(1) Simplified lexical sign for the verb *is*:

$$\begin{bmatrix} \textsc{phon} & \langle is \rangle \\ \textsc{subj} & \langle \boxed{1} \rangle \\ \textsc{comps} & \langle \boxed{2} \rangle \\ \textsc{arg-st} & \left\langle \boxed{1}\ \text{NP} \begin{bmatrix} \textsc{pers} & 3rd \\ \textsc{num} & sg \end{bmatrix}, \boxed{2}\ \text{XP} \right\rangle \end{bmatrix}$$

(2) Simplified lexical signs for *I* and *she*:

$$\begin{bmatrix} \textsc{phon} & \langle I \rangle \\ \textsc{head} & \begin{bmatrix} noun \\ \textsc{pers} & 1st \\ \textsc{num} & sg \end{bmatrix} \end{bmatrix} \quad \begin{bmatrix} \textsc{phon} & \langle she \rangle \\ \textsc{head} & \begin{bmatrix} noun \\ \textsc{pers} & 3rd \\ \textsc{num} & sg \\ \textsc{gen} & fem \end{bmatrix} \end{bmatrix}$$

(3) a. * I is sober.
b. She is sober.

The features supplied by the trigger and target must be consistent, but there is no general minimum requirement on how many features they specify. Both of them can be, and typically are, underspecified for some agreement features. For example, gender is not specified by the verb in (??) or the first pronoun in (??).

Since unification is commutative, the representation of an agreement construction is the same regardless of whether a feature originates from the trigger or the target. This immediately accounts for common agreement behavior observed when triggers are underspecified (Barlow 1988). For example, Serbo-Croatian is a grammatical gender language, where common nouns are assigned to the masculine, feminine, or neuter gender. The noun *knjiga* 'book' in (??) is feminine, so the modifying determiner and adjective appear in feminine form (Wechsler & Zlatić 2003: 4, example (1)).

(4) Ov-a star-a knjig-a stalno pad-a.
this-NOM.F.SG old-NOM.F.SG book-NOM.SG always fall-3SG
'This old book keeps falling.'

However, some nouns are unspecified for gender, such as *sudija* 'judge'. Interestingly, the gender of an agreeing adjective actually adds semantic information, indicating the sex of the judge (Wechsler & Zlatić 2003: 42, example (23)).

(5) 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.'

Here the gender feature comes from the targets instead of the trigger. This illustrates an advantage of constraint-based theories like HPSG over transformational accounts in which a feature is copied from the trigger, where it originates, to the target, where it is then realized. The usual source of the feature (the noun) lacks it in (??), a problem for the feature-copying view.

The same problem occurs even more dramatically in *pro*-drop languages. Many languages allow subject pronouns to drop, and distinguish person, number, and/or gender on the verb. If those features originate from the null subject, then there would have to be distinct null pronouns, one for each verbal and predicate adjective inflection (Pollard & Sag 1994: 64). This would be more complex and stipulative, and moreover the paradigm of putative null pronouns would have to exactly match the set of distinctions drawn in the verb and adjective systems, rather than reflecting the pronoun paradigm. HPSG avoids this suspicious assumption. Null anaphora is modeled by allowing the *pro*-dropped argument to appear on the ARG-ST list but not a valence list like SUBJ or COMPS (see Wechsler, Koenig & Davis 2021, Chapter ?? of this volume). For example, in the context given in (??) a Serbo-Croatian speaker could omit the subject pronoun.

(6) Context: Speaker comes home to find her bookcase mysteriously empty.
Gde su (one) nestale?
where did (they.F.PL) disappear.F.PL
'Where did they (i.e. the books) go?'

The sign for the inflected participle specifies feminine plural features on the initial item in its ARG-ST list. The SUBJ list item is optional:

(7) Simplified lexical sign for the participle form *nestale*:

$$\begin{bmatrix} \textsc{phon} & \langle \textit{nestale} \rangle \\ \textsc{subj} & \langle (\boxed{1}) \rangle \\ \textsc{comps} & \langle\rangle \\ \textsc{arg-st} & \left\langle \boxed{1}\ \text{NP} \begin{bmatrix} \textsc{num} & \textit{pl} \\ \textsc{gen} & \textit{fem} \end{bmatrix} \right\rangle \end{bmatrix}$$

The feminine plural features are specified regardless of whether the subject pronoun appears. When the pronoun is dropped we have the usual underspecification, only in this case the trigger does not exist, so it is effectively fully underspecified, realizing no features at all.

3 Locality in agreement

3.1 Argument and modifier agreement

In HPSG, the grammatical agreement of a predicator with its subject or object, or an adjective, determiner, or other modifier with its head noun, piggy-backs on the mechanism of valence saturation and modification. Agreement is encoded in the grammar by adding features of person, number, gender, case, and deixis to the existing feature descriptions involved in syntactic and semantic composition. This simple assumption is sufficient to explain the broad patterning of distribution of agreement, in contrast to the transformational approach where complex locality conditions must be stipulated.

In HPSG, predicate-argument agreement arises directly from the valence saturation, as illustrated already in (??) above. Thus the locality conditions on the trigger-target relation follow from the conditions on the subject-head or complement-head relation. Similarly, attributive adjectives agree with nouns directly through the composition of the modifier with the head that it selects via the MOD feature. For example, the Serbo-Croatian feminine adjective form *stara* 'old.F' in (??b) specifies feminine singular features for the common noun phrase (N′) that it modifies.

