Modeling agreement in syntax

1 Unification vs. feature copying

1.1 Unification

- the features of target and goal are unified; unification is only possible if there are no conflicting values

(1)   Ja   sidel   /   sidel-a
        1SG.NOM   sat.MSC.SG   sat-F.SG
        'I was sitting (man/woman)'

– Subject has   [NUMBER: sg; PERSON: 1]
– verb has   [NUMBER: sg; GENDER: feminine]

– feature structure after unification: [NUMBER: sg; PERSON: 1; GENDER: feminine]
– agreement is modeled as symmetric
– can handle underspecification; has problems with mismatches
– predominant in HPSG (Pollard and Sag (1994)); and LFG (Bresnan (2001)); *feature checking* in early Minimalism (Chomsky (1995)) was similar (but did not involve underspecification); *feature sharing* in more recent developments within Minimalism (Frampton and Gutmann (2006)) is also unification-based

1.2 Feature Copying

- features of the controller are copied onto the target → agreement modeled as asymmetric
- Since the earliest versions of generative grammar; became prominent again with the Agree framework, cf. Chomsky (2000)

2 Agreement in the Minimalist Program

2.1 Syntactic relationships involve feature checking

- (All) syntactic relationships involve feature checking
– Selectional features: heads have selectional/subcategorization/structure-building features for their arguments, e.g.: V *talk* {PP, DP}
– heads have checking features (later: probe features) that drive movement operations

- selectional features
– are checked under c-command (if they percolate)/m-command (if they do not percolate)

- attracting features
– Observation: certain elements must be displaced from their theta-position

(2) a.   What₁ did John read __₁   b. *John read what?   (grammatical under echo-
                                                                        interpretation)

– Displacement/movement is handled by means of feature-checking:
    i.   attracting heads have uninterpretable (probe) features, e.g. *u*Wh, *u*Phi
    ii.   the attracted elements (= goals) have matching interpretable features (mostly = inherent features) (one exception: case)

iii.   uninterpretable features have to be checked before they reach the interface to semantic interpretation, i.e. LF, because they are not legible there → they trigger syntactic movement operations; interpretable features do not have to be checked

(3)   The T-model

N = {A$_i$, B$_j$, C$_k$ ... }
    ↓ Select & Merge & Move
Spell-Out ——————→ **PF**
    ↓ Select & Merge & Move
    LF
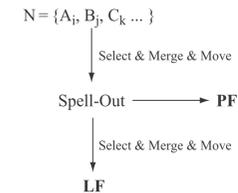
- Observation: movement does not seem to take place in all languages

- V-to-I-movement in French vs. English

(4) a.   Jean bois   souvent du   vin.
          Jean drinks often   of   wine
          'Jean often drinks wine.'

     b.   John often drinks wine.

- Wh-in-situ

(5) a.   What did Bill buy?

     b.   Bill mai-le   shenme?
   Bill buy-ASP   what
          'What did Bill buy?'   Mandarin Chinese

- uninterpretable features differ in strength: strong vs. weak features
– strong: overt movement (i.e. before spell-out): unchecked strong features are not legible at PF → have to be deleted before Spell-out
– weak: covert movement (i.e. after spell-out); the economy principle *procrastinate* prefers covert over overt movement so that overt checking of weak features is blocked

– T has a strong *u*V-feature in French, but a weak one in English
– C has a strong *u*Wh feature in English, but a weak one in Mandarin Chinese

– Note that checking must not mean that the [-interpretable] features are completely deleted because at least in the case of PF they must be accessible for morphological computations (case and agreement morphology). Rather, checking renders [–interpretable] features invisible for PF/LF (i.e. they won't be offensive at the interfaces).

- Movement is subject to *Last Resort:*
– A movement operation is licensed only if it allows the elimination of [–interpretable] formal features.

