Syntax-Semantic Interface Issue
Louisa Sadler (University of Essex)

- **Numerally quantified NPs:** Numeral noun combinations are singular and show number/gender agreement within the NP. NQNPs control singular agreement on the verb unless the NP denotes a human in which case PL is optionally permitted. It appears from (8) that if an individuated interpretation is signalled by PL on a CNVB dependent clause, non-individuated SG marking is not subsequently possible

- **Coordination:** the standard pattern involves resolved agreement. A further pattern illustrated in (13) involves a discontinuous coordination: the verb follows one conjunct (with which it agrees) and the remaining conjunct is separate. The coordinating particle is affixed to each conjunct. The resolution rules are straightforward, but (18) shows that if a human denoting term is in gender III it still determines I/II PL on the verb. Supplementary data shows that this (single) noun determines III.SG and I/II.PL agreement.

- **Disjunction:** With human disjuncts, 5 speakers accept and 3 speakers reject plural agreement, in both NP-V and V-NP orders. In supplementary data with inanimate disjuncts, the plural pattern is found in both orders for all speakers. The CCA examples given all involve human disjuncts: all speakers permit CCA in V - NP order (22), and 2 out of 8 speakers permit CCA in NP-V order.They (all) also permitted separation of the disjuncts and NP-V agreement (avoid the problem by separating the disjuncts and agreement with the preceding disjunct, shown in (21)).

- **Disjunction marked with concessive particle:** allows CCA in the V-NP order (29). All also permit it in the NP-V order (30) and allows the single disjunct agreement pattern by separating the disjuncts, as in (25), which is similar to (21). Plural agreement is found with animates (human?), but apparently not with inanimates.

- **Nominal predications:** The examples indicate that the copula may agree with the subject or with the predicate.

1 Numerally Quantified NPs

- a numerally quantified human NP can control either SG or PL verbal agreement, other numerally quantified NPs control SG verbal agreement

- NP-internally, a numerally quantified NP shows SG CONCORD (Kathol, 1999; Sadler, 1999, 2003; Corbett, 2001; Wechsler and Zlatić, 2000; King and Dalrymple, 2004)

- our baseline assumption is that verb-argument agreement is INDEX agreement

- so, the INDEX NUM of a human nominal can differ from its CONC value

NB: if numerally quantified NPs show singular concord, so we would expect any further NP-internal modifiers to be SG if NP-internal agreement uniformly targets the CONC features, in

the case where the head noun is human, just as it is when the head noun is non-human (see (3a)). We don't seem to have an example of this sort.

We start with the SG agreement case. On the (INDEX/CONCORD) view the structure of the NPs (3a) is as follows, and (1) is similar.

(1)
$$\begin{bmatrix} \text{PRED} & \text{'BULL'} \\ \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{GEND} & \text{III} \end{bmatrix} \\ \text{CONC} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{GEND} & \text{III} \end{bmatrix} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{'THREE'} \end{bmatrix}, \begin{bmatrix} \text{PRED} & \text{'BIG'} \end{bmatrix} \right\} \end{bmatrix}$$

So the entries involved here are straightforward. (I give them verbosely for now, without templates).

(2) *ɬippu/three*.III.SG
$$\begin{aligned} &(\uparrow \text{ PRED}) = \text{'THREE'} \\ &((\text{ADJ} \in \uparrow) \text{ CONC NUM}) =_c \text{SG} \\ &((\text{ADJ} \in \uparrow) \text{ CONC GEND}) =_c \text{III} \end{aligned}$$

(3) *ans/bull*
$$\begin{aligned} &(\uparrow \text{ PRED}) = \text{'BULL'} \\ &(\uparrow \text{CONC NUM}) = \text{SG} \\ &(\uparrow \text{CONC GEN}) = \text{III} \\ &(\uparrow \text{IND NUM}) = \text{SG} \\ &(\uparrow \text{IND GEN}) = \text{III} \\ &(\uparrow \text{CASE}) = \text{ABS} \end{aligned}$$

The nominal f-structure for **(2)** is as follows:

(4)
$$\begin{bmatrix} \text{PRED} & \text{'LAD'} \\ \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{PL} \\ \text{GEND} & \text{I} \end{bmatrix} \\ \text{CONC} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{GEND} & \text{I} \end{bmatrix} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{'THREE'} \end{bmatrix} \right\} \end{bmatrix}$$

So while SG nonhuman Ns have their INDEX NUM fixed lexically, this is not the case for human denoting Ns (typically in CL I or II). First approximation in (5)