(8) Simplified lexical sign for *stara*:

$$\begin{bmatrix} \textsc{phon} & \langle \textit{stara} \rangle \\ \textsc{mod} & \begin{bmatrix} \textsc{head} & \begin{bmatrix} \textit{noun} \\ \textsc{num} \ \ \textit{sg} \\ \textsc{gend} \ \textit{fem} \end{bmatrix} \\ \textsc{comps} & \langle\rangle \end{bmatrix} \end{bmatrix}$$

In head-adjunct phrases, the MOD value of the adjunct daughter is token-identical with the *synsem* value of the head daughter. So *stara*'s feminine singular features cannot conflict with the features of the noun it modifies.

The predicted locality conditions are also affected by the percolation of features from words to phrasal nodes, and this depends on the location of the features within the feature description. Agreement features of the *trigger* appear

either within the HEAD value or the semantic CONTENT value (these give rise to CONCORD and INDEX agreement, respectively; see Section ??). In either case these features percolate from the trigger's head word to its maximal phrasal projection, due to the Head Feature Principle in the former case and the Semantics Principle in the latter. For example the noun phrase *the books* inherits its [NUM *pl*] feature from the head word *books*. This determines plural agreement on a verb: *These books are/*is interesting.* Apparent exceptions, where a target seems to fail to agree with the head of the trigger, are discussed below.

However, agreement features of the *target* appear in neither the HEAD nor the CONTENT value of the target form, but rather appear embedded in an ARG-ST list item or MOD features. So agreement features of the target do not project to the target's phrasal projection such as VP, S, or AP. This is a welcome consequence. If the subject agreement features of the verb projected to the VP, for example, we would expect to find VP-modifying adverbs that consistently agree with them, but we do not.[1]

4 Varieties of agreement target

4.1 Anaphoric agreement

In anaphoric agreement, an anaphoric pronoun agrees in person, number, and gender with its antecedent. Since Pollard & Sag (1992; 1994), anaphoric agreement has been analyzed in HPSG by assuming that person, number, and gender are formal features of the referential index associated with an NP. Anaphoric binding in HPSG is modeled as coindexation, i.e. sharing of the INDEX value, between the binder and bindee. Thus any specifications for agreement features of the INDEX contributed by the binder and bindee must be mutually consistent. In (??), Principle A of the Binding Theory requires the reflexive pronoun to be coindexed with an o-commanding item, here the subject pronoun:

(9) a. She admires herself.

b. *admire*:

$$\left[\text{ARG-ST}\left\langle \text{NP}:\left[\begin{array}{l}\textit{ppro}\\ \text{INDEX}\ \boxed{1}\end{array}\right]\left[\begin{array}{l}\text{PERS}\ \textit{3rd}\\ \text{NUM}\ \textit{sg}\\ \text{GEN}\ \textit{fem}\end{array}\right],\ \text{NP}:\left[\begin{array}{l}\textit{ana}\\ \text{INDEX}\ \boxed{1}\end{array}\right]\left[\begin{array}{l}\text{PERS}\ \textit{3rd}\\ \text{NUM}\ \textit{sg}\\ \text{GEN}\ \textit{fem}\end{array}\right]\right\rangle\right]$$

[1] VP-modifying secondary predicates sometimes agree with their own subjects. What we do not find are adjuncts that consistently agree with the subject agreement features of the VP even when the adjunct is not predicated of that subject.

The agreement features are formal features and not semantic ones, but the semantic correlates of person (speaker, addressee, other), number (cardinality), and gender (male, female, inanimate, etc.) are invoked under certain conditions (described in Section ??). Thus INDEX agreement is distinct from *pragmatic agreement* whereby semantic features of two coreferential expressions must be semantically consistent in order for them to refer to a single entity. INDEX agreement is enforced only within the syntactic domain defined by binding theory, while pragmatic agreement applies everywhere. For example, feminine pronouns are sometimes used for ships, in addition to neuter pronouns. Whichever gender is chosen, it must be consistent in binding contexts (example based on Pollard & Sag's 1994: 79 example (46a)):

(10) a. The ship lurched, and then it righted itself. She is a fine ship.
b. The ship lurched, and then she righted herself. It is a fine ship.
c. * The ship lurched, and then she righted itself.
d. * The ship lurched, and then it righted herself.

The bound reflexive must agree formally with its antecedent, while other coreferential pronouns need not agree, as they are not coarguments of the antecedent and not subject to the structural binding theory.

In grammatical gender languages, where common nouns are conventionally assigned to a gender, an anaphoric pronoun appearing outside the binding domain of its antecedent can generally agree with that antecedent either formally or, if it is semantically appropriate (such as an animate, sexed entity), it can alternatively agree pragmatically. In most situations pronouns allow either pragmatic or INDEX agreement with their antecedents. For example, pronouns coreferential with the Serbo-Croatian grammatically neuter diminutive noun *devojče* 'girl' can appear in either neuter or feminine gender (from Wechsler & Zlatić 2003: 198):

(11) Ovo malo devojče$_i$ je ušlo.
this.N.SG little.N.SG girl.N.SG AUX.3SG entered.N.SG
a. Ono$_i$ je htelo da telefonira.
it.N.SG AUX.SG wanted.N.SG that telephone
b. Ona$_i$ je htela da telefonira.
she.F.SG AUX.SG wanted.F.SG that telephone
'This little girl$_i$ came in. She$_i$ wanted to use the telephone.'