- Checking domains: Features can be checked in two configurations:
– Spec-head-relationship (e.g. between C and its specifier)
– head-head-relationship (e.g. when a V adjoins to T)

2.2   Case and agreement in Minimalism

▪ in GB, nominative and accusative were assigned in very different configurations

– nominative: Spec-head-relationship between I and the subject in Spec, TP

– accusative: head-complement-relationship between V and the object

▪ Minimalism: case-/agreement-checking uniformly under spec-head; in the early versions Chomsky (1991), Chomsky (1993), this was done in separate agreement projections, viz. AgrSP and AgrOP

(6)
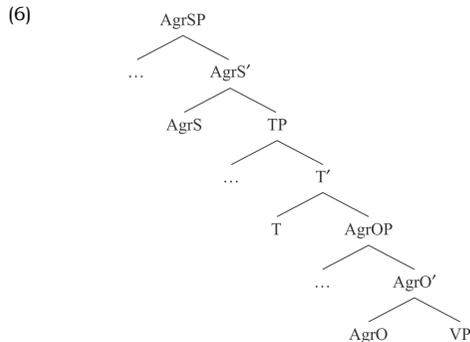
– The functional heads AgrS and AgrO bear inflectional material (or at least inflectional features), but how exactly agreement with their specifier was established was hardly discussed at that time

– AgrS and AgrO also have a case-feature that needs to be checked: AgrS [nominative]; AgrO [accusative]

– Subject and direct object enter the syntax with a specified case-feature, e.g. [nominative], and the feature is then checked against the one on the functional head

▪ Case-checking without agreement projections

– With Chomsky (1995), agreement projections were given up; instead case- and agreement checking was assumed to take place in Spec, TP (formerly: IP) and Spec, vP, a functional head above the lexical VP that introduces the external argument:

– This implies that v can have more than one specifier: object agreement/accusative case is checked in the outer specifier of v:

(7)   [$_{TP}$ SU$_2$ T [$_{vP}$ OBJ$_1$ __$_2$ v [$_{VP}$ V __$_1$]]]
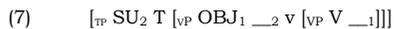
▪ Case-checking now also involves phi-features:

– v/T have *u*Phi (person, number, gender) that need to be checked against *i*Phi-features on DP

– The phi-features on both v/T and the DP are prespecified, checking verifies whether they match in values

– The case-feature on v/T is [– interpretable], but what about the case feature on DP?

– [+interpretable] features must not be deleted and therefore can in principle undergo several checking operations, thus the interpretable phi-features on DP can participate in several checking operations:

(8)   a.   As   alun**as**   parece**m**   ter   sido   contratad**as**.
           the.F.PL student.F.PL seem.3PL have   been   hired.F.PL   Portuguese
           'The (female) students seem to have been hired.'   Hornstein et al. (2005: 295)

      b.   [$_{TP}$ [as alunas]$_1$ [$_{T'}$ -m$_{[3.PL]}$ [$_{vP}$ parece- [$_{TP}$ __$_1$ ter [$_{vP}$ sido [$_{PARTP}$ __$_1$ -das$_{[FEM.PL]}$ [$_{vP}$ contrata- __$_1$]]]]]]]

– the case feature on DP, however, cannot enter several checking operations; raising from finite clauses is impossible → [case] on DP is uninterpretable:

(9)   a.   John$_1$ seems __$_1$ to love Mary.

      b.   *John$_1$ seems __$_1$ that loves Mary.

           → case is thus an exception in that here 2 [– interpretable] features enter a checking relationship

– DPs also have [+interpretable] categorial features [*i*D] which are checked against uninterpretable equivalents of T (*u*D = EPP)
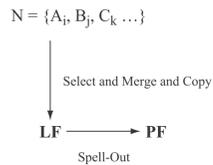
2.3   Covert movement: category movement or move-FF?

