

## **‘Elsewhere’ in Gender Resolution**

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### **1. Introduction**

Coordinate structures such as the subject of the French sentence (3) pose an interesting challenge for the grammar of agreement:<sup>1</sup>

(1) Le garçon est compétent (m.sg) / \*compétente (f.sg).

‘The boy is competent.’

(2) La fille est \*compétent (m.sg) / compétente (f.sg).

‘The girl is competent.’

(3) [Le garçon et la fille] sont compétents (m.pl) / \*compétentes (f.pl).

‘The boy and the girl are competent.’

The predicate adjective shows gender agreement with its subject, masculine in (1) and feminine in (2). When masculine and feminine are conjoined as in (3), the predicate appears in masculine plural in French. More generally, languages follow two strategies to handle coordination of unlike conjuncts, either *resolution* or *partial agreement* (this terminology follows Corbett, 1991). A *resolution* rule derives the agreement features of a coordinate NP on the basis of the features of all the individual conjuncts. Example (3) illustrates the purported French resolution rule dictating that mixes of genders are resolved to the masculine. In *partial agreement*, on the other hand, agreement consults one conjunct and ignores the other(s), as in this example from Ndebele (Bantu) taken from Moosally (1998, p. 88):

- (4) In-khezo lemi-ganu i-qamukila.  
12-spoon CONJ.4-plate 4-broke  
'The spoons and plates broke.'

In Ndebele partial agreement the predicate agrees with the closest conjunct, ignoring any others.

The present paper largely sidesteps partial agreement (on which see, i.a., Corbett 1991, Johannessen, 1996, 1998 and Moosally, 1998), focusing instead on gender resolution. While there has been relatively little formal generative work on this problem, some recent generative treatments of resolution (see §3 below) have proposed formal mechanisms for computing the agreement features of the coordinate NP on the basis of the features of the conjuncts (Dalrymple and Kaplan, 2000; Vincent and Börjars, 2000). To date these feature computation mechanisms have not succeeded in capturing the attested range of systems, both undergenerating (Serbo-Croatian and Slovene are problems; see §3 and §6) and perhaps overgenerating as well (some unattested systems which we predict to be impossible could be generated by Dalrymple and Kaplan 2000; see §6). Recognition of a default or 'elsewhere' (Anderson, 1969; Kiparsky, 1973) gender, together with a theory relating grammatical to semantic gender categories, will be shown below to solve these problems.

Even more important than the empirical problems is the standard question of explanation: *Why* do the feature computation rules and the featural representations of the genders take the specific forms that have been posited? A feature resolution mechanism specialized for coordinate NPs fails to relate the details of the resolution system in a given language to other aspects of the grammar of that language. In contrast, the present study explains the gender resolution facts in terms of the *semantics* of grammatical gender, understood within a theory of markedness. As Corbett (1999: 402) observed,

‘genders always have a semantic core (there are no purely formal systems).’ Though grammaticalized, genders can be shown to have optional semantic content that surfaces under predictable circumstances, with consequences throughout the grammar of agreement. Among those consequences are the patterns of agreement with coordinate NP’s.

## 2. Gender Resolution Patterns

Continuing with the French example above, consider the effect on predicate agreement when we conjoin two feminines (5), two masculines (6), and a mixture of masculine and feminine (7)=(3). The system is summarized in (8).

(5) [La fille et sa soeur] sont \*compétents (m.pl) / compétentes (f.pl).

‘The girl and her sister are competent.’

(6) [Le garçon et son frère] sont compétents (m.pl) / \*compétentes (f.pl).

‘The boy and his brother are competent.’

(7) [Le garçon et sa soeur] sont compétents (m.pl) / \*compétentes (f.pl).

‘The boy and his sister are competent.’

(8) French rule (m,f)

1. f.pl: f + f

2. m.pl: elsewhere

The letters ‘m,f’ on the first line of (8) indicate that French has a two gender system, with the genders masculine (m) and feminine (f). As shown, a group of feminine conjuncts triggers feminine plural agreement, and masculine plural is the default used in all other cases.

The three-gender system of Serbo-Croatian (masculine, feminine, neuter) has a similar pattern. A group of feminines yields feminine plural agreement, as shown in (9). All other combinations result in masculine plural agreement. Perhaps most surprisingly, a coordinate structure with all neuter gender conjuncts triggers, not neuter plural, but masculine plural agreement, as shown in (11).

(9) Sve snage i sva pažnja biće posvećene toj borbi  
 all powers(F.PL) and all attention(F.SG) will be dedicated.F.PL to this struggle

(10) Ogledalo i četka za kosu su bili na stolu.  
 mirror.NT.SG and brush-F.SG for hair AUX were-M.PL on table  
 ‘The mirror and the hair brush were on the table.’

(11) Ogledalo i nalivpero su bili / \*bila na stolu.  
 mirror.NT.SG and fountain pen-NT.SG AUX were-M.PL/\*NT.PL on table  
 ‘The mirror and the fountain pen were on the table.’

The Serbo-Croatian rule is actually identical to the French rule above, but has a different effect because the language has three rather than two genders.

(12) Serbo-Croatian rule (m, f, nt):

1. f.pl: f + f

2. m.pl: elsewhere

Turning to Icelandic, when gender is homogeneous across all conjuncts then that gender is inherited by the coordinate structure. Any heterogeneity of gender is resolved with the neuter plural form, as in (13)-(14). The Icelandic pattern is given in (15).

(13) Drengurinn og telpan eru þreytt.

the.boy and the.girl are tired.**NT.PL**

(14) ég sá á og lamb, boeði svart

I saw ewe(F) and lamb(NT), both.**NT.PL** black.**NT.PL**

Corbett (1991:283)

(15) Icelandic rule (m, f, nt):

1. f.pl: f + f

2. m.pl: m + m

3. nt.pl: elsewhere (including nt + nt and all mixtures)

### 3. Syntactic feature computation

Dalrymple and Kaplan (2000) propose a theory of feature resolution based on the operation of set union, implemented within the framework of Lexical Functional Grammar. Gender values are represented with sets of abstract features. For example, in French the masculine value is represented with the singleton set containing the element M, while feminine is represented with the null set.

