air* marks that E⟨R, E and R cannot be coindexed. A contra-indexation is then passed up to the auxiliary, which will then be contra-indexed with the main verb, in violation of G & P's constraint. We also predict that *gu*, the prospective marker, will behave in the same way as *air*. This is the case:

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| (57) | a. | Tha | Daibhidh | gu bhith | a' | falbh | |
| | | Be-Pres | David | Asp | be-VN | asp | leave-VN |
| | | 'David has left' | | | | | |
| | b. | *Tha | Daibhidh | a' | a bhith | gu | falbh |
| | | Be-Past | David | Asp | be-VN | asp | leave-VN |

### 4.4 Summary

This section has motivated the idea that the Tense chain used in the licensing of measure phrases is composed from smaller aspectual chains via the mechanism of selection. Once the separate aspectual chains have been composed via selection indices the temporal operator of the clause can bind all of the denotational arguments within its selection domain via binding indices to form the T-chain proper. The advantage of this system is that it allows temporal interpretation to run directly from morphosyntactic structure. The system also predicts an unexpected constraint in the tense/aspect system of SG.

## 5 Consequences for Licensing Measure Phrases

Recall that a tense chain is essentially formed via the mechanism of selection, encoded as coindexation of the internal theta-argument of a head with the denotational argument of that head's XP sister. This immediately predicts that internal arguments of verbs are possible elements of a Tense chain. Note, however, that the selection driven process of aspectual chain composition relies on a lexical indexing of the denotational argument and internal theta-argument of either aspectual particles or auxiliaries. This lexical indexing is read off the semantic properties of the head (see (45)). It follows that the internal theta-argument of a verb will only be part of an aspectual chain if there is lexical coindexing of the denotational argument of the verb and its internal theta-argument that follows from the meaning of the verb. Any such verb we then expect to behave much like an auxiliary, since this type of lexical indexing is characteristic of auxiliaries.

In fact this is exactly the kind of property we would like to attribute to verbs that take measure phrase complements. These can almost always be paraphrased by a copular verb. Crucially, this same copula is used as an auxiliary in the languages concerned:

(58) a. Anson weighs 70 kilos

b. Anson is 70 kilos

(59) a. The book cost twelve dollars

b. The book is twelve dollars

(60) a. Tha dà clach deug de chudrom ann an Daibhidh
Be-pres two stone teen of weight in(redup) David
'David weighs twelve stone'

b. Tha trì not air an leobhar seo
Be-pres three pounds on the book that
'That book costs three pounds'

We therefore specify the lexical entry of a verb like 'cost' as:

(61) cost
$\langle e_i, (a(b_i))\rangle$

We can now actually derive the observation that measure phrases do not raise. If the $\phi$-features of arguments are specified on the positions in the argument structure then the internal theta-argument of 'cost' will have no nominal $\phi$-features, since it is coindexed with the denotational event argument, which has no nominal $\phi$-features. This means that the XP complement will never raise to the AgrO projected by 'cost', since there are no $\phi$-features to check[11]. Such a situation is not the case for most complements which have $\phi$-features and are therefore required to be in the specifier of AgrO at LF for reasons of case checking. Measure phrases, since they do not raise to AgrO, are therefore potential Tense chain members.

Consider then the licensing of measure phrases in postverbal position in SG:

| | | | | | |
|---|---|---|---|---|---|
| (62) | Tha | a' cho-labhairt | a' | mairsinn | seachdainn |
| | be-PRES | the conference | ASP | last-VN | week |
| | $\langle S_i, (R_i)\rangle$ | | $\langle R_i, (E_i)\rangle$ | $\langle e_i, (a(b_i))\rangle$ | $\langle x_i, 0\rangle$ |
| | 'The conference is lasting a week' | | | | |

Here the denotational argument of the measure phrase is coindexed with that of the verb and that of Asp. It therefore is part of a composed aspectual chain via selection indices. Note that it also conforms to the generalised version of Visibility if we take 'coindexed' in this definition to refer to selection indices.