▪ There is reason to believe that covert movement only involves movement of the formal features of (the head of) an XP, but not other features:

▪ wh-in-situ (the wh-phrase has matrix scope in both sentences):

(10) a.   [Que   fotografia de [si   mesmo]$_{i/k}$]$_1$ [o   João]$_k$ disse que [o   Pedro]$_i$ viu   __$_1$?
           which picture   of self own   the João said that the Pedro saw

      b.   [O   João]$_k$ disse que [o   Pedro]$_i$ viu que   fotografia de [si   mesmo]$_{i/*k}$?
           the João   said that the Pedro   saw which picture   of self own
           'Which picture of himself did João say that Pedro saw?'
                                            Brazilian Portuguese, cf. Hornstein et al. (2005: 307)

– if covert movement involved movement of the entire phrase *Que fotografia de si mesmo* one would expect the same binding possibilities as with overt movement

– the contrast can be understood if covert movement only involves movement of the formal features of the wh-word *Que* to the attracting head (an instance of head-movement, the checking configuration is head-head)

(11)   [**FF(que)** +C [o João]$_k$ disse que [o Pedro]$_i$ viu que fotografia de [si mesmo]$_{i/*k}$]

▪ Binding in existential sentences

(12) a.   [[many students$_i$]$_1$ seemed to each other$_i$ [__$_1$ to have been in trouble]]

      b.   *[there$_1$ seemed to each other$_i$ [__$_1$ to have been many students$_i$ in trouble]]

– If the entire associate *many students* underwent movement to Spec, TP to check nominative case at LF, we would expect the same binding possibilities as with overt movement, contrary to fact.

– Instead, what moves are just the formal (= case and phi-) features of *many students* (and not the semantic features)

- When do we get category movement and when feature movement?
– strong features require category movement (stipulation)
– weak features can be checked by feature movement

- instead of procrastinate: movement must target the smallest number of features

- towards a single-output syntax
– There no reason anymore to adopt a separate covert component since the defining property of "covert" movement is now movement of different elements rather than movement at a certain point → category and feature movement can be mixed.
– a welcome result of this is that the extension condition/cyclicity is no longer violated by "covert" movement
– The need for a special spell-out point before LF (which has properties of an intermediate level of representation like S-Structure) is no longer there:

(13)   Single-output syntax: either covert movement/feature movement apply cyclically or are replaced by Agree, cf. below.

$$N = \{A_i, B_j, C_k \ldots\}$$

Select and Merge and Copy

LF ⟶ **PF**

Spell-Out

– Note that a single-output syntax is in principle also possible with full category movement, cf. Bobaljik (2002)
– for arguments for covert category movement, cf. Pesetsky (2000)

2.4   Agree

– only [+ interpretable] features are fully specified in the lexicon (= valued), [– interpretable] features start out unvalued and acquire their values during the derivation (valuation)
– heads with [– interpretable] features are called *probes*, they search for a constituent with [+interpretable] equivalents of its features, a so-called *goal*
– the operation Agree copies the values from the goal to the probe; as a consequence, the probe features are valued (they can now be used for morphology; but they are deleted/invisible for purposes of LF), cf. (Chomsky (2000), Chomsky (2001)):

(14)   Agree between a probe P and a goal G obtains if

a.   P bears at least one unvalued probe feature and thereby seeks the value of a matching feature of G
b.   P c-commands G
c.   G is active (G has an unvalued [–interpretable] feature)
d.   G is the closest goal to P (i.e. there is no other goal H that is c-commanded by P and itself asymmetrically c-commands G and bears [+interpretable] features matching those of P)
e.   P and G are contained within the same phase
→   As a result of Agree, G values P (uF) and P values G (uF)