The neuter pronoun in (??a) reflects INDEX agreement with the antecedent while the feminine pronoun (??b) reflects its reference to a female (pragmatic agree-

ment). But when a reflexive pronoun is locally bound by a nominative subject, agreement in formal INDEX features is preferred:

(12) Devojče je volelo samo / ?* samu sebe.
girl.NOM.N.SG AUX3.SG liked.N.SG own.ACC.N.SG ACC.F.SG self.ACC
'The girl liked herself.'

Again, this illustrates INDEX agreement in the domain defined by the structural binding theory.

4.2 Grammatical agreement: INDEX and CONCORD

As noted above, in HPSG agreement effectively piggy-backs on other independently justified grammatical processes. Anaphoric agreement is a side-effect of binding (Section ??) while grammatical agreement is a side-effect of valence saturation and modification (Section ??). The formal HPSG analysis of a particular agreement process mainly consists of positing agreement features somewhere in the feature structure; the observed properties follow from the location of those agreement features. With regard to the location of the features, grammatical agreement bifurcates into two types, INDEX and CONCORD.[2] (The attribute name CONCORD was introduced by Wechsler & Zlatić 2000: 799, Wechsler & Zlatić 2003: 14; precursors to the idea were treated as HEAD features in Pollard & Sag 1994, and called AGR by Kathol 1999.) The best way to understand this bifurcation of agreement, and indeed the operation of grammatical agreement systems generally, is by considering their diachronic origin. Although our primary goal is the description of synchronic grammar, a look at diachrony can help explain the forms that the grammar takes, and can also provide clues as to the best formalization of it.

Within the diachronic literature on agreement there are thought to be two different lexical sources for agreement inflections: (i) incorporated pronouns and (ii) incorporated noun classifiers (Greenberg 1978). These two sources, ultimately traced to pronouns and common nouns, give rise to INDEX and CONCORD target inflections, respectively, as explained next.

[2] The INDEX/CONCORD theory is sketched in Pollard & Sag (1994: Chapter 2) and Kathol (1999), and developed in detail in Wechsler & Zlatić (2000; 2003), all in the HPSG framework. It has since been adopted into LFG (King & Dalrymple 2004, inter alia) and GB/Minimalism (Danon 2009).

4.2.1 INDEX agreement

Taking pronouns first, many grammatical agreement systems evolve historically from the incorporation of pronominal arguments into the predicates selecting those arguments, such as verbs and nouns (Bopp 1842; Givón 1976; Wald 1979, inter alia). When a phrase serving as antecedent of the incorporated pronoun is reanalyzed as the true subject or object of the predicate, the pronominal affix effectively becomes an agreement marker. With this reanalysis the only change in the affix is that it loses its ability to refer: it no longer functions as a pronoun. The affix retains its agreement features, and what was formerly anaphoric agreement with the topic becomes grammatical agreement with the subject or object. This explains why the features of grammatical agreement match those of pronominal anaphora: typically person, number, and gender, with occasional deictic features (Bresnan & Mchombo 1987: 752).

As explained above, structural anaphoric binding involves identifying (structure sharing) the referential indices of the pronoun and its binder. Therefore grammatical agreement derived from it is also INDEX agreement. For example, the signs for English *is* and *I* in (??) and (??) above should be rewritten as follows:

(13) Simplified sign for *is*, illustrating INDEX agreement:

$$\begin{bmatrix} \textsc{phon} & \langle is \rangle \\ \textsc{subj} & \left\langle \text{NP} \left[\textsc{content}|\textsc{index} \begin{bmatrix} \textsc{pers} & 3rd \\ \textsc{num} & sg \end{bmatrix} \right] \right\rangle \\ \textsc{comps} & \langle \text{XP} \rangle \end{bmatrix}$$

(14) Sign for *I*, illustrating INDEX features:

$$\begin{bmatrix} \textsc{phon} & \langle I \rangle \\ \textsc{content}|\textsc{index} & \boxed{1} \begin{bmatrix} \textsc{pers} & 1st \\ \textsc{num} & sg \end{bmatrix} \\ \textsc{context} & speaker(\boxed{1}) \end{bmatrix}$$

This finite verb form specifies third person singular features of its subject's referential index.

One salient distinguishing characteristic of INDEX agreement is that it includes the PERSON feature. The only known diachronic source of the PERSON feature is from pronouns. Therefore, the other type of agreement, CONCORD, lacks the PERSON feature (as we will see below).

By modeling verb agreement in a way that reflects its historical origin, we are

able to explain an array of facts concerning particular agreement systems. Some of these facts and explanations are presented in Section ?? below.