(16) French:

MASC: {M}

FEM: { }

To calculate the gender value for a coordinate structure, simply union the sets associated with the conjuncts. The French resolution pattern at left is correctly captured by the set designations in (16) above:

MASC & MASC = MASC             $\{M\} \cup \{M\} = \{M\}$

MASC & FEM = MASC             $\{M\} \cup \{ \} = \{M\}$

FEM & FEM = FEM             $\{ \} \cup \{ \} = \{ \}$

Turning now to the three-gender system of Icelandic, Dalrymple and Kaplan designate the following sets for the gender values:

(17) Icelandic:

MASC: {M}

FEM: {F}

NEUT: {M, F}

The Icelandic coordination pattern is also captured on the Dalrymple and Kaplan system, as shown by the set union operations at right:

MASC & MASC = MASC             $\{M\} \cup \{M\} = \{M\}$

FEM & FEM = FEM	$\{F\} \cup \{F\} = \{F\}$
NEUT & NEUT = NEUT	$\{M, F\} \cup \{M, F\} = \{M, F\}$
MASC & FEM = NEUT	$\{M\} \cup \{F\} = \{M, F\}$
MASC & NEUT = NEUT	$\{M\} \cup \{M, F\} = \{M, F\}$
FEM & NEUT = NEUT	$\{F\} \cup \{M, F\} = \{M, F\}$

Dalrymple and Kaplan (2000) note that Slovene resolution poses a problem for this approach. Exactly as in Serbo-Croatian as described above, coordinated neuter NPs yield masculine plural agreement: NEUT & NEUT = MASC. Since set union is idempotent (for any set X,  $X \cup X = X$ ), any feature set assigned to NEUT will incorrectly yield NEUT and not MASC agreement.<sup>2</sup> Vincent and Börjars (2000) propose a modification of Dalrymple and Kaplan 2000, using set intersection instead of union. This too fails for Slovene and Serbo-Croatian, since intersection, like union, is idempotent (for any set X,  $X \cap X = X$ ). A modified, semantically-motivated set intersection approach is proposed in Section 6 below.

#### 4. Syntactic versus semantic resolution.<sup>3</sup>

The grammatical feature computation mechanism described above ignores an important distinction drawn by Corbett (1991) between *syntactic* and *semantic* gender resolution: ‘Gender resolution by the semantic principle involves reference to the meaning of the conjoined elements even if this implies disregard for their gender. The syntactic principle operates according to the gender of the conjoined items irrespective of their meaning.’ (p. 269)

Among Corbett’s examples of semantic gender resolution are Bantu languages. Bantu coordination resolution is based on meaning and not morphological Noun Class—even though agreement with simple, non-coordinate NPs is based on Noun Class. Consider Luganda, as described by Givón (1970:252). Conjuncts of the same noun class in Luganda can be conjoined, yielding plural agreement of that class (Givón suggests that all Bantu languages allow this). Now consider agreement when the conjuncts differ in noun class. In Luganda human-denoting nouns typically fall into class 1/2 (i.e. class 1 in singular, class 2 in plural), but there are many exceptions.<sup>4</sup> Noun Class 1/2 is the resolution class for humans, while NC 7/8 is used for non-humans. This applies irrespective of the Noun Classes of the conjuncts (Corbett, 1991):

(18) *ek-kazi, aka-ana ne olu-sajja ba-alabwa*  
 5-fat.woman 12-small.child and 11-tall.man 2-were.seen  
 ‘The fat woman, small child, and tall man were seen.’

(19) *en-te, omu-su, eki-be ne ely-ato bi-alabwa*  
 9-cow 3-wildcat 7-jackal and 5-canoe 8-were.seen  
 ‘The cow, the wildcat, the jackal, and the canoe were seen.’

Of course, with a normal non-coordinate subject the predicate must agree in Noun Class: *ek-kazi* ‘fat woman’ normally triggers class 5 agreement, and so on. But the semantic principle operates in coordination resolution.

Turning to French, it is unclear a priori whether the masculine plural agreement in example (3)/(7) results from a syntactic rule (mixes of the two grammatical genders trigger masculine) or rather a semantic rule (NP’s denoting mixed-sex groups trigger masculine). Corbett (1991:279) notes that inanimates follow the same rule as animates:<sup>5</sup>

(20) Le livre et le cahier sont neufs / \*neuves  
 the book(M) and the notebook(M) are new.M.PL / \*new.F.PL

(21) la misère et la ruine sont désastreuses / \*désastreux.  
 the misery(F) and the ruin(F) are disastrous-F.PL / disastrous-M.PL

(22) Ce savoir et cette adresse sont merveilleux / \*merveilleuses.  
 this knowledge(M) and this skill(F) are marvellous.M / marvellous.F.PL

From this Corbett reasonably concludes that French employs syntactic and not semantic resolution.

However, there some evidence to support a third possibility: that *inanimate* NPs are subject to syntactic resolution, while *animate* NPs are subject to semantic resolution. In particular, it appears to be true cross-linguistically that when grammatical and natural gender diverge, resolution depends on natural, not grammatical gender — even though simple, non-coordinate agreement follows grammatical gender. For example, consider the French nouns *sentinelle* ‘sentry’ and *personne* ‘person’. Both nouns are grammatically feminine regardless of whether they refer to men or women (indeed, a *sentinelle* is typically, though not necessarily, assumed to be male). This is illustrated in (23). (In all examples assume the referent of *sentinelle* or *personne* is male.)