(15)
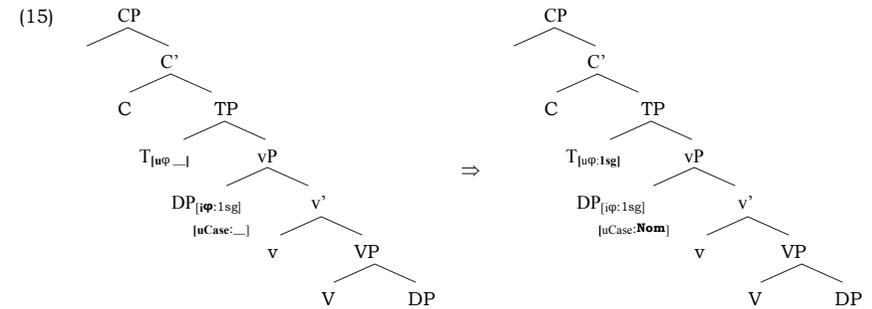
– T is an active probe because of [uφ]
– The subject DP is active because it has an [uCase] feature
– as a result of Agree DP, values T (φ-features) and T values DP (case)
– Agree with T results in Nom, Agree with v results in Acc: case assignment is a reflex of agreement in phi-features

- Case and agreement are thus seen as two sides of the same coin: A syntactic relationship is marked by either
– head-marking: agreement
– dependent-marking: case

    → where we find which marking is essentially a property of the morphology, but not of the syntax, the underlying syntactic process is the same, viz. Agree

- activity: a constituent remains active as long as it has some unchecked/unvalued [–interpretable] feature, in the cases we are interested in, this will be an [uCase] feature.

(16) a.   l-banaant-u   kunna   waaqif-aat
       the-girls-NOM   were.3F.PL standing-F.PL
       'The girls were standing.'

    b.   [TP l-banaant-u1{P:3; N:PL; G:F; NOM} [T' T{P:3; N:PL; G:F; EPP} [VP kunna   Standard Arabic
       [PartP __1 Part{N:PL; G:F; EPP} [vP __1 waaqif-aat]]]]]   Hornstein et al. (2005: 320)

– case assignment + deactivation only takes place if agreement in *person* is involved:

(17)   *John1 seems __1 that loves Mary.

– exceptions are found in Bantu languages (multiple person agreement):

(18)   (Mimi) ni-li-kuwa ni-ngali   ni-ki-fanya   kazi
       I   **1SG**-PST-be **1SG**-still **1SG**-PRF-do work
       'I am still working.'   Swahili, cf. Henderson (2006: 276)

- and movement?
– covert/feature movement is replaced by Agree, i.e. simple feature copying (the semantic effects are the same, i.e. no extension of binding possibilities etc.)
– overt movement applies if a head bears a movement diacritic in addition to a probe feature, these diacritics are usually called EPP-features. → Agree is a precondition for Move (Internal Merge) → constraints on movement now follow from constraints on Agree

- the features in wh-movement
- C has [uWh] and [EPP]
- *wh*-phrase has [iWh] and [uQ] (which makes it active), [uQ] is checked as a by-product of Agree between [uWh] and [iWh]

2.5 Locality: intervention and phases

2.5.1 Intervention

- An experiencer can block Agree between T and a postverbal nominative subject:

(19) a. Jóni   virð-ast/?*virð-ist   vera taldir   líka hestarnir.
John.DAT seem-3**PL**/seem-3SG to.be believed.**PL** to.like horses.NOM.**PL**
'John seems to be believed to like horses.'

b. Mér   ?*virð-ast/virð-ist   Jóni   vera taldir   líka hestarnir.
Me.DAT seem-3PL/seem-3SG John.DAT to.be believed.PL to.like horses.NOM.PL
'John seems to me to be believed to like horses.'   Bobaljik (2008: 319)

- In a, *John* is raised to Spec, TP, nothing intervenes between T and the nominative → plural agreement
- in b. *John* is not raised all the way, it intervenes between T and the nominative → default agreement
- However, *John* arguably is no longer active so that it is eventually not clear why it should intervene here; this would be an instance of *defective intervention*, a possibility which many reject for conceptual reasons

2.5.2 Phases

- Agree is also restricted by locality:

(20) *Phase Impenetrability Condition (PIC)* (Chomsky (2000), Chomsky (2001))
In phase α with the head H, the domain of H is not accessible to operations outside α; only H and its edge are accessible to such operations.