4.2.2 CONCORD

The agreement inflections on modifiers of nouns, such as adjectives and determiners, are thought to derive historically not from pronouns, but from noun classifiers (Greenberg 1978; Reid 1997; Seifart 2009; Grinevald & Seifart 2004, Corbett 2006: 268–269). The classifier morphemes in turn derive historically from lexical common nouns denoting superordinate categories like animal, woman, man, etc. For example Reid (1997) posits the following historical development of Ngan'gityemerri (southern Daly; southwest of Darwin, Australia), a language where the historical stages continue to cooccur in the current synchronic grammar. Originally the language had general-specific pairings of nouns as a common syntactic construction, such as *gagu wamanggal* 'animal wallaby' in (??) (from Reid 1997: 216, examples (162)–(165)). The specific noun can be omitted when reference to it is established in discourse, leaving the general noun and modifier, to form NPs like *gagu kerre*, literally 'animal big' but functioning roughly like nominal ellipsis 'big one'. Then, where the specific noun is also included, both noun and modifier attract the generic term (??). The gender markers then reduce phonologically and incorporate, producing modifier gender agreement (??).

(15) a. Stage I:
Gagu wamanggal kerre ngeben-da.
animal wallaby big 1SG.SB.AUX-shoot
'I shot a big wallaby.'

b. Stage II:
Gagu wamanggal gagu kerre ngeben-da.
animal wallaby animal big 1SG.SB.AUX-shoot
'I shot a big wallaby.'

c. Stage III:
wa=ngurmumba wa=ngayi darany-fipal-nyine.
male=youth male=mine 3SG.AUX-return-FOC
'My initiand son has just returned.'

If the same affix is retained on the modifiers and the noun they modify, then the result is symmetrical agreement (also known as alliterative agreement), like the feminine *-a* endings in Spanish *zona rosa* (Corbett 2006: 87–88). But often an asymmetry between the affixes on the noun and the modifiers develops: the

noun affix becomes obligatory and is subject to morphophonological processes that do not affect the modifier affix (Reid 1997: 216). This process may further progress to "prefix absorption" into the common noun, as evidenced by "gender prefixed nominal roots being interpreted as stems for further gender marking" (Reid 1997: 217).

Agreement marked with inflections from such nominal sources is called *concord*, which is described using the HPSG CONCORD feature. What is the proper HPSG formalization of this type of agreement, given its provenance? The last stages of the diachronic development, described in the previous paragraph, imply that the *form* of the trigger (the noun) is influenced by the agreement features. That is, noun declension classes tend to correlate with gender assignment (and more generally, phonological and morphological characteristics of nouns correlate with gender assignment); and number is marked on nouns as well. (This close relation between declension class and CONCORD is demonstrated in detail in Wechsler & Zlatić 2003: Chapter 2.) Thus the agreement features must appear both on the head noun (to inform its form and/or its gender selection and number value) and on the phrasal projection of that noun (to trigger agreement via the MOD feature of the agreement targets). Ergo CONCORD is a HEAD feature of the trigger.

Along with the number and gender features, the CONCORD value is assumed to include the case feature when case is a feature of NPs realized on both the head noun and its modifying adjectives or determiner. CONCORD lacks the person feature, since common nouns, from which the agreement inflections on the targets derive, lack the person feature (common nouns do not distinguish person values, since they are all in the third person). Meanwhile, INDEX agreement preserves the pronominal features of person, number, and gender, reflecting its origins. In the usual case the number and gender values found in CONCORD match those found in INDEX. The Serbo-Croatian noun form *knjiga* triggers feminine singular nominative CONCORD on its adjectival possessive specifier and modifier, and third person singular INDEX agreement on the finite auxiliary. (The status of the participle is discussed below.)

(16) Moja stara knjiga je pala.
my.F.NOM.SG old.F.NOM book.NOM.SG AUX.3.SG fall.PPRT.F.SG
'My old book fell.' (Wechsler & Zlatić 2003: 18)

The nominative singular noun form *knjiga* specifies its agreement features in both CONCORD (a HEAD feature) and INDEX, with the respective values for number and gender shared:

(17) Lexical sign for *knjiga* 'book' (from Wechsler & Zlatić 2003: 18):

$$\begin{bmatrix} \textsc{phon} & \langle\ \textit{knjiga}\ \rangle \\ \textsc{synsem} & \begin{bmatrix} \textsc{category} & \begin{bmatrix} \textsc{head} & \begin{bmatrix} \textit{noun} \\ \textsc{concord}\ \boxed{3} & \begin{bmatrix} \textsc{case}\ \textit{nom} \\ \textsc{num}\ \boxed{1}\ \textit{sing} \\ \textsc{gen}\ \boxed{2}\ \textit{fem} \end{bmatrix} \end{bmatrix} \\ \textsc{spr} & \left\langle \left(\text{AP}\ \left[\textit{poss}, \textsc{concord}\ \boxed{3} \right] \right) \right\rangle \end{bmatrix} \\ \textsc{content} & \begin{bmatrix} \textsc{index}\ \boxed{i} & \begin{bmatrix} \textsc{pers}\ \textit{3rd} \\ \textsc{num}\ \boxed{1} \\ \textsc{gen}\ \boxed{2} \end{bmatrix} \\ \textsc{restr} & \{ \textit{book}(i) \} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The specifier (SPR) is shown as AP because the possessive phrase is categorically an adjective phrase in Serbo-Croatian. The features in the overlap between CONCORD and INDEX are normally shared as in this example. But with some special nouns, features can be asymmetrically specified in only one of the two values (with no reentrancy linking them, of course). This leads to mismatches between CONCORD and INDEX targets, discussed in Section **??** below.

The phi features also appear within the HEAD value, as shown in (**??**), so that adjunct APs can agree with those features. For example, concord by the attributive adjective *stara* 'old' is guaranteed because its MOD feature is specified for feminine singular features, as shown in (**??**) in Section **??** above.