(23) a. La sentinelle/ personne à la barbe a été prise (f.sg) / \*pris (m.) en otage.

‘The sentry/ bearded person was taken hostage.’

b. Les sentinelles ont été prises (f.pl) / \*pris (m.) en otage.

‘The sentries were taken hostage.’

Now consider coordinate NPs. Recall first of all that masculine plural is the resolution value for mixed gender subjects, as in (24a). But crucially this rule is based on semantic gender, i.e. sex, and not grammatical gender, as shown in (24b,c):<sup>6</sup>

- (24) a. Suzanne et Pierre ont été pris (m) / \*prises (f.pl) en otage.  
 ‘Suzanne and Pierre were taken hostage.’
- b. La sentinelle et sa femme ont été pris (m) / \*prises (f.pl) en otage.  
 ‘The sentry and his wife were taken hostage.’
- c. La sentinelle et la personne à la barbe ont été pris (m.) / \*prises (f.pl) en otage.  
 ‘The sentry and the bearded person were taken hostage.’

In (24b,c) we have two grammatically feminine NP conjuncts, yet the participle appears in masculine. Reversing conjunct order has no effect on agreement. Clearly sex, not grammatical gender, is determining agreement. In (24b) the sexes are mixed, yielding the masculine resolution form, while in (24c) *both* conjuncts are male-denoting, again yielding masculine plural. This result for 24b is summarized here:

(25) example (24b)

<u>type of resolution rule</u>		<u>predicted form</u>	<u>correct?</u>
syntactic: feminine	+ feminine =>	feminine plural	*
semantic: male	+ female =>	masculine plural	✓

Similar facts obtain in Icelandic. As shown in (26), the noun *skáld* ‘poet’ is grammatically neuter, regardless of the sex of the poet. But when this noun refers to a male poet, and is coordinated with another male-denoting noun, the predicate is not

neuter plural— the form used for mixed gender subjects, as we saw above. Instead it appears in masculine plural (27):

(26) Skáldi þ er frægt / ??frægur

the.poet(NT) is famous.NT.SG / ??M.SG

‘The poet is famous.’

(27) Skáldi þ og Jón eru frægir / \*fræg

the.poet(NT) and Jon are famous.M.PL / \*NT.PL

‘The poet and Jon are famous.’ (assume the poet is male)

(28) <u>type of resolution rule</u>		<u>predicted form</u>	<u>correct?</u>
syntactic: neuter	+ masculine =>	neuter plural	*
semantic: male	+ male =>	masculine plural	√

In Serbo-Croatian the diminutive *devojč* ‘(little) girl’ is grammatically neuter while *devojka* ‘girl’ is grammatically feminine. In (30), summarized in (29), we see that resolution based on sex is preferred to resolution based on grammatical gender.

(29) <u>type of resolution rule</u>		<u>predicted form</u>	<u>correct?</u>
syntactic: feminine	+ neuter =>	masculine plural	*
semantic: female	+ female =>	feminine plural	√

- (30) Ova velika devojka i ovo malo devojč&e  
 this-F.SG big girl(F.SG) and this-NT.SG little-NT.SG girl(NT.SG)  
 su se lepo igrale / ?igrali.  
 aux.pl refl well played-F.PL/ played-M.PL  
 ‘This big girl(F) and this little girl(NT) played well.’

Recall from above that unlike conjuncts (indeed, anything but a group of feminine conjuncts) yield masculine plural. Although (30) contains a mix of genders (feminine and neuter), the preferred form for the predicate is nevertheless feminine plural.

Summarizing, gender resolution for animates proceeds by consulting the meaning (‘natural gender’, i.e. sex) of the coordinate NP and not the form (‘grammatical gender’) of the conjunct NPs.

### 5. Animates and genders with semantic correlates.

Grammatical genders often have semantic correlates: masculine gender correlates with male sex and feminine gender with female sex. What is the exact nature of this ‘correlation’? A careful answer to this question will effectively dissolve the problem of gender resolution in coordinate structures.

Consider how an NP receives its gender feature. Typically an NP inherits its gender from the lexical gender feature of its head noun: the NPs *la table* and *la sentinelle à la barbe* have feminine gender because the underlined head noun is inherently specified in the lexicon as feminine. The grammatical mechanism responsible for the lexical gender feature on simple (non-coordinate) NPs like *la personne avec la barbe* is the Head Feature Principle or its X-bar theoretic equivalent: ‘head features’ are shared between the

head word and the phrase it heads. Gender is a head feature; the head noun (stem) *personne* bears the feature [GENDER FEM]; hence the NP itself bears this feature. We will call this the *inherent (grammatical) gender* of the nominal.

This source of grammatical gender is lacking in either of two situations: when the head noun is lexically genderless; or where the phrase lacks a head noun altogether. As an example of the former, consider proper names (31) and certain sex-neutral nouns, such as French *journaliste* (32) and Serbo-Croatian *sudija* ‘judge’ (33).

(31) a. Le (m.sg) Professeur Dupont est beau (m.sg).

‘Professor Dupont (a man) is handsome.’

b. La (f.sg) Professeur Dupont est belle (f.sg).

‘Professor Dupont (a woman) is beautiful.’

(32) a. Le (m.sg) journaliste est compétent (m.sg).

The (male) journalist is competent.

b. La (f.sg) journaliste est compétente (f.sg).

The (female) journalist is competent.

(33) a. Taj stari sudija je dobro sudio.

that.M old.M judge AUX well judged.M

‘That old (male) judge judged well.’

b. Ta stara sudija je dobro sudila.  
 that.F old.F judge AUX well judged.F  
 ‘That old (female) judge judged well.’

c. \*To mlado sudija je dobro sudilo.  
 that.N young.N judge AUX well judged.N  
 (‘That young judge judged well.’)

Neuter is impossible in (33c), a matter we return to below.