Domain of a phase: complement of H
Edge of a phase: H and the specifier of H

- phases are maximal projections with special properties: once completed, their domain is transferred to the interfaces (PF, LF), a.k.a cyclic-spell-out (spell-out happens after each phase and not at the end of the derivation) → material within the domain becomes inaccessible for syntactic operations, e.g. inaccessible for Agree
- Which nodes are phases?
- C, v, D
- criteria: propositionality (vP contains entire argument structure, CP the entire sentence with tense and mood, DP contains the entire argument structure of a noun)
- there are alternative proposals: e.g.: every XP is a phase, cf. Heck and Müller (2007)
- motivation
- (conceptual) reduction in computational cost/memory load, increase in computational efficiency
- they ensure the cyclicity of the derivation

- The problem of successive-cyclic movement
- Moving a direct object directly to Spec, CP directly is not possible because the complement of the vP phrase will have been transferred by the time the probe C is merged, the direct object would be no longer accessible:

(21) What did John eat __?

- Solution: successive-cyclic movement via the edge of vP:

(22) [$_{CP}$ What$_1$ did [$_{TP}$ John$_2$ [$_{vP}$ __$_1$ __$_2$ v **[$_{vP}$ eat __$_1$]**]]]

- trigger for successive-cyclic movement: so-called optional EPP-/edge-features that can be added to phase-heads
- note that there are other ways of ensuring successive cyclicity, e.g. phase balance (Heck and Müller (2007)), greed-based movement, e.g. Bošković (2007)

- the problem of long-distance agreement
- there are examples where there seems to be a phase-boundary between probe and goal:
i. e.g. long-distance agreement in Tsez: matrix V agrees with embedded abs-argument

(23) eni-r   [už-ā   magalu   b-āc'-ru-łi]   b-iy-xo
mother(II)-DAT boy(I)-ERG bread(**III**)[ABS] III-eat-PST_PTCP-NOMLZ[ABS] **III**-know-PRS
'The mother knows that the boy ate the bread.'   Tsez, Polinsky and Potsdam (2001: 584)

- possible solution: the absolutive argument covertly moves to the edge of CP where it is accessible to the matrix v-probe → no phase-boundary intervenes

(24)
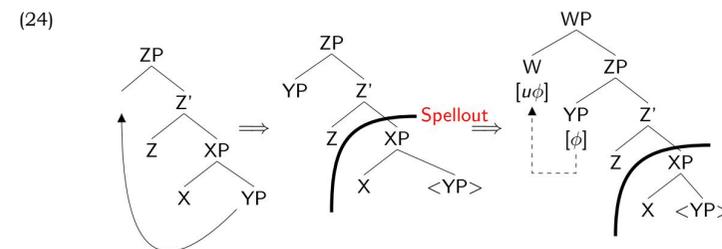
- There seems to be a consensus that most cases of apparent long-distance agreement (between matrix v/T and an argument of the embedded clause) are either of the Tsez type or involve restructuring, i.e. embedding of a constituent smaller than TP, perhaps not even involving vP so that no phase boundaries intervene, cf. Richards (to appear)

ii. e.g. in agreement between T and unaccusative subjects that remain inside VP:

(25) a. dass gestern im Atlantik   **ein Schiff** sank
that yesterday in.the atlantic.ocean a.NOM ship   sank
'that there sank a ship in the Atlantic Ocean yesterday.'

b. [that [$_{TP}$ **T** [$_{vP}$ v **[$_{vP}$ ein Schiff sank]**]]]

– the search space (from Richards (to appear))