4.3 Conclusion

To summarize this section, we have seen the two main historical paths to agreement, and shown how HPSG formalizes these two types of agreement so as to capture the syntactic and semantic properties that follow directly from their origins. Agreement that descends from anaphoric agreement of pronouns with their antecedents, through the incorporation of personal pronouns into verbs and other predicators, inherits the INDEX matching process found in the anaphoric agreement from which it descends. Agreement that descends from the incorporation of noun classifiers involves features located in the HEAD value that connect a trigger noun form to its phrasal projection. The feature sets differ for the same reason; PERSON is a feature only of the first type, and CASE only of the second. CONCORD correlates strongly with declension class, while INDEX agreement need not correlate as strongly (for evidence see Wechsler & Zlatić 2003: Chapter 2).

The differences in feature sets and morphology further correlate with systematic syntactic differences, described in the following section.

5 Syntactic, semantic, and default agreement

This chapter has so far focused mainly on formal agreement, as opposed to semantic agreement. But this is one of three different ways in which the form of an agreement target may be determined by a grammar:

(18) Formal, semantic, and default determinants of target form.
   a. Formal agreement: The target form depends on the trigger's formal phi features.
   b. Semantic 'agreement': The target form depends on the trigger's meaning.
   c. Failure of agreement: The target fails to agree and hence takes its default form.

In formal agreement, the trigger is grammatically specified for certain features as a consequence of the words making up the trigger phrase: for example a nominal may be marked for a gender as a consequence of the lexical gender of the head noun. In semantic agreement, the target is sensitive to the meaning of the trigger instead of its formal features. English number agreement can be formal as in (??), from Wechsler (2013: 92), or semantic as in (??), from McCloskey (1991: 92):

(19) a. His clothes are/*is dirty.
   b. His clothing is/*are dirty.

(20) a. That the position will be funded and that Mary will be hired now seems/??seem likely.
   b. That the president will be reelected and that he will be impeached are/??is equally likely at this point.

Regarding (??), McCloskey (1991: 564–565) observes that singular is used for "a single complex state of affairs or situation-type", while plural is possible for "a plurality of distinct states of affairs or situation-types". The latter sort of interpretation is facilitated by the use of the adverb *equally*. Formal and semantic gender agreement are illustrated by the French examples in (??):

(21) a. La sentinelle à la barbe a été { prise / *pris } en otage.
the.F sentry bearded AUX been taken.F.SG taken.M hostage
'The bearded sentry was taken hostage.'

b. Dupont est { compétent / compétente }.
Dupont is competent.M.SG competent.F.SG
'Dupont { a man / a woman } is competent.'

The grammatically feminine noun *sentinelle* 'sentry' triggers feminine agreement regardless of the sex of the sentry; but in (??b) feminine agreement indicates that Dupont is female while masculine agreement indicates that Dupont is male.

How does the grammar negotiate between formal and semantic agreement? In HPSG, syntactic and semantic representations are composed in tandem, making the framework well suited to address this question. It was addressed in early HPSG work, including Pollard & Sag (1994: Chapter 1). The specific approach due to Wechsler (2011) exploits the underspecification of agreement features (see Section ??). I posit the Agreement Marking Principle (AMP), which states that target agreement features are semantically interpreted whenever the trigger is underspecified for the formal grammatical features to which the target would normally be sensitive. The subject phrases in (??) are specified for number due to the formal features of the head nouns, but those in (??) are not, as a (coordinate) clause has no grammatical source for those features. Consequently, by the AMP, the verb's number feature is semantically interpreted in (??). Similarly, *sentinelle* in (??a) gives its formal feminine gender feature to the subject, while *Dupont* lacks a gender specification, triggering the semantic interpretation of the target adjectives in (??b): feminine is interpreted as 'female'.

Agreement targets generally have a default form for use when there is no trigger or the normal agreement relation is blocked for some reason. Blocking of agreement comes about in various situations; here we consider a case where the trigger is interpreted metonymically, apparently resulting in a reassignment of the referential index. Swedish predicate adjectives normally agree with their subjects in number (either singular or plural) and grammatical gender, either neuter (NT) or 'common' gender (COM), the gender held in common between masculine and feminine:

(22) a. Hus-et är gott.
house-DEF.N.SG is good.N.SG
'The house is good.'

b. Pannkaka-n är god.
pancake-DEF.COM.SG be.PRES good.COM.SG
'The pancake is good.'

c. { Hus-en / Pannkak-orna } är god-a.
house-PL.DEF pancake-PL.DEF be.PRES good-PL
'The houses / The pancakes are good.'

As shown in (??), a predicate adjective is inflected for number, and, in the singular, for gender, and agrees with its subject. But in sentences like (??), the adjective appears in the neuter singular form, regardless of the number and gender features of the subject. Note that *pannkakor* is the plural form of a common gender noun (Faarlund 1977; Enger 2004; Josefsson 2009):

(23) Pannkak-or är gott.
pancake-PL be.PRES good.N.SG
'Situations involving pancakes are good.' (e.g. 'Eating pancakes is good.')

