Chapter 16

Complement extraction lexical rule and variable argument raising

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When (i) clause union phenomena are described by lexical entries involving vari- 1
able argument raising in the manner of Hinrichs & Nakazawa (1993) and (ii) object extraction is accounted for without trace by lexical rule (CELR), the empirical consequences that many authors wished to achieve by these formal constructs are systematically unavailable.

One probable consequence is that the CELR has to be dropped. Among various 2
alternative formal options, extraction by trace appears to be superior.

The grammar of Pollard & Sag (1994) has two components: a set of descriptions 3
Descr and a collection of metadescriptive expressions Meta. Any feature structure is grammatically well-formed only if it satisfies every member of Descr. Among the members of Descr are, e.g., the HFP, the Subcat Principle, the ID Principle, the Trace Principle, the various parts of the Binding Theory.

Pollard & Sag (1994) assumes that a Lexicon – i.e., a collection of lexical en- 4
tries – is part of the grammar (an assumption that might be debated); and members of Meta are meant to express statements about the Lexicon and its members, namely:

(i) a collection of "generic lexical entries" (Pollard & Sag 1994: 36f.). "Actual lexical entries" are in a relation "instantiate" to generic lexical entries, and the "information" associated with either of them is "amalgamated" in the former.

[§] *Editors' note:* This is the previously unpublished paper version of a talk given at the HPSG workshop in Tübingen on June 21, 1995. The citation style was adjusted to the conventions in this volume, and closing brackets (omitted in the original) were added to all AVMs. The text used to be available from a web page with the note: 'The background of this has been developed in lecture notes (Spurenlose Extraktion [Höhle 1994]) in 1994.'

Tilman N. Höhle. 2019. Complement extraction lexical rule and variable argument raising. In Stefan Müller, Marga Reis & Frank Richter (eds.), *Beiträge zur deutschen Grammatik. Gesammelte Schriften von Tilman N. Höhle. Second revised edition*, 539–551. Berlin: Language Science Press.
DOI:10.5281/zenodo.2588377

Clearly, generic lexical entries are descendants of the ‘generic lexical frames’ in Flickinger et al. (1985), the ‘(definitions of) word classes’ in Flickinger (1987) and Flickinger & Nerbonne (1992), and the ‘(definitions of) lexical types’ in Pollard & Sag (1987: 192–196, 198f. and 200–208). (N.b. that although the types of Pollard & Sag 1987 in general correspond to the sorts of Pollard & Sag 1994, the lexical types of Pollard & Sag 1987 correspond to generic lexical entries of Pollard & Sag 1994 rather than to sorts.)

(ii) the Raising Principle and the Control Theory. These are well-formedness conditions on lexical entries of the form: if lexical entry E has property α, then E also has property β. (α and β are compatible.)

(iii) a set of lexical rules. These are well-formedness conditions on the Lexicon of the form: if Lexicon L has a member with property α, then L also has a member with property β. (α and β are incompatible.)

5 Although Pollard & Sag (1994) is silent about the role of the Lexicon in the grammar, a Word Principle (WP) might be inferred:

(iWP) Any feature structure of sort *word* must satisfy a lexical entry. (Hence, a lexical entry is a description.)

If the WP is thought to be a member of Descr, it can be formalized:

(fWP) $:word \Rightarrow (D_1 \vee \ldots \vee D_n)$

In this case, the Lexicon – i.e., the set of D_i in the fWP – is necessarily finite. But if lexical rules are used to define the Lexicon inductively, as in Pollard & Sag (1994: 395 n. 1), the WP must be a member of Meta, and there is no known way to formalize it. (Cf. Pollard 1993.)

6 In section 9.5.1 of Pollard & Sag (1994), traces are abolished; i.e., the Trace Principle is tacitly replaced by a No Trace Principle to the effect that there is no sign whose LOC value is a member of its INHER SLASH value:

(NTP) ¬:SS LOC ≈ :SS NONLOC INHER SLASH FIRST

Unslashed words with a trace complement are substituted by slashed words. Pollard & Sag (1994) attempts to motivate this move by data discussed by Pickering & Barry (1991). However, this attempt is inconsistent with the word order theory of HPSG. Pickering & Barry’s (1991) data are problematic for theories (like, e.g., GPSG) in which phonologically empty constituents are subject to constituent order principles just like nonempty constituents are. But from the HPSG word order theory it follows that empty constituents have no word order properties at all (cf. Pollard & Moshier 1990: 291f.); hence it *predicts* the possible existence of

Pickering & Barry's (1991) data. – Even though dropping traces is unmotivated, one might wish to explore its consequences.

Thus, while the word *gibt* in (1a) is unslashed, the word *gibt* in (1b) is slashed, 7
and so are their respective lexical entries in (2).