Now consider the structure with the perfective particle:

| | | | | | |
|---|---|---|---|---|---|
| (63) | *Tha | a' cho-labhairt | air | mairsinn | seachdainn |
| | be-PRES | the conference | ASP | last-VN | week |
| | $\langle S_i, (R_i)\rangle$ | | $\langle R_i, (E_j)\rangle$ | $\langle e_j, (a(b_j))\rangle$ | $\langle x_j, 0\rangle$ |
| | 'The conference has lasted a week' | | | | |

Here the measure phrase is coindexed with the event argument of the verb but the semantics of the aspectual particle means that the denotational argument of the *air* carries a different index. This means that the measure phrase is not coindexed with a functional head and that the generalised version of Visibility is violated since *seachdainn* is not F-licensed. The same explanation extends to the analogous structure with the prospective marker *gu*, which is also ill formed.

The question now arises as to why the corresponding English structures are grammatical:

(64) a. The conference has lasted a week

b. ?This book has cost twenty pounds

We will attribute the slight ill-formedness of the (b) example here to a semantic tension between the perfective, which requires a final bound on an event, and the measure verb *cost* which is lexically specified as some kind of unbounded state. Recall that we require the measure phrase to be coindexed with a T functional head. This requirement is satisfied by the head movement of V into the functional head realised by *-ed*, under the standard assumption that head movement leaves a trace.

But now we seem to have lost some of the empirical coverage of the original approach in Adger 1993. Recall that quantificational determiners were ruled out in measure phrases because they create a minimality barrier for T-chain formation. Selectional indices, however, ignore functional structure so a measure phrase with a quantificational determiner would be able to be part of a T-chain.

However, this problem ignores the difference we have already drawn for independent semantic reasons between selectional and binding indices. Selectional indices compose aspectual chains into a single domain, but the actual formation of T-chains is stated in terms of binding indices. We repeat the relevant structure:

(65)

| | | | |
|---|---|---|---|
| Op | T | Asp | VP |
| $\mathrm{Op}^j$ | $\langle S_i^j, (R_i)\rangle$ | $\langle R_i^j, (E_i)\rangle$ | $\langle e_i^j, (a(b))\rangle$ |

The tense operator of the sentence binds all the denotational arguments it governs within its selection domain. Government of the denotational argument of a quantified measure phrase is blocked by the quantifier, which counts as a closer binder:

(66)

| | | | | | |
|---|---|---|---|---|---|
| Op | T | Asp | VP | Q | DP |
| $\mathrm{Op}^j$ | $\langle S_i^j, (R_i)\rangle$ | $\langle R_i^j, (E_i)\rangle$ | $\langle e_i^j, (a(b))\rangle$ | $\mathrm{Q}^k$ | $\langle x_i^k\rangle$ |

So, while the measure phrase is in the appropriate selectional domain to be part of a T-chain, whether or not it is actually part of a T-chain depends on binding.

One final prediction is made by the system we have outlined in this paper. We predict that measure phrases in structures with the auxiliary verb *bith* and the R=E aspectual particle *a'* should be well-formed, even if the auxiliary carries the perfective particle. This follows since the measure phrase will be coindexed with the aspectual head *a'*, as above. This proves to be the case, and such structures are actually a paraphrase for the ill-formed bare perfective structures:

(67) Tha a' cho-labhairt air a bhith a' mairsinn seachdainn
be-PRES the conference ASP be-VN ASP last-VN week
'The conference has been lasting a week'

## 6 Conclusions

This paper has sought to defend a generalised version of Visibility by showing that it is implicated as a premiss in the basic analysis of measure phrases and that it has interesting and unexpected empirical consequences when combined with an independently motivated refinement of the notion of Tense chain. We argued that potential Tense chains were composed from smaller aspectual chains via a mechanism of selection indices and that the actual Tense chain is formed from binding indices. Crucial evidence for this theoretical standpoint derives from the interaction between word order, agreement and aspect in Scottish Gaelic.

## Notes

[1]Many thanks to Bob Borsley, Ronnie Cann, Elisabet Engdahl, Laura Joosten, Martin Mellor, Catrin Siân Rhys, Jeff Runner and the participants of SCIL V for comments on earlier drafts/presentations of this paper.