In general, Swedish predicate adjectives appear in neuter singular when there is no triggering NP, such as with clausal subjects (see (??a) below). Wechsler & Zlatić (2003) posit the index type *unm* ('unmarked') for referential indices that lack phi features, such as those introduced by verbs. So *gott* has a SUBJ list item whose index is disjunctively specified for either neuter singular or type *unm*.

The lack of agreement in (??) then arises because the subject phrase refers, not to the pancakes, but to a situation involving them; hence its referential index is distinct from the one lexically introduced by the noun *pannkakor*. A rule shifts the index and encodes the metonymic relation between the entity and the situation involving it. This is implemented with a non-branching phrasal construction in Wechsler (2013: 82, example (20)):

Redo as Sag 1997 without MOTHER. In any case the DTRS have to be a list.

(24) *metonymy-ctx:*

$$\begin{bmatrix} \text{MTR} & \begin{bmatrix} \text{SYN} & NP \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & s_{unm} \\ \text{RESTR} & \{ involve(s, i) \} \cup \boxed{1} \end{bmatrix} \end{bmatrix} \\ \text{DTRS} & \begin{bmatrix} \text{SYN} & NP \\ \text{SEM} & \begin{bmatrix} \text{INDEX} & i \\ \text{RESTR} & \boxed{1} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The noun *pannkakor* in (??) has an index marked with the features [PERSON *3rd*], [GENDER *com*], and [NUMBER *pl*], which, by the Semantics Principle, are therefore

shared with the index of the daughter NP node in a structure licensed by rule (??). But the construction specifies the mother NP node's index is unmarked for those features, thus explaining the neuter singular adjective.

On the alternative ellipsis analysis, sentence (??) has an elliptical clausal or infinitival subject, with a structure like (??a) except that *att äta* is silent (Faarlund 1977; Enger 2004; Josefsson 2009):

(25) a. Att äta pannkakor är gott.
to eat pancakes be.PRES good.N.SG
'Eating pancakes is good.'

b. Det är gott att äta pannkakor.
it be.PRES good.N.SG to eat pancakes
'It is good to eat pancakes.'

c. * Det är gott pannkakor.
it be.PRES good.N.SG pancakes
Intended: 'It is good to eat pancakes.'

But the metonymic subject behaves in all respects like an NP, and unlike a clause or infinitival phrase. For example, unlike an infinitival it resists extraposition, as shown in (??b, c). The metonymy analysis captures the fact that the subject has a clause-like meaning but not clause-like syntax.

6 Mixed agreement

The two-feature (INDEX/CONCORD) theory of agreement was originally motivated by *mixed agreement*, where a single phrase triggers different features on distinct targets (Pollard & Sag 1994: Chapter 2; Kathol 1999). For example, the French second person plural pronoun *vous* refers to multiple addressees, and also has an honorific or polite use for a single (or multiple) addressee. When used to refer politely to one addressee, *vous* triggers singular on a predicate adjective but plural on the verb, as in (??a):

(26) a. Vous êtes loyal.
you.PL be.2PL loyal.M.SG
'You (singular, formal, male) are loyal.'

b. Vous êtes loyaux.
you.PL be.2PL loyal.PL
'You (plural) are loyal.'

Wechsler (2011) analyzes this by adopting the following suppositions: (i) *vous* has a second person plural marked referential index; (ii) *vous* lacks phi features for CONCORD; (iii) finite verbs agree with their subjects in INDEX; and (iv) predicate adjectives agree with their subjects in CONCORD. Suppositions (i) and (iii) need not be stipulated, as they follow from the theory: the pronoun must have INDEX phi features since it shows anaphoric agreement (when it serves as binder or bindee); and the verb must agree in INDEX since it includes the PERSON feature. By the Agreement Marking Principle (see Section **??**), the (CONCORD) number and gender features of the predicate adjective are interpreted semantically, which is what is shown by example (**??**).

"Polite plural pronouns" of this kind are found in many languages of the world (Head 1978). The cross-linguistic agreement patterns observed in typological studies (Comrie 1975; Wechsler 2011) confirm the predictions of the theory. Taken together, suppositions (i) and (iii) from the previous paragraph entail that any person agreement targets agreeing with polite pronouns should show formal, rather than semantic, agreement. Targets lacking person, meanwhile, can vary across languages. This pattern is confirmed for all languages with polite plurals that have been surveyed, including Romance languages; Modern Greek; Germanic (Icelandic); West, South and East Slavic; Hindi; Gbaya (Niger-Congo); Kobon and Usan (Papuan); and Sakha (Turkic) (see Comrie 1975 and Wechsler 2011).

The INDEX/CONCORD distinction plays a crucial role in this account of mixed agreement. An earlier hypothesis, proposed by Kathol (1999), is that French predicate adjectives are grammatically specified for semantic agreement with their subjects, while finite verbs show formal agreement. But a plurale tantum noun such as *ciseaux* 'scissors' triggers syntactic agreement on the predicate adjective:

(27) Ces ciseaux sont géniaux! (*génial!)
these.PL scissors(M.PL) are.PL brilliant.M.PL brilliant.M.SG
'These scissors are cool!'

As far as the syntax is concerned, *ciseaux* 'scissors' is an ordinary common noun with masculine plural CONCORD features, so it triggers those features on the adjective. More generally, agreement target types cannot be split into "formal" and "semantic" agreement targets; both formal and semantic agreement are found across all target types. Which of the two is observed for a given agreement feature depends, according to the INDEX/CONCORD theory, on whether the trigger is specified for the grammatical feature, together with the INDEX versus CONCORD status of the target.