The following principle is operating:

(34) Gender agreement with an animate NP that lacks inherent gender is always interpreted semantically.

*Professeur Dupont*, *journaliste* and *sudija* lack inherent gender. So by (34), such nouns denote males or females depending as they trigger masculine or feminine agreement. Note that this generalization applies only to NP’s lacking inherent grammatical gender. Semantic interpretation of gender is blocked by inherent gender, e.g. in *la sentinelle*.

Next consider plurals:

(35) a. Les Dupont sont belles (f.pl) / beaux (m.pl).  
 ‘The Duponts (all women / a male or mixed sex group) are beautiful.’

b. Les journalistes sont compétentes (f.pl) / compétents (m.pl).  
 ‘The (female / male or mixed sex) journalists are competent.’

Feminine plural is used for a group of females, while masculine (plural) agreement indicates a group of males or a mixed-sex group. Pronouns (36) and sex-differentiated common nouns (37) follow the same pattern:

(36) Ils (m.pl) / Elles (f.pl) parlent dans la cuisine.

‘They (a male or mixed-sex group / a female group) are talking in the kitchen.’

(37) a. un Américain (m.sg): male American

b. une Américaine (f.sg): female American

c. les Américains (m.pl): male or mixed sex Americans

d. les Américaines (f.pl): female Americans

According to a long-noted cross-linguistic generalization (Corbett 1991:292, citing Greenberg 1966 and Schane 1970; Farkas and Zec 1995), the gender used for mixed sex groups in a given language is the same for coordinate structures (*Pierre et Marie*), non-sex-differentiated plural proper nouns (*les Dupont*), non-sex-differentiated plural common nouns (*les journalistes*), sex-differentiated plural common nouns (*les Américains*), and plural pronouns (*ils*). The other languages discussed in this paper show the same generalization. A Serbo-Croatian masculine plural pronoun (*oni*) or sex-differentiated common noun (e.g. *Amerikanci*) refers to a male or mixed-sex group, while the feminine forms (*one, Amerikanke*) refer to a group of females, paralleling the coordinate structure resolution rule above. In Icelandic, neuter plural is used for mixed-sex coordinate structures, as well as pronouns (*þau* ‘they.NT’, a mixed sex group).

The French and Serbo-Croatian facts above follow if the gender features have the semantic interpretations in (38) below. Serbo-Croatian neuter lacks a semantic correlate,

as shown in (33c). So we distinguish two types of genders, those with semantic correlates, such as masculine and feminine (hereafter *s-genders* for semantic-gender), and those lacking a semantic correlate, such as neuter in some languages (*e-genders* for empty or expletive gender).

(38) Semantic interpretations of French or Serbo-Croatian *s-genders*

(applying only to NPs lacking inherent gender; see (34))

- a. feminine: 'female'
- b. masculine: 'non-female'

Sex is a distributive property: a group is female iff all of its members are female, and male iff all of its members are male. As a rule the set of distributive properties of a group is just the intersection of the sets of distributive properties of each of the group's members. Hence for a singular NP the semantic feature 'female' in 38a entails (or perhaps presupposes) that the NP refers to a female, while for a plural NP the semantic feature 'female' means that the NP refers to a group of females. However, the negatively defined semantic feature 'non-female' is not distributive (since negation itself is not distributive): a 'non-female' group is a group that fails to meet the description of a 'female' group (namely a group of females). Thus any group containing at least one male is a 'non-female' group.<sup>7</sup>

Returning now to (animate) coordinate structures, we find that the problem of resolution has vanished. A coordinate NP lacks a head noun.<sup>8</sup> Hence it lacks an inherent lexical gender feature, so by (34) an agreeing predicate assigns semantic gender. Mixed sex coordinate NPs trigger masculine gender agreement (in French, e.g.) because masculine has the appropriate meaning.

## 6. The origin of inanimate resolution rules.

Let us assume that the inanimate resolution rules are grammaticalizations of the logic of semantic combination just discussed. As just noted, the set of distributive properties of a group is just the intersection of the sets of distributive properties of each of the group's members. The same logic applies to (privative) distributive morphological features. The set of privative features associated with a group is just the intersection of the sets associated with each member of the group.

Corresponding to the semantic values 'female' and 'non-female' (see 38), each positively specified gender is represented as unary set such as {F}, and each negatively specified gender such as non-feminine (i.e. masculine) as a null set { } (cp. Vincent and Börjars 2000). E-genders like neuter can be either unary or null sets: Serbo-Croatian neuter is {N} while Icelandic neuter is { }, as we will see below. Since they lack semantic correlates, e-genders are exempt from the logic of distributivity: there is no sense in which a 'group of neuter items' is a 'neuter group'. So e-gender features will be systematically removed from the computation of gender features for group-denoting NP's.

To remove any e-genders from the calculated intersection set, we intersect it with the set  $G_s$  of all s-gender features available in the language. In the following proposed universal rule for the gender value of aggregate discourse referents, the biconditional 'A $\Leftrightarrow$ B' means that any representation satisfying description A must also satisfy B, and vice versa:

(39) Rule for deriving gender of inanimate aggregate discourse referents:

$$\text{D.R.}\{[\text{GEND } \gamma_1], \dots [\text{GEND } \gamma_n]\} \Leftrightarrow \text{D.R.}[\text{GEND } \gamma_1 \cap, \dots \cap \gamma_n \cap G_s]$$

where  $\gamma_1 \dots \gamma_n$  are null or unary sets and  $G_s$  is the set of s-gender features in the grammar.

According to (39) the GEND(er) value for an aggregate discourse referent is just the intersection of the s-gender values of the discourse referent's elements. In a coordinate structure those elements correspond to the conjuncts; see below. This solves the problem plaguing the set-based accounts of Dalrymple and Kaplan 2000 and Vincent and Börjars 2000 (see Section 3) and correctly accounts for the Serbo-Croatian/ Slovene type of language. The system is illustrated with French, Serbo-Croatian, and Icelandic below. The semantic correlate of each s-gender is shown in parentheses.