(1) a. daß [er es ihr gibt]

b. wem [er es gibt]

(2) a. lexical entry of unslashed *gibt* 'gives' as in (1a):

$$\begin{bmatrix} \textit{word} \\ \text{PHON} \langle \text{gibt} \rangle \\ \text{SS} \begin{bmatrix} \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD VFORM } \textit{finite} \\ \text{SUBCAT} \begin{bmatrix} \text{FIRST LOC} \begin{bmatrix} \text{CAT HEAD CASE} & \textit{dative} \\ \text{CONTENT INDEX} & \boxed{1} \end{bmatrix} \\ \text{REST} \begin{bmatrix} \text{FIRST LOC} \begin{bmatrix} \text{CAT HEAD CASE} & \textit{accusative} \\ \text{CONTENT INDEX} & \boxed{2} \end{bmatrix} \\ \text{REST} \begin{bmatrix} \text{FIRST LOC} \begin{bmatrix} \text{CAT HEAD CASE} & \textit{nominative} \\ \text{CONTENT INDEX} & \boxed{3} \end{bmatrix} \\ \text{REST } \textit{elist} \end{bmatrix} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{CONTENT} \begin{bmatrix} \textit{give} \\ \text{GIVER} & \boxed{3}\ \textit{ref} \\ \text{GIVEN} & \boxed{2}\ \textit{ref} \\ \text{RECEIVER} & \boxed{1}\ \textit{ref} \end{bmatrix} \end{bmatrix} \\ \text{NONLOC} \begin{bmatrix} \text{INHER SLASH} & \textit{elist} \\ \text{TO-BIND SLASH} & \textit{elist} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

b. lexical entry of slashed *gibt* as in (1b):

$$\begin{bmatrix} \textit{word} \\ \text{PHON} \langle \text{gibt} \rangle \\ \text{SS} \begin{bmatrix} \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD VFORM } \textit{finite} \\ \text{SUBCAT} \begin{bmatrix} \text{FIRST LOC} \begin{bmatrix} \text{CAT HEAD CASE} & \textit{accusative} \\ \text{CONTENT INDEX} & \boxed{2} \end{bmatrix} \\ \text{REST} \begin{bmatrix} \text{FIRST LOC} \begin{bmatrix} \text{CAT HEAD CASE} & \textit{nominative} \\ \text{CONTENT INDEX} & \boxed{3} \end{bmatrix} \\ \text{REST } \textit{elist} \end{bmatrix} \end{bmatrix} \end{bmatrix} \\ \text{CONTENT} \begin{bmatrix} \textit{give} \\ \text{GIVER} & \boxed{3}\ \textit{ref} \\ \text{GIVEN} & \boxed{2}\ \textit{ref} \\ \text{RECEIVER} & \boxed{1}\ \textit{ref} \end{bmatrix} \end{bmatrix} \\ \text{NONLOC} \begin{bmatrix} \text{INHER SLASH} \begin{bmatrix} \text{FIRST} \begin{bmatrix} \text{CAT HEAD CASE} & \textit{dative} \\ \text{CONTENT INDEX} & \boxed{1} \end{bmatrix} \\ \text{REST} & \textit{elist} \end{bmatrix} \\ \text{TO-BIND SLASH } \textit{elist} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

8 Notice that (i) to emphasize that the issue of traceless extraction by lexical rule is logically and empirically independent of the choice of valence attributes, I keep the valence attribute SUBCAT as in Pollard & Sag (1994: Appendix); (ii) for reasons given in §10 the order of elements in the SUBCAT value is as in Pollard & Sag (1987) (elements to the right are less oblique than those to the left).

9 The perfect auxiliary *hab-* 'have' in (3) is a variable argument raiser. The word *hat* in (3a) is unslashed. Extractions as in (3b)–(3d) are thought to be object extractions exactly like the extraction in (1b). Hence, the word *hat* in (3b, 3c) is slashed. See (4) and (6) for the lexical entries. In (3d) it is unobvious whether *hat* or *gegeben* should be slashed.

(3) a. daß [er es ihr gegeben hat]
    b. gegeben (glaubt sie) daß [er es ihr hat]
    c. es ihr gegeben (glaubt sie) daß [er hat]
    d. wem [er es gegeben hat]

(4) lexical entry of unslashed *hat* 'have' as in (3a):

$$\begin{bmatrix} \textit{word} \\ \text{PHON} \left\langle \text{hat} \right\rangle \\ \text{SS} \begin{bmatrix} \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD VFORM } \textit{finite} \\ \text{SUBCAT} \begin{bmatrix} \text{FIRST} \begin{bmatrix} \textit{w–ss} \\ \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD VFORM} & \textit{past-part} \\ \text{SUBCAT} & \boxed{2} \end{bmatrix} \\ \text{CONTENT } \boxed{1} \end{bmatrix} \end{bmatrix} \\ \text{REST } \boxed{2} \end{bmatrix} \end{bmatrix} \\ \text{CONTENT} \begin{bmatrix} \textit{perfect} \\ \text{SOA-ARG } \boxed{1}\ \textit{psoa} \end{bmatrix} \end{bmatrix} \\ \text{NONLOC} \begin{bmatrix} \text{INHER SLASH} & \textit{elist} \\ \text{TO-BIND SLASH} & \textit{elist} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

10 **Comment (i) on (4)** Most authors follow Hinrichs & Nakazawa in describing the SUBCAT value with the help of some definite relation. As a rule, no formal explication of definite relations and no definition of the relation used is offered; nor are the ontological implications of definite relations discussed. Moreover, using a relation excludes the option of treating (3b, 3c) by any general CELR. To avoid these complications, I follow Meurers (1994) in the formalization of variable argument raising as shown in (4).