[2]F-licensing, as it is defined here, would predict that a wh-phrase in the specifier of CP is independently licensed, and thus does not need to be coindexed with Agr or T. It is empirically unclear whether wh-phrases actually do need abstract Case, given examples like:

(i) Who$_i$ do you believe sincerely t$_i$ to be a genius

(ii) Someone [O$_i$ t$_i$ to fix the sink] is coming this afternoon

In the first case we have the trace of the wh-phrase in a position where it cannot be assigned Case by the lower Infl, since it is non-finite, nor by the higher ECM verb, since there is an adverb intervening. The second case involves movement of an empty operator from a non-Case marked position to the specifier of the C of the infinitival relative. Such examples suggest that this definition of F-licensing may be correct. On the other hand, if it turns out that wh-phrases do need Case, then the definition here can be revised so that it applies to only A-chains.

[3]Indefinites are marked with what appears to be the common case (nominative/accusative alternations are neutralised in SG, unlike Irish). We will not discuss this here although two possible explanations come to mind. Either the post verbal slot is actually assigned partitive case and the partitive paradigm is an amalgam of the common and genitive paradigms (this is suggested by Ramchand 1993) or indefinites and definites are licensed in different ways: the latter by an inserted case marking (similar to English *of*-insertion) and the former by tense binding. We will not take up this question here.

[4]This does not appear to be the case for Welsh, but see Hendrick 1988 for a reanalysis of the Welsh data which makes it amenable to this generalisation.

[5]Bob Borsley has pointed out that claiming that *pro* has no $\phi$-features will result in different generalisations for antecedent agreement having to be made for overt and non-overt pronouns. Overt pronouns will be required to have compatible $\phi$-features with their antecedents, while *pro* will be required to be in an agreement relationship with a head that has compatible $\phi$-features. It might be possible to state these generalisations with reference to only agreement with a head, since overt pronouns will have to be in an agrement relationship with a head for reasons of checking/Case anyway.

[6]This data is actually more complex than it seems from this presentation. Some speakers have very weak judgements here, often preferring *'s e* to *'s ann* and justifying this judgement with some statement to the effect that the verbal noun is a noun and therefore must be used with *'s e*. Other speakers find no contrast, deeming both to be marginally acceptable. Finally, the speakers who agree with the judgements given here typically have no realisation for the aspectual particle *a'* and allow a range of complement types after adjectives like *doirbh*, suggesting that the appearance of *'s ann* may be attributed to the clefting of an aspectual phrase that happen to be homophonous with FOP. However, the point still holds that there is a contrast between (25) and (26) which is difficult to explain if agreement is a feature of V.

[7]It may be objected that the elements which we have glossed here as

agreement markers are in fact possessive pronouns, and indeed this is the traditional analysis. However, whereas we have a fair amount of evidence for the syntactic realisation of agreement features and a clear way of incorporating them into our theory, the same situation does not hold for possessive pronouns. In fact, we would argue that possessive pronouns in SG are simple manifestations of agreement features in the standard cases as well. See McCloskey and Hale 1984 for discussion of the similar Irish facts.

[8]We shall not address the question of the correct logical form of these elements here. The important point is that the weak island constraint is a constraint on the denotation of an extracted element. Krifka 1990 has pointed out that DPs are typically ambiguous between what he terms an Event-Related and an Object-Related reading. The former reading derives from the DP in question being counted as part of the event in the interpretative domain. On our account measure phrases have obligatory Event-Related readings, since they are part of a T-chain. As noted by T. Hoekstra (see also Honcoop 1992) Event-Related readings are never possible across weak islands.

[9]This analysis ignores phenomena such as imperfectivity, for which is is necessary to view the Reichenbachian points as temporal intervals with internal structure.

[10]Asp is actually probably sister to AgrP, but we shall abstract away from Agr in the discussion here. This abstraction is derivable from Relativised Minimality (see Roberts 1991).

[11]A general problem for the checking view of raising is provided by examples like:

(i) Under the bed seems to be a good place to hide

(ii) Very quickly seems to be the best way to do it

Presumably neither the PP nor the AdvP have features that need to be checked. It may be that subject raising differs from object raising due to the interference of some version of the Extended Projection Principle. Webelhuth 1989 suggests that such subjects contain an empty Determiner on the basis of the fact that they form DP chains in a number of constructions (p239-240). I have no alternative explananation.

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