(26)
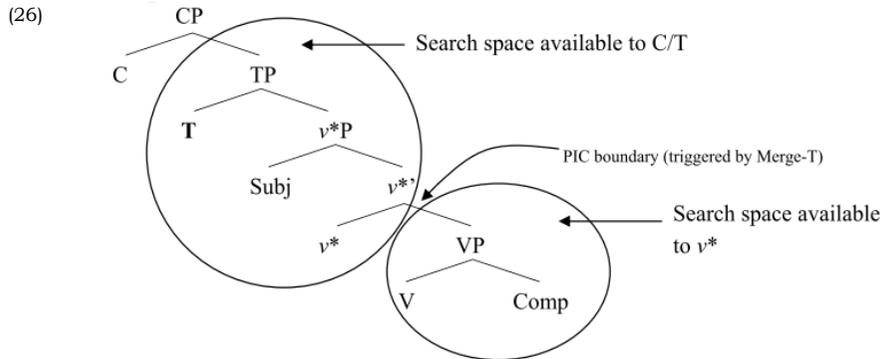
- "solution1": not all vPs are phases, only those of transitive and unergative verbs are;
- complements of raising verbs aren't phases either (either because they are TPs instead of CPs or because the CP also counts as a defective phase):

(27)   There **seem** to have come **many guests**.

- Solution 2: weakening of the PIC:

(28)   *Phase Impenetrability Condition* (version PIC 2)
[Given structure [$_{ZP}$ Z ... [$_{HP}$ α [H YP]]], with H and Z the heads of phases]:
The domain of H is not accessible to operations at ZP; only H and its edge are accessible to such operations.

- consequence: the domain of vP/CP is not transferred until the next higher phase head is merged, which in the case at hand extends the search space of T (from Richards (to appear)):

(29)
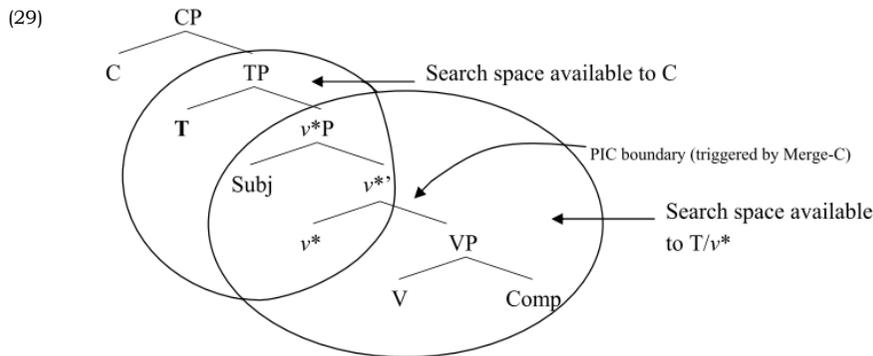
- solution 3: cyclic Agree (Bhatt (2005), Legate (2005))
- the featural properties of the embedded goal can be transmitted up the tree via smaller, local Agree steps, whereby an embedded probe, once valued by the embedded goal, can itself then act as the goal for an Agree operation involving a higher probe (and so on) → in the case at hand, features from the nominative object would be copied onto v where they are accessible for T

(30)
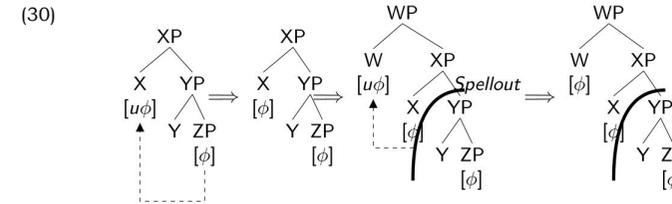
- potential problem: phi-features on heads must act as probes as well as as goals – activity?