11 **Comment (ii) on (4)** Variable argument raisers are hypothesized to combine with a very low projection of the expression they select. For ease of exposition I

assume that the projection is in fact a word. To enforce this, I partition the sort *synsem* into *w-ss* and *p-ss* and assume these feature declarations:

(5) Approp(ss, *phrase*) = *p-ss*
Approp(ss, *word*) = *w-ss*

There is no *category* attribute LEXICAL (since no reason for having it is known).

(6) lexical entry of slashed *hat* as in (3b, 3c): 12

$$\begin{bmatrix} \textit{word} & \\ \text{PHON} & \langle \text{hat} \rangle \\ \text{SS} & \begin{bmatrix} \text{LOC} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD VFORM} & \textit{finite} \\ \text{SUBCAT} & \boxed{2} \end{bmatrix} \\ \text{CONTENT} & \begin{bmatrix} \textit{perfect} & \\ \text{SOA-ARG} & \boxed{1}\ \textit{psoa} \end{bmatrix} \end{bmatrix} \\ \text{NONLOC} & \begin{bmatrix} \text{INHER SLASH} & \begin{bmatrix} \text{FIRST} & \begin{bmatrix} \text{CAT} & \begin{bmatrix} \text{HEAD VFORM} & \textit{past-part} \\ \text{SUBCAT} & \boxed{2} \end{bmatrix} \\ \text{CONTENT} & \boxed{1} \end{bmatrix} \\ \text{REST} & \textit{elist} \end{bmatrix} \\ \text{TO-BIND SLASH} & \textit{elist} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The relation between (2a) and (2b) and between (4) and (6) is regular: for each lexical entry like (2a) and (4) there is a lexical entry like (2b) and (6), respectively. To express generalizations like this, Pollard & Sag (1994) uses lexical rules whose syntax and intended semantics vaguely resemble GPSG's metarules. Syntactically, a lexical rule is a pair <Pattern, Target> whose members are expressions written in the syntax of the description language, enriched with regular expressions. A first version of the Object Extraction Lexical Rule (which is similar to the CELR of Pollard & Sag 1992: 446) might be formulated as in (7): 13

(7) OELR, first version:

$$\text{Pattern: } \begin{bmatrix} \text{SS} & \begin{bmatrix} \text{LOC CAT SUBCAT (REST)}^{n} & \begin{bmatrix} \text{FIRST LOC} & \boxed{1} \\ \text{REST} & \boxed{2} \end{bmatrix} \\ \text{NONLOC INHER SLASH} & \boxed{3} \end{bmatrix} \end{bmatrix}$$

$$\text{Target: } \begin{bmatrix} \text{SS} & \begin{bmatrix} \text{LOC CAT SUBCAT (REST)}^{n} & \boxed{2} \\ \text{NONLOC INHER SLASH} & \begin{bmatrix} \text{FIRST} & \boxed{1} \\ \text{REST} & \boxed{3} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

(By (7), there must be lexical entries that allow subjects to be extracted in violation of the Comp-trace filter. I ignore this effect, as it is immaterial to my concerns.)

Expressions of the form "$(\alpha)^{n}$" signify a sequence of n occurrences of expression α, with $n \geq 0$. Identity of tags across Pattern and Target signifies that identi- 14 cal description language expressions occur in place of the tags. (In the Coercion Lexical Rule of Pollard & Sag (1994: 314), tag identity across Pattern and Target is erroneously intended to signify token-identity of feature structures that satisfy lexical entries.) Identity of tags within Pattern or Target, however, has its usual interpretation as an abbreviation of path equations or (in a language with variables) identity of variables.

15 The lexical entry (2a) matches the Pattern of (7) in that the expressions that the Pattern contains are contained in (2a), for $0 \leq n \leq 2$. Taking $n = 0$, tag $\boxed{1}$ stands for the expression (8a); tag $\boxed{2}$ stands for the expression (8b), and tag $\boxed{3}$ stands for the expression “*elist*”.

(8) a.
$$\begin{bmatrix} \text{CAT HEAD CASE } \textit{dative} \\ \text{CONTENT INDEX } \boxed{1} \end{bmatrix}$$

b.
$$\begin{bmatrix} \text{