(40) French.  $G_s = \{F\}$

FEM:  $\{F\}$  (< 'female')

MASC:  $\{\}$  (< 'non-female')

MASC & MASC = MASC       $\{\} \cap \{\} \cap G_s = \{\}$

FEM & FEM = FEM       $\{F\} \cap \{F\} \cap G_s = \{F\}$

MASC & FEM = MASC       $\{\} \cap \{F\} \cap G_s = \{\}$

(41) Serbo-Croatian.  $G_s = \{F\}$

FEM:  $\{F\}$  (< 'female')

MASC:  $\{\}$  (< 'non-female')

NEUT:  $\{N\}$  (e-gender)

MASC & MASC = MASC       $\{\} \cap \{\} \cap G_s = \{\}$

FEM & FEM = FEM       $\{F\} \cap \{F\} \cap G_s = \{F\}$

NEUT & NEUT = MASC	$\{N\} \cap \{N\} \cap G_s = \{ \}$
MASC & FEM = MASC	$\{ \} \cap \{F\} \cap G_s = \{ \}$
MASC & NEUT = MASC	$\{ \} \cap \{N\} \cap G_s = \{ \}$
FEM & NEUT = MASC	$\{F\} \cap \{N\} \cap G_s = \{ \}$

(42) Icelandic.  $G_s = \{M, F\}$

MASC: $\{M\}$	(< 'male')
FEM: $\{F\}$	(< 'female')
NEUT: $\{ \}$	(e-gender)

MASC & MASC = MASC	$\{M\} \cap \{M\} \cap G_s = \{M\}$
FEM & FEM = FEM	$\{F\} \cap \{F\} \cap G_s = \{F\}$
NEUT & NEUT = NEUT	$\{ \} \cap \{ \} \cap G_s = \{ \}$
MASC & FEM = MASC	$\{M\} \cap \{F\} \cap G_s = \{ \}$
MASC & NEUT = MASC	$\{M\} \cap \{N\} \cap G_s = \{ \}$
FEM & NEUT = MASC	$\{F\} \cap \{N\} \cap G_s = \{ \}$

While permitting the Serbo-Croatian / Slovene type, this theory also rules out certain unattested resolution patterns. The following pattern, like Serbo-Croatian or Slovene but with masculine and neuter genders reversed, cannot be generated (assuming neuter is an e-gender):

(43) \*Unattested. (m, f, nt)

1. FEM & FEM = FEM

2. Elsewhere (NEUT & NEUT; MASC & MASC; and mixes): NEUT

For any unary or null sets  $X$  and  $Y$ , if  $X \neq Y$  then  $X \cap Y = \{ \}$ ; so the null set represents the resolution gender. Since the sets representing the genders must be distinct, there can be at most one null set in the gender paradigm. If neuter is represented as the null set, then masculine must be non-null (e.g.  $\{M\}$ )— but this would yield the Icelandic pattern above, not (43). This result does not follow from feature computation mechanisms that are not rooted in the semantics.

Note that our rule (39) is not specific to coordinate structures, but applies more generally to aggregate discourse referents. This is because the cross-linguistic generalization noted above— that pronouns, *inter alia*, invariably follow the same resolution pattern as coordinate structures, in a given language— applies not only to animates but inanimates as well. For example, feminine plural is the resolution gender for Rumanian inanimates, both in coordinate structures (see below) and in pronouns, the latter illustrated in this discourse:

(44) Să vopsim podeaua odată cu plafonul.

C paint.1pl floor.DEF[F] same.time with ceiling.DEF[M]

Vor fi amândouă albe.

will be both white.F.PL

‘Let’s paint the floor<sub>i</sub> when we paint the ceiling<sub>k</sub>. They<sub>i+k</sub> will both be white.’

The demise of coordinate structure resolution, in favor of a discourse referent rule, has a further consequence. On the common view that the relevant discourse referents are denotations of maximal extended projections of nominals (NP or DP, depending on one's analysis), but that sub-constituents of nominals are not referential, it follows that gender resolution should not be possible when coordinating smaller sub-constituents of nominals. In fact it has been observed for NP-internal concord that resolution cannot apply and only partial agreement is possible (Serbo-Croatian; Corbett 1983, p. 209-210):

- (45) najsvirepije / \*najsverepiji [kazne i mucenja]  
 cruellest.F.PL cruellest.M.PL punishments(F.PL) and tortures(NT.PL)  
 'the cruellest punishments and tortures'

Only partial agreement with the nearer conjunct is possible.

## 7. Origins of the featural representations of grammatical genders.

Obviously the featural definitions of the genders— whether they are specified as unary or null sets— crucially affect the results. Where do these feature assignments come from?<sup>9</sup> In most languages the grammatical features directly correspond to semantic features of the language. From the French semantic features 'female' ~ 'non-female', we get the grammatical features {F} ~ { }, and so on, mutatis mutandis, for the other languages.<sup>10</sup> E-genders can be of either type: Serbo-Croatian neuter is unary ({N}) while Icelandic neuter is null ({ }).

The tendency towards parallelism between semantic and syntactic resolution patterns can be explained as a consequence of *abductive inference* (also called

*hypothetical inference or abduction*).<sup>11</sup> The philosopher C. S. Peirce explained abduction as tentatively accepting the results of reversing modus ponens:<sup>12</sup>

‘If  $\mu$  were true,  $\pi$ ,  $\pi'$ ,  $\pi''$ ’ would follow as miscellaneous consequences. But  $\pi$ ,  $\pi'$ ,  $\pi''$  are in fact true.

$\therefore$  Provisionally, we may suppose that  $\mu$  is true.