7 Agreement defined on other structures

So far our look at grammatical agreement has focused primarily on agreement defined on local grammatical relations like subject, object, and modifier. In this section we look at HPSG analyses of two other types of agreement, namely long-distance and superficial agreement.

7.1 Long-distance agreement

The simple picture of locality in the previous sections is challenged by the phenomenon of long-distance agreement, where the trigger appears within a clause subordinate to the one headed by the target verb. Long-distance agreement has been observed in a number of languages, including Tsez (Nakh-Dagestanian; Polinsky & Potsdam 2001), Hindi-Urdu (Bhatt 2005), and Passamaquoddy (Athabaskan; Bruening 2001; LeSourd 2018).

Passamaquoddy long-distance agreement is illustrated by this sentence (LeSourd 2018: example (5)), with the relevant elements indicated in bold:

I would like to replace bold by italics.

(28) N-kosicíy-a-**k** [eli- Píyel -litahási-t
1-know-DIR-PROX.PL thus- Peter -think-3AN
[eli-kis-ankum-í-hti-t **nìkt** **ehpíc-ik**
thus-PAST-sell-3/1-PROX.PL-3AN those.PROX woman-PROX.PL
posonúti-yil]]
basket-IN.PL
'I know that Peter thinks that those women sold me the baskets.'

The *-k* suffix on the matrix verb *kosicíy* 'know' marks plural, deictically proximate agreement with the phrase *nìkt ehpícik* 'those women' in the doubly embedded subordinate clause. LeSourd (2018) analyzes Passamaquoddy long distance agreement in the HPSG framework. He notes that Passamaquoddy long distance agreement is parallelled by long-distance raising, in which an NP in the matrix clause is coreferential with an implicit argument of a subordinate clause (LeSourd 2018: example (4)):

(29) N-kosicíy-a-**k** **nìkt** **ehpíc-ik**$_i$ [eli- Píyel -litahási-t
1-know-DIR-PROX.PL those.PROX woman-PROX.PL thus- Peter -think-3AN

[eli-kis-ankum-í-hti-t **e**$_i$ posonúti-yil]]
thus-PAST-sell-3/1-PROX.PL-3AN basket-IN.PL
'I know about those women$_i$ that Peter thinks that they$_i$ sold me the baskets.'

Passamaquoddy speakers report that sentences (**??**) and (**??**) suggest the subject of 'know' (the speaker) is familiar with the women. This provides evidence that the phrase 'those women' in (**??**) is an argument of the matrix verb 'know', as implied by the translation. Similarly, the matrix clause (**??**) contains a null argument (cross-referenced by the proximate plural *-k* suffix), which is cataphoric to 'those women'. Hence a more literal translation of (**??**) is 'I know about them$_i$ that Peter thinks that those women$_i$ sold me the baskets.'[3] What the long-distance agreement and raising constructions share is simply that the matrix object is coreferential with some argument contained in the subordinate clause. The following lexical entry for the verb root *kosicíy* 'know' captures that:

(30) *kosicíy* 'know':
$$\begin{bmatrix} \textsc{phon} & \langle \textit{kosicíy} \rangle \\ \textsc{arg-st} & \langle \text{NP}_i\ ,\ \text{NP}_j,\ \text{S:}\left[\textsc{restr}\ \langle \ldots \left[\textsc{prd}|\textsc{arg}\ j\right] \ldots \rangle\right] \rangle \end{bmatrix}$$

LeSourd adopts the version of HPSG described in the Sag et al. (2003) textbook, which uses a simplified Minimal Recursion Semantics. The semantic restrictions feature (RESTR) takes as its value a list of elementary predications (PRD). The list for each node is a concatenation of the restrictions of the daughter nodes. Thus every semantic argument contained within the S complement, whether overt or null, will correspond to some argument (ARG) of an elementary predication (PRD) in S's RESTR list. The lexical entry in (**??**) stipulates that the matrix object NP corefers with some such argument. In conclusion, Passamaquoddy long-distance agreement is really the anaphoric agreement of a pronoun with an antecedent in a higher clause.

7.2 Superficial agreement

In some languages, string adjacency of the trigger and target, rather than a grammatical relation such as subject or modifier, is a grammatical condition on agreement. This may arise because person agreement derives historically from pronoun incorporation, and a basic syntactic precondition for incorporation is string

[3] LeSourd notes that Passamaquoddy lacks Principle C effects, so cataphora of this kind is permitted.

adjacency between the pronoun and the head into which it incorporates (Givón 1976; Ariel 1999; Wechsler et al. 2010; Fuss 2005). If the trigger occupies the syntactic position that the pronoun occupied prior to incorporation (for example because the trigger is itself a pronoun) then the result is that trigger and target are adjacent. For example, West Flemish complementizers agree with an immediately following subject, even though the complementizer and subject are not related by any grammatical relation (Haegeman 1992). To take another example, Borsley (2009) analyzes Welsh superficial agreement in the HPSG framework, citing examples like the following:

(31) a. Gwelon nhw ddraig.
see.PAST.3PL they dragon
'They saw a dragon.'

b. arno fo
on.3SG.M he
'on him'

c. Gweles i a Megan geffyl.
see.PAST.1SG I and Megan horse
'Megan and I saw a horse.'