- solution 4: Agree is not subject to the PIC (only movement is), cf. e.g. Bošković (2007); similarly, Richards (to appear), defective phases only trigger PF-spell-out (and thus enforce local movement) but not LF-spellout, thereby extending the search space for Agree as under PIC2 in those cases (and thus allow non-local Agree).

2.6 Feature sharing

- problem: concord within DP: D, N (and modifiers like A and Num) agree in number, gender and case
- N: has [+interpretable] number and gender features
- D: arguably has [–interpretable] number and gender features and [+ interpretable] person
- All constituents of the DP start out with an [–interpretable] case-feature

2.6.1 What would a checking approach look like?

- if only [–interpretable] features can act as probes, we can assume that D acts as probe and finds interpretable features on N
- there may be interpretable phi (gender/number) features on D through raising of N that could check off uninterpretable features on v/T/P
- D arguably has a +interpretable [person] feature

- but:
- since checking between D and N also involves the case-feature, it will be checked on both heads so that no active case feature is left for checking with v/T/P;
- possible solution (unattractive): duplication of case features on D: both a case-feature that triggers checking with N as well as a case-feature that makes it active for checking with v/T/P. gender/number of v/T are then checked by the features of N.

2.6.2   What would an Agree-based approach look like

- since case is assigned, D and N start out with an unvalued case-feature.
- D has unvalued phi-features, probes and find [Gender, Number] on N, which are then copied onto D. Since the case feature has not yet been valued, D remains active (and N does, too).
- D has [*i*Person] which can check [*u*Person] on v/T
- But: since D's gender/number features have been valued through Agree with N, these features are no longer accessible for Agree with [*u*Gender, *u*Number] v/T
- → N has to act as a goal for v/T for [Gender, Number] since they are interpretable on N, but (features on the probe must be able to probe separately)
- This may be blocked by locality: D has an unvalued case feature that could intervene
- N may not be accessible for reasons of phase-hood (not in the edge-domain of D), it would have to go N-to-D-raising, but that does not always take place
- even if checking between v/T and N is possible, there remains the case problem:
- v/T has one case feature that needs to be checked/assigned, but there are two probes that need case, viz. N and D → v/T will be deactivated after Agree with one of them, the other one then cannot be assigned case and the derivation crashes
    → remains problematic

2.6.3   A Feature-sharing solution

- Frampton and Gutmann (2006), Pesetsky and Torrego (2007)

- valued and interpretable are independent dimensions:
- interpretable unvalued features can probe   (i.e. unvalued features probe)
- valued uninterpretable features can be goals

- Agree is feature sharing, i.e. two syntactic locations share a feature
- Agree is also possible between an unvalued probe and an (partially) unvalued goal

- features within DP (cf. e.g. Georgi and Salzmann (2011))
- D has [Person: X] [Number: __] [Gender: __] [Case: __]
- N has   [Number: Y] [Gender: Z] [Case: __]

- D agrees with N, leading to feature sharing:
- D has [Person: X] [Number: **Y**] [Gender: **Z**] [Case: α]
- N has   [Number: Y] [Gender: Z] [Case: α]
    → both D and N are still active (Case is unvalued), an outside probe e.g. T, is merged and
       agrees with D:

- D has [Person: X] [Number: Y] [Gender: Z]   [Case: **Nom**]
- T has [Person: **X**] [Number: **Y**] [Gender: **Z**]

    → since N shares the case-feature with D, its feature structure then looks as follows:
- N has   [Number: Y] [Gender: Z] [Case: **Nom**]

2.7   Further important topics

- Multiple agreement (a single probe simultaneously agrees with more than one goal): Hiraiwa (2000)

- phi-features for Su and Obj on a single head (T or v): Béjar and Rezac (2009), Georgi (to appear)

- single features acting as probes (separate person and number probes): Béjar and Rezac (2009)

- relativized probing (syntactic agreement is relativized to certain values of the person feature on a goal): Nevins (2007)

- upward probing (a functional head can probe upwards): e.g. Baker (2008)

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