This kind of reasoning is often called *adopting a hypothesis for the sake of explanation of known facts.*’ (Peirce, 1992)

Grammar acquisition is the development of explanations for the ‘known facts’ ( $\pi$ ,  $\pi'$ ,  $\pi''$ ) about the input corpus. Grammatical gender features hypothesized (‘abduced’) on the basis of the French *animate* agreement facts would be {F} and { }, correctly yielding the pattern in (8) above: if all conjuncts are feminine, use feminine plural; elsewhere use masculine plural. The vast majority of conjoined *animates* confirm this hypothesis, the only counterexamples being the special cases discussed above like *sentinelle* and *personne* which are feminine even when the referent is male. Hence this hypothesis is grammaticalized as the featural representation of the grammatical genders, applying to inanimates.

As invoked here, abductive inference is not part of the grammar, but rather a functional mechanism predicting the likely development path for grammar. Other factors could contravene the effects of abductive inference, leading to a heterogenous system with different patterns for animate and inanimate agreement. For example, in Rumanian, mixed sex animates trigger masculine plural, while inanimate gender mixes resolve to the feminine plural (Corbett, 1991:288-9; Farkas and Zec, 1995; Moosally, 1998). The

pattern for animates is identical to that of French, Serbo-Croatian, etc. (examples from Moosally, 1998):

- (46) Maria s|| tata      au fost    văzut||      fumînd    marijuana.  
 Maria and father   were      seen.M.PL   smoking   marijuana  
 ‘Maria and father were seen smoking marijuana.’

Pronouns and sex-differentiated common nouns pattern as expected, with the masculine plural *ei* ‘they.M.PL’ and, e.g. *scriitori* ‘male writers’ (rather than *scriitoare* ‘female writers’) used for mixed sex groups.

Rumanian nouns like *santinelă* ‘sentry’, which is grammatically feminine, behave as in the languages described above (§4): *sex* rather than *gender* determines agreement in coordinate structures, as first noted by Farkas and Zec (1995):

- (47) Maria    s||      santinela      au fost              căsătorit||  
 Maria      and      sentry.DEF      PST.PL were      married.M.PL  
  
 de catre    preotul      local.  
 by          priest.DEF    local

‘Maria and the sentry were married by the local priest.’

So far Rumanian is just like French. Following the analysis above, we posit that feminine/ masculine agreement indicate ‘female’/ ‘non-female’ semantics, a meaning arising wherever grammatical gender does not preempt it.

Unlike animates, which resolve to masculine plural, inanimates resolve to feminine plural (Farkas and Zec, 1995, p. 96):

(48) MASC & MASC => MASC.PL

- a. Nucul s¶ prunul sunt uscat¶.  
walnut.DEF[M] and plum.DEF[M] are dry.M.PL  
'The walnut tree and the plum tree are dry.'

All other combinations of MASC, FEM, or NEUT => FEM.PL

- b. Podeaua s¶ plafonul sunt albe.  
floor.DEF[F] and ceiling.DEF[M] are white.F.PL  
'The floor and the ceiling are white.'
- c. Scaunul s¶ dulapul sunt albe.  
chair.DEF[N] and cupboard.DEF[N] are white.F.PL

If all conjuncts are masculine we get masculine plural agreement (47a). All other combinations of masculine, feminine or neuter yield feminine plural agreement (47b-c). This shows clearly that the resolution mechanism for inanimates is independent of the determinants of animate gender agreement.

Why is Rumanian resolution asymmetrical? A clue is found in the morphological gender system of that language. The so-called neuter gender is really a class of inanimate<sup>13</sup> nouns that are masculine in the singular but feminine in the plural (Bley-

Vroman, 1977; Farkas and Zec, 1995).<sup>14</sup> Thus for plurals, feminine is the gender with the broadest distribution—the unmarked or ‘elsewhere’ gender, hence used for resolution.<sup>15</sup>

Further evidence for the separation between animate and inanimate resolution is an asymmetry in Serbo-Croatian noted by Corbett (1983, 1991). He reports many textual exceptions to the resolution rule, involving overapplication of the masculine plural default to coordinate structures consisting entirely of feminine conjuncts, as in this example (from Corbett, 1991, 302):<sup>16</sup>

(49) *stula*                    *i* *staka*                    *bili*                    *su* *sve* *sto* *je* *tada**h**ja*  
wooden.leg(FEM) and crutch(FEM) been.M.PL are all that je of.that.time  
  
*medicina* *mogla* *da*    *mu*                    *pruži*  
medicine could that him.DAT offer

‘A wooden leg and a crutch were all that medical science of that time could offer him.’

Interestingly, Corbett notes that ‘I have found no examples of masculine agreement with feminine nouns denoting persons’ (Corbett, 1991, 302). Thus we do not find violations of the semantic content of genders, while the weaker, derivative, autonomous resolution rule for inanimates is occasionally violated.

Summarizing, the principles governing resolution follow directly from the logic of distributivity. Denotations like ‘female’ correspond in the morphosyntactic domain to privative morphological features, while negatively defined denotations like ‘non-female’ correspond to the *lack* of a privative morphological feature, represented by the null set.

Semantic and grammatical feature representations, while shown to be autonomous, tend to be parallel due to the effects of abductive inference.

### 8. How inherent gender blocks semantic gender

A crucial aspect of this analysis is that gender features have semantic content only where the agreement trigger lacks inherent gender. This blocking effect can be captured formally in Lexical Functional Grammar. Unification-based formalisms such as LFG model agreement as a correlation arising because features of a single grammatical object, namely the functional structure or f-structure, are specified by two distinct elements in the sentence. This specification occurs via equations, of two types: *defining equations*, which build the f-structure, and *constraining equations*, notated with  $=_c$ , which check the f-structure for the presence of a feature. Suppose that gender agreement morphology encodes a disjunction between two equations, a defining equation for the semantic gender (i.e., sex) of the agreement trigger, and a constraining equation for its semantically null grammatical gender, as in the following example.