(5) *lo/lad* (↑ PRED) = 'LAD'
(↑ CONC NUM) = SG
(↑ CONC GEN) = I
{(↑ IND NUM) = SG | (↑ IND NUM) =$_c$ PL}
(↑ IND GEN) = III
(↑ CASE) = ABS

In the case of (2), the verbal agreement defines the SUBJ INDEX NUM as PL, but the intention is that it can only combine with plural NPs and numerally quantified (human) SG nouns: (5) is too permissive as it will permit it to occur anywhere that a plural verbform defines it as INDEX NUM PL. Hence what we want is for it to default to SG unless defined as PL by a NQ. (An alternative is to change our assumption that verbal agreement is defining, and make it constraining - as usual we explore the ramifications of the more uncomfortable route).

- the INDEX of a human-denoting SG N is SG unless numerally quantified.

(6) *lo/lad* (↑ PRED) = 'LAD'
(↑ CONC NUM) = SG
(↑ CONC GEN) = I
{(↑ IND NUM) = SG | (↑ IND NUM) =PL} ∧ (↑ ADJ ∈ TYPE) =$_c$ NQ }
(↑ IND GEN) = III
(↑ CASE) = ABS

(7)
$$\begin{bmatrix} \text{PRED} & \text{'LAD'} \\ \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{PL} \\ \text{GEND} & \text{I} \end{bmatrix} \\ \text{CONC} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{GEND} & \text{I} \end{bmatrix} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{'THREE'} \\ \text{TYPE} & \text{NQ} \end{bmatrix} \right\} \end{bmatrix}$$

Supplementary notes indicate that the PL verb pattern is permitted only by 7 out of 12 informants, suggesting that the (↑ IND NUM) =PL} ∧ (↑ ADJ ∈ TYPE) =$_c$ NQ disjunct is not available for all speakers.

As ever there are several alternatives which may be attractive in various ways. One is to have the relevant NQ paradigms define the INDEX NUM value of the nominal head.

(8) *łib-aw/three*I.SG (↑ PRED) = 'THREE'
((ADJ ∈ ↑) CONC NUM) =$_c$ SG
((ADJ ∈ ↑) CONC GEND) =$_c$ III
((ADJ ∈ ↑) IND NUM) = SG|PL

(9) *lo/lad*
$(\uparrow \text{ PRED}) = \text{`LAD'}$
$(\uparrow \text{CONC NUM}) = \text{SG}$
$(\uparrow \text{CONC GEN}) = \text{I}$
$\{(\uparrow \text{IND NUM}) = \text{SG} \mid (\uparrow \text{ADJ} \in \text{TYPE}) =_c \text{NQ}\}$
$(\uparrow \text{IND GEN}) = \text{III}$
$(\uparrow \text{CASE}) = \text{ABS}$

A different approach would assume that the numeral is in fact the f-structure head. The idea would then be that NQ with non-human arguments define a SG INDEX while those with human arguments define a disjunction of values. Adjuncts of the head noun would be ADJ in the f-structure of the head noun.

(10) *ɬib-aw/three (*I.SG*)*
$(\uparrow \text{ PRED}) = \text{`THREE}\langle \text{ OBJ} \rangle\text{'}$
$(\uparrow \text{ INDEX NUM}) = \text{PL}|\text{SG}$
$(\uparrow \text{ OBJ CONC NUM}) =_c \text{SG}$

(11) *ɬippu/three (*III.SG*)*
$(\uparrow \text{ PRED}) = \text{`THREE}\langle \text{ OBJ} \rangle\text{'}$
$(\uparrow \text{ INDEX NUM}) = \text{SG}$
$(\uparrow \text{ OBJ CONC NUM}) =_c \text{SG}$

(12)
$$\begin{bmatrix} \text{PRED} & \text{`THREE}\langle \text{ OBJ} \rangle\text{'} \\ \text{INDEX} & [\text{NUM} \quad \text{PL}] \\ \text{OBJ} & \begin{bmatrix} \text{PRED} & \text{LAD} \\ \text{INDEX} & [\text{NUM} \quad \text{SG}] \\ \text{CONC} & [\text{NUM} \quad \text{SG}] \\ \text{ADJ} & \{[\text{PRED} \quad \text{`YOUNG'}]\} \end{bmatrix} \end{bmatrix}$$

However several problems arise with this sort of approach (i) it is odd that the NQ shows CONC agreement with its own OBJ and (ii) the externally assigned CASE is realized not on the NQ but on the nominal head. **To summarize:**