The trigger is the subject in (??a), object in (??b), and the first conjunct of a coordinate subject in (??c). But in every case, "An agreeing element agrees with an immediately following noun phrase if and only if the latter is a pronoun" (Borsley 2009: example (48)). Borsley (2009: example (99)) expresses this as an HPSG implicational constraint using the DOMain feature from linearization theory (Reape 1994; Müller 1995; 1999; Kathol 2000):

(32) [DOM ⟨[AGR 1], NP: $ppro_{2}$, ...⟩] ⇒ 1 = 2

The DOMain list encodes linear precedence between constituents that are not necessarily sisters. In (??) the AGR value is the set of phi features of the target; the colon following NP represents the semantic CONTENT attribute; and the subscripted tag 2 is the INDEX value. The rule states that when a constituent bearing the AGR attribute is immediately followed by a personal pronoun (content of type *ppro*), then the AGR value is identified with the pronoun's index (shown here as 2), that is, it agrees with a right-adjacent pronoun.

8 Conclusion

Agreement is analyzed in HPSG by assigning phi features to specific locations in the feature descriptions representing the grammar. Anaphoric agreement results from phi features appearing on the referential indices of the binder and bindee, together with the assumption that binding consists of the identification of those indices. Verbal agreement with subjects and objects results when phi features appear on the verb's ARG-ST list items that are identified with the SYNSEM values of the subject and object phrases. Modifier agreement with heads occurs when phi features appear within the MOD value of the modifier. According to the INDEX/CONCORD theory, when agreement is historically descended from anaphoric agreement of incorporated pronouns, then those features within the ARG-ST list or MOD items are located on the referential index; while otherwise they are collected in the CONCORD feature and placed within the value of the HEAD features. The locality conditions on agreement follow from the normal operation of the grammar in which those phi features are embedded. Some cases of agreement seem to exist outside those conditions. Long-distance agreement has been analyzed as a kind of anaphoric agreement within a prolepsis construction, and superficial agreement has been defined on string adjacency and precedence, within linearization theory.

Abbreviations

add PPRT

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Chapter 7

Case

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The aim of this chapter is to provide an outline of HPSG work on grammatical case. Two issues that attracted much attention of HPSG pracitioners in the 1990s and early 2000s are the locality of case assignment, especially the so-called structural case assignment, as well as case syncretism and underspecification; they are discussed in two separate sections. The third section summarises other work on case carried out within HPSG, including some computational efforts, as well as investigations of case phenomena at the syntax-semantics interface and at the border of syntax and morphology.

1 Introduction

HPSG is not widely known for its approach to grammatical case. For example, it is only mentioned in passing in the 2006 monograph *Theories of Case* (Butt 2006: 225) and in the 2009 *Oxford Handbook of Case* (Malchukov & Spencer 2009: 43), which features separate articles on GB/Minimalism, Lexical Functional Grammar, Optimality Theory and other grammatical frameworks. As most of the HPSG work on case was carried out in the 1990s and early 2000s, this perception is unlikely to have changed since the publication of these two volumes.

The aim of this chapter is to provide an overview of HPSG work on grammatical case and to show that it does offer novel solutions to some of the problems related to case. Two main research areas are presented in the two ensuing sections: structural case assignment is discussed in Section **??** and case syncretism and underspecification in Section **??**. Some of the other HPSG work on case, including implementational work, is outlined in Section **??**.

Adam Przepiórkowski. 2021. Case. In Stefan Müller, Anne Abeillé, Robert D. Borsley & Jean-Pierre Koenig (eds.), *Head-Driven Phrase Structure Grammar: The handbook*, 233–261. Berlin: Language Science Press. DOI: ??

2 Structural case assignment

Pollard & Sag (1994) did not envisage a separate theory of case:[1] "Nominative case assignment takes place directly within the lexical entry of the finite verb", while "the subject SUBCAT element of a nonfinite verb [...] does not have a case value specified" (p. 30). However, they added in a footnote on the same page that "for languages with more complex case systems, some sort of distinction analogous to the one characterized in GB work as 'inherent' vs. 'structural' is required."

In the transformational Government and Binding theory of the 1980s (GB; Chomsky 1981; 1986), "inherent" – or "lexical" – case is understood as rigidly assigned by the head and independent of syntactic environment, while "structural" case varies with the structural context (e.g., Haider 1985: 70). This difference can be illustrated on the basis of the following examples from German (Przepiórkowski 1999a: 63, based on data from Heinz & Matiasek 1994):

(1) a. Der Mann unterstützt *den Installateur*.
the man.NOM supports the plumber.ACC
'The man is supporting the plumber.'

b. *Der Installateur* wird unterstützt.
the plumber.NOM AUX supported
'The plumber is supported.'

c. das Unterstützen *des Installateurs*
the supporting the plumber.GEN
'the support for/from the plumber'

(2) a. Der Mann hilft *dem Installateur*.
the man.NOM helps the plumber.DAT
'The man is helping the plumber.'

b. *Dem Installateur* wird geholfen.
the plumber.DAT AUX helped
'The plumber is helped.'

c. das Helfen *des Installateurs*
the helping the plumber.GEN
'the help from/*for the plumber'

[1] This section is to some extent based on Przepiórkowski (1999a), Section 3.4 and Chapter 4; see also Müller (2013), Chapter 14.