(50) a. *compétente*, A  $(\uparrow\text{PRED}) = \text{'competent} < (\uparrow\text{SUBJ}) >'$

$$(\uparrow\text{SUBJ GEND}) =_c \{F\} \vee (\uparrow\text{SUBJ GEND}) = \text{'female'}$$

$$(\uparrow\text{SUBJ NUM}) = \text{SG}$$

b. *compétent*, A  $(\uparrow\text{PRED}) = \text{'competent} < (\uparrow\text{SUBJ}) >'$

$$(\uparrow\text{SUBJ GEND}) =_c \{ \} \vee (\uparrow\text{SUBJ GEND}) = \text{'non-female'}$$

$$(\uparrow\text{SUBJ NUM}) = \text{SG}$$

Values in quotes, here ‘female’ and ‘non-female’, are semantic values, which add to the semantic form the presupposition of reference to a female/non-female. The values {F} and { }, on the other hand, are semantically vacuous. The lexical entries for nouns like *table* and *personne* have the semantically vacuous feminine gender (represented by the set {F}), while *Dupont* and *journaliste* are unspecified for gender:

- (51) a. *table* ‘table’, *personne* ‘person’, *sentinelle* ‘sentry’, etc.: ( $\hat{\text{GEND}}$ ) = {F}  
 b. *crayon* ‘pencil’, etc.: ( $\hat{\text{GEND}}$ ) = {M}  
 c. *Dupont* (name), *journaliste* ‘journalist’, etc.: no GEND equation

In sentence (52a) the variant of *compétente* specifying a ‘female’ subject would conflict with the {F} gender of *personne*, so the disjunct specifying {F} must be selected instead. Thus the adjective in (52a) is silent regarding the sex of the subject referent. Conversely, the variant of *compétente* selecting a {F} subject is unavailable in (52b). The constraining equation ( $\hat{\text{SUBJ GEND}} =_c \{F\}$ ) would check the f-structure for the feature {F} and fail to find it, since *Dupont* lacks inherent gender (see 51c). Only the value ‘female’ is available, so Dupont must refer to a female.

- (52) a. [La personne à la barbe]<sub>[GEND {F}]</sub> est compétente<sub>[SUBJ GEND =<sub>c</sub> {F}]</sub>.  
 ‘The bearded person is competent.’  
 b. Dupont est compétente<sub>[SUBJ GEND = ‘female’]</sub>.  
 ‘Dupont (a female) is competent.’

In sum, the gender feature marked on agreement targets has two possible functions: it can check for the presence of a semantically vacuous grammatical agreement feature

inherent in the trigger NP; or it can have semantic content.

Being exocentric, coordinate structures lack inherent gender, so they generally trigger semantic agreement whenever possible (e.g. when they denote animates). The special ‘Rule for deriving gender of inanimate aggregate discourse referents’ in (39) is a stopgap for those cases where semantic agreement fails but the rest of the grammar also fails to provide an inherent grammatical gender value. Next we consider why some languages lack such a stopgap.

### **9. ‘Syntactic’ and ‘semantic’ gender resolution revisited.**

According to Corbett (1991), languages of the world can be classified according to whether they employ syntactic resolution, semantic resolution, or some combination of the two. The present claim is that *all* languages employ semantic resolution. When the domain of semantic classification (male/female) extends only to sexed items, the discourse referent rule (39) covers the residue outside that domain. On the present assumptions, a pure semantic resolution language is one where the domain of semantic classification exhausts the entire universe of concepts, so that there is no residue for syntactic resolution to cover. Recall the Luganda examples (18-19) above, where classes 2 and 8 are ‘resolution classes’ for humans and non-humans, respectively. Following our earlier approach we hypothesize these semantic genders for Luganda:

(52) Luganda (NC 1/2, 3/4, 5/6, 7/8, 9/10, etc.)

1. NC 1/2: ‘human’
2. NC 7/8: elsewhere (‘non-human’).

Unlike systems based on sex classification, the Luganda system has human (NC 1/2) and non-human (NC 7/8) classes that exhaustively partition the concepts of the world. This

means that in Luganda there is no residue to be covered by syntactic rules.<sup>17</sup> The Luganda type system is also found in Dzamba, Likila, Lingala, and Swahili (Bokamba 1985, cited in Corbett 1991, p.275-6)<sup>18</sup>. Corbett notes that while the Bantu systems vary in the details, and there are descriptive complications (partial agreement; homophony between conjunction and comitative marker), it is nevertheless valid that ‘In almost all the Bantu languages investigated we find evidence for semantic resolution based on the human/non-human distinction.’ (Corbett 1991, p. 276).

### 10. Competition between semantic and syntactic resolution.

In languages employing both principles, semantic gender assignment generally blocks the syntactic gender resolution, as we saw from sex-gender mismatches like *sentinelle*. However, this blocking effect is not always complete. The syntactic resolution system can sometimes compete with the semantic interpretations of genders.

The first example comes from Serbo-Croatian. We saw in (30) above that feminine plural agreement is preferred for a coordinate NP denoting a group of females, even though the conjuncts are not all morphologically feminine. However, feminine agreement appears to require at least one morphologically feminine conjunct:

- (53) Ovo        moje        devojč~~e~~    i    ovo        tvoje        luc~~e~~  
           this.NT.SG   my.NT.SG   girl.NT.SG   and this.NT.SG   your.NT.SG   doll.NT.SG.  
           su        se    lepo    \*igrale        /    igrali.  
           aux.pl   refl.   well   played.F.PL   /   played.M.PL  
           ‘My girl(NT) and your “doll” (= girl, NT) played well.’