1. NQ modify CONCORD NUM = SG heads.
2. In PL nouns and non-human SG nouns, INDEX NUM=CONC NUM.
3. Human SG nouns are INDEX NUM= SG unless modified by a NQ, in which case they may be INDEX NUM = PL.
4. I assume this reflects a semantic difference with non-aggregate, individuated readings being more accessible to human NQ NPs

There are several open questions concerning the structure of example **(5)** which looks like it involves an apposition between *nen* (1PL.EXCL) and *q'ˤwe<r>u*, with the latter modifying an absent nominal head. What is interesting about these cases is that the two members of the appositional structure do not have to share the same INDEX features (compare (5) and (6)), while the supplementary data seem to show that either can be the head which controls verbal agreement.

2 Coordination

Where the coordinated NP forms a single constituent, we see a form of resolved agreement on the verbal predicate. The verb is plural (resolved number) and the verbal agreement is either with I/II or III/IV, as with other cases in which a verb agrees with a plural controller. While the 4 genders are relevant for verbal agreement with SG controllers, this is not the case in the plural: here all that appears to be relevant is whether or not the NP denotes a human referent. Rather than setting up a calculus to provide the right binary distinction using a GEND feature in the plural, the verbal morphology might directly target a HUM/NONHUMAN distinction rather than distinctions in GEND. We add HUM as an INDEX feature.

(13) *e<b>t:-li/become.*I/II.PL (↑ TNS) = PFV
(↑ SUBJ CASE) = ABS
@3PLHUM (↑ SUBJ INDEX)

Recall parametrised templates and template inclusion:

(14) IV.SG(P) ≡ (P GEND) = IV
(P NUM) = SG

(15) 3SGIV(P) ≡ @IV.SG(P)
@3(P)

(16) 3(P) ≡ (P PERS) = 3

So for the plural verbforms:[1]

(17) PLHUM(P) ≡ (P HUM) = +
(P NUM) = PL

(18) PLNHUM(P) ≡ (P HUM) = -
(P NUM) = PL

(19) 3PLHUM(P) ≡ @PLHUM(P)
@3(P)

[1] All nouns are lexically specified with a HUM value. The relevance of GEND to PL nouns depends on what the facts are.

2.1 Feature Resolution and INDEX

The standard approach in LFG replaces the use of atomic features by set values and resolves by set union (Dalrymple and Kaplan, 2000). Other work uses featural decomposition rather than set values (Dalrymple et al., 2009; Kazana, 2011; Sadler, 2006, 2011)

set values and membership constraints

was (GER): (↑ CASE) = {NOM, ACC}
$x \in \{\text{NOM, ACC}\} \Rightarrow \text{NOM} = x \vee \text{ACC} = x$ (implicit disjunction)
$s = \{\text{NOM, ACC}\} \Rightarrow \text{NOM} \in s \wedge \text{ACC} \in s$ (implicit conjunction)

Person features may be represented by sets of marker features, and resolved by set union:

(20) {S,H} (1ST) ∪ {H} (2ND) = {S,H} (1ST)
{S,H} (1ST) ∪ {} (3RD) = {S,H} (1ST)
{H} (2ND) ∪ {} (3RD) = {H} (2ND)
{} (3RD) ∪ {} (3RD) = {} (3RD)

(21) NP ⟶ NP CONJ NP
$\downarrow \in \uparrow$ $\downarrow \in \uparrow$
(↓ INDEX PERS) ⊆ (↑ INDEX PERS) (↓ INDEX PERS) ⊆ (↑ INDEX PERS)

(22) $x \cup y$ is the smallest set z such that $x \subseteq z \ \wedge \ y \subseteq z$

(23) José y yo hablamos (‘ José and I were speaking’)

$$h: \begin{bmatrix} \text{PRED} & \text{‘SPEAK}\langle\text{SUBJ}\rangle\text{’} \\ \text{SUBJ} \quad s: & \left\{ \begin{bmatrix} j: \begin{bmatrix} \text{PRED} & \text{‘JOSE’} \\ \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & \{\} \end{bmatrix} \end{bmatrix} \\ y: \begin{bmatrix} \text{PRED} & \text{‘PRO’} \\ \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & \{\text{S,H}\} \end{bmatrix} \end{bmatrix} \end{bmatrix} \right\} \\ & \begin{bmatrix} \text{INDEX} & \begin{bmatrix} \text{PERS} & \{\text{S,H}\} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

Verb agreement by constraining equation:

(24) hablamos: $(h \text{ SUBJ PERS}) =_c \{\text{S,H}\}$

Using set values, we can represents (HUM +) as {H} and (HUM -) as { }

(25) NP $\longrightarrow$

NP	NP
$\downarrow \in \uparrow$	$\downarrow \in \uparrow$
$(\downarrow \text{IND PERS}) \subseteq (\uparrow \text{IND PERS})$	$(\downarrow \text{IND PERS}) \subseteq (\uparrow \text{IND PERS})$
$(\downarrow \text{IND HUM}) \subseteq (\uparrow \text{IND HUM})$	$(\downarrow \text{IND HUM}) \subseteq (\uparrow \text{IND HUM})$

An alternative simply uses HUM values and explicit percolation: the coordinate structure is HUM = + iff (at least) one conjunct is HUM = +.

(26) NP $\longrightarrow$

NP	NP
$\downarrow \in \uparrow$	$\downarrow \in \uparrow$
$(\downarrow \text{IND PERS}) \subseteq (\uparrow \text{IND PERS})$	$\{ (\uparrow \text{IND HUM}) = + \wedge (\uparrow \in \text{IND HUM}) = +$
	$\mid (\uparrow \text{IND HUM}) = - \}$
	$(\downarrow \text{IND PERS}) \subseteq (\uparrow \text{IND PERS})$

(27) $\text{PLHUM(P)} \equiv$ (P HUM) = +
(P NUM) = PL

(28) $\text{PLNHUM(P)} \equiv$ (P NUM) = PL

(9) - (12): the verb (13) specifies the SUBJ to be 3PLHUM, the lexical entries (such as (29)) define the Ns as 3SGHUM, and (26) resolves the INDEX feature of the coordinate NP. NUM is resolved semantically.

(29) *ušdu-wu/brother*.SG.ABS
(↑ PRED) = 'BROTHER'
(↑ CASE) = ABS
@3IHUM(↑ IND)
{(↑ INDEX NUM) = SG | (↑ ADJ ∈ TYPE) =$_c$ NQ}
(↑ CONC NUM) = SG
@CONCIND (%for person and gender)

(18): the noun *χalq'* is exceptional in being a III gender noun lexically specified as HUM = +. This determines its behaviour in the PL, where it controls I/II.PL agreement forms as shown in Marina's supplementary data of 22/10/13.

Closest Conjunct Agreement occurs only in cases in which the coordination is discontinuous (and may involve some sort of ellipsis).

3 Disjunction

All speakers permit a CCA pattern for disjunctive NPs in which a verb agrees with a following disjunctive NP (or agrees with a preceding disjunct in cases of discontinuous disjunction). Some speakers permit a CCA pattern also when the verb follows a disjuntive (continuous) NP, as in (23). An alternative is a number-resolved pattern, illustrated in (19) and (20) with human nouns and accepted by some speakers. Additional information provided on 22/10/2013 (examples (3a) and (3b)) suggests that resolved number is also found with nonhuman disjuncts and required in some circumstances.

Number resolution (between the INDEX of the coordinate structure and the INDEX of each conjunct) is considered to be semantically based, allowing for both boolean and accidental coordination *The president and treasurer are/is waiting over there*. For boolean uses of *and*:

(30) (↑ INDEX NUM) = (↑ ∈ INDEX NUM)

The data suggests that the disjunction affix may be associated with (INDEX NUM) = PL on the disjunctive NP

(31) ((∈ ↑) INDEX NUM) = PL

4 Nominal Predicates

These appear to be examples in which there are two ABS arguments. All the examples given involve *be*. In compound tenses, the copula *be* agrees with the higher SUBJ ABS argument: we previously outlined a treatment in which the compound tense auxiliary was PREDless. The verb (or verbs) occurring in these equative or attributive constructions may agree with either ABS argument: this would be captured as a lexical fact associated with the verb (or verbs) occurring in this construction.

For concreteness (and in the absence of fuller information about these sorts of constructions), we might propose a PREDLINK analysis in which the copula has a closed complement.

(32)
$$\begin{bmatrix} \text{PRED} & \text{`BE}\langle\text{SUBJ, PREDLINK}\,\rangle\text{'} \\ \text{PREDLINK} & \begin{bmatrix} \text{PRED} & \text{`SHEEP'} \\ \text{CASE} & \text{ABS} \\ \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 3 \\ \text{GEND} & \text{III} \\ \text{HUM} & - \end{bmatrix} \\ \text{CONC} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 3 \\ \text{GEND} & \text{III} \end{bmatrix} \\ \text{ADJ} & \left\{ \begin{bmatrix} \text{PRED} & \text{`REAL'} \end{bmatrix} \right\} \end{bmatrix} \\ \text{SUBJ} & \begin{bmatrix} \text{DEMON} & + \\ \text{PRED} & \text{`PRO'} \\ \text{CASE} & \text{ABS} \\ \text{INDEX} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 3 \\ \text{GEND} & \text{II} \\ \text{HUM} & + \end{bmatrix} \\ \text{CONC} & \begin{bmatrix} \text{NUM} & \text{SG} \\ \text{PERS} & 3 \\ \text{GEND} & \text{II} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(33) *halhaʁ-du-b/real*III.SG (↑ PRED) = 'REAL'
((ADJ ∈ ↑) CONC NUM) =$_c$ SG
((ADJ ∈ ↑) CONC GEND) =$_c$ III

(34) *d-i/is*.II.SG (↑ PRED) = 'BE⟨SUBJ, PREDLINK ⟩'
(↑ TENSE) = PRES
(↑ SUBJ CASE) = ABS
(↑ PREDLINK CASE) = ABS
@II.SG(↑ SUBJ|PREDLINK IND)

(35) *b-i/is*.III.SG (↑ PRED) = 'BE⟨SUBJ, PREDLINK ⟩'
(↑ TENSE) = PRES
(↑ SUBJ CASE) = ABS
(↑ PREDLINK CASE) = ABS
@II.SG(↑ SUBJ|PREDLINK IND)

.

References

Bresnan, Joan, Ronald M. Kaplan, and Peter G. Peterson. 1985. Coordination and the flow of information through phrase structure. MS, Xerox PARC.

Corbett, Greville G. 2001. Agreement: Terms and boundaries. In *The Role of Agreement in Natural Language: Proceedings of the 2001 Texas Linguistic Society Conference*.

Dalrymple, Mary and Ronald M. Kaplan. 2000. Feature indeterminacy and feature resolution. *Language* 76(4):759–798.

Dalrymple, Mary, Ronald M. Kaplan, John T. Maxwell, III, and Annie Zaenen, eds. 1995. *Formal Issues in Lexical-Functional Grammar*. Stanford, CA: CSLI Publications.

Dalrymple, Mary, Tracy Holloway King, and Louisa Sadler. 2009. Indeterminacy by underspecification. *Journal of Linguistics* 45:31–68.

Kaplan, Ronald M. and John T. Maxwell, III. 1988. Constituent coordination in Lexical-Functional Grammar. In *Proceedings of the 12th International Conference on Computational Linguistics (COLING 88)*, vol. 1, pages 303–305. Budapest. Reprinted in Dalrymple et al. (1995, pp. 199–210).

Kathol, Andreas. 1999. Agreement and the syntax-morphology interface in HPSG. In R. Levine and G. Green, eds., *Studies in Current Phrase Structure Grammar*, pages 223–274. Cambridge, UK: Cambridge University Press.

Kazana, Despina. 2011. *Agreement in Modern Greek coordinate Noun Phrases*. Ph.D. thesis, University of Essex.

King, Tracy Holloway and Mary Dalrymple. 2004. Determiner agreement and noun conjunction. *Journal of Linguistics* 40(1):69–104.

Mittendorf, Ingo and Louisa Sadler. 2005. Nouns, Numerals and Number in Welsh NPs. In M. Butt and T. H. King, eds., *Proceedings of the LFG05 Conference*, pages 294–312. Stanford, CA: CSLI Publications.

Sadler, Louisa. 1999. Non-distributive features and coordination in Welsh. In M. Butt and T. H. King, eds., *On-line Proceedings of the LFG99 Conference*.

Sadler, Louisa. 2003. Coordination and Asymmetric Agreement in Welsh. In Miriam Butt and Tracy Holloway King, ed., *Nominals: Inside and Out*, pages 85–118. Stanford, CA: CSLI.

Sadler, Louisa. 2006. Gender resolution in Rumanian. In M. Butt, M. Dalrymple, and T. H. King, eds., *Intelligent Linguistic Architectures: Variations on Themes by Ron Kaplan*, pages 301–321. CSLI Publications, Stanford.

Sadler, Louisa. 2011. Indeterminacy, Complex Features and Underspecification. *Morphology* 21:379—417.

Wechsler, Stephen and Larisa Zlatić. 2000. A theory of agreement and its application to Serbo-Croatian. *Language* 76(4):759–798.

Wechsler, Stephen and Larisa Zlatić. 2003. *The Many Faces of Agreement*. Stanford, CA: CSLI Publications.