With no morphologically feminine conjuncts at all, feminine agreement becomes difficult

or impossible. Similar facts are reported for Ndebele (Moosally, 1998). The Class 1/2plural animate resolution class can apply only if at least one of the conjuncts belongs to class 1/2 (data from Moosally, 1998, p. 91-92):

- (54) a. Um-angoye le-nja ba-zazwan-an-a.  
1a-cat CONJ.5-dog 1/2pl-friends-RECIP-PAST  
'The cat and the dog were friends.'
- c. \*U-sane le-nkazana ba-hle.  
11-baby CONJ.5-girl 2-pretty  
'The baby and the girl are pretty.'

Similarly, some French speakers report uncertainty or disagreement about the judgments in (24), suggesting that the morphological rule is competing with the semantic one.

## 11. Conclusion

The fact that gender need not have a direct semantic basis— *la table* is feminine, but does not denote a female— does not mean that semantics can be safely ignored. It was argued that gender morphology on agreement targets (modifiers, predicates, determiners, etc.) indicates either semantic class or semantically vacuous grammatical agreement. Semantically vacuous grammatical agreement arises whenever the NP trigger is marked for the agreement feature due to the NP's internal morphosyntactic structure— specifically, when the NP contains a head noun that is lexically marked for gender. On the other hand, where the NP lacks an inherent grammatical gender feature, then target gender features have semantic content— if the nominal lies within the domain of semantic classification. If not then grammatical resolution arises. Semantic and

grammatical resolution are autonomous processes, but both are governed by the same logic of distributivity, and they tend to be parallel due to abductive inference. Summarizing, we find the following hierarchy of defaults:

(55) Gender assignment hierarchy.

1. Inherent grammatical gender (if NP has a head with a gender value). Else:
2. Semantic gender (if NP's denotation is within the domain of the semantic classification system). Else:
3. Rule for deriving gender of inanimate aggregate discourse referents.

'Elsewhere' enters the picture in two ways. First, the traditional notion of an unmarked/default/ elsewhere gender must be preserved to capture the range of attested phenomena. Second, the application of the three sources of gender summarized in (55) is governed by a hierarchy of defaults.

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## Notes

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<sup>2</sup>Dalrymple and Kaplan 1998 outline two possible solutions for Slovene: either agreeing elements distinguish between coordinate and non-coordinate neuter plural NP's, or the conjunction word itself could contribute a crucial feature. If we are correct in concluding (§8) that languages lack resolution rules specific to coordinate structures, then neither solution is available.

<sup>3</sup> The observations in this section are inspired by those of Farkas and Zec 1993 on Rumanian.

<sup>4</sup> Following the Bantuist tradition, a noun is lexically associated with a representation of the form  $x/y$ , where  $x$  is the noun's singular Noun Class and  $y$  is its plural Noun Class.

<sup>5</sup> Some speakers prefer to reverse the order of conjuncts in (22), so that the masculine is closer to the agreement target. But feminine agreement in (22) is impossible, so this is not partial agreement.

<sup>6</sup> There is cross-speaker variation in some of these judgements. See Section 10 below. The test in (24) is based on Farkas and Zec 1995.

<sup>7</sup> A variant of this account would replace 'non-female' in 38b with 'animate'. A general blocking principle would ensure that the most informative alternant in a paradigm must be selected over less informative ones. For females, feminine would block masculine since 'female' is more informative than 'animate'; other animates would be masculine.

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Blocking principles of this kind have been proposed by the structuralists (Roman Jakobson, i.a.), in studies of pragmatics (cp. Grice's Maxim of Quantity), and in various forms within the generative paradigm, including the faithfulness constraints of Optimality Theory. For a recent application to agreement morphology see Blevins 2000.

<sup>8</sup>Or perhaps the conjunction is the (functional) head (Johannessen 1996); or coordinate NPs are multiply headed by the conjunct NPs (Farkas and Ojeda 1983). In any case, the important point is that they lack the usual clear projection line from a unique  $N^0$  head to the NP. Partial agreement may be analyzed as a special case where head features are inherited from one conjunct, or where one conjunct is the specifier (Johannessen 1996).

<sup>9</sup> This is a question that Dalrymple and Kaplan (2000) do not ask. Their set-theoretic representations for the genders are stipulated.

<sup>10</sup> An interesting exception to this parallelism is Rumanian, discussed below.

<sup>11</sup> Peirce was an early theorist of abduction; more recent applications to linguistics include Strigin 1999 and Hobbs et al 1993. For a related argument see Corbett 1983:202.

<sup>12</sup> Modus ponens states that from  $p \rightarrow q$  and  $p$ , we deduce  $q$ . Abduction assumes  $p \rightarrow q$  and  $q$ , and tentatively concludes  $p$ .

<sup>13</sup> The term 'inquate', characterizing nouns belonging to different genders in singular and plural, comes from the notion that there are too few members to make a quorum (Corbett 1991, 1999).

<sup>14</sup> Neuter nouns have some declensions not found in masculine or feminine (Mallinson 1986), but trigger masculine when singular, feminine when plural.

<sup>15</sup> Farkas and Zec (1995) elegantly analyze the three Rumanian genders with a single feature [F]: masculine nouns are [-F], feminine nouns are [+F], and neuter nouns are

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unmarked for [F]. Defaults fill in unspecified [F] values as minus in the singular and plus in the plural. This unifies the treatment of coordinates and neuters.

<sup>16</sup>These cannot be due to the failure of agreement altogether. The Serbo-Croatian ‘neutral gender’— the form of a verb when there is no nominative NP subject at all— is neuter (singular), and not masculine.

<sup>17</sup>In Luganda, as in many Bantu languages, mixing human and non-human conjuncts is strongly dispreferred; a comitative construction is used instead. If it is forced then the form selected is Noun Class 2. See Moosally (1998) for description and discussion.

<sup>18</sup> In Swahili the crucial semantic feature is animacy rather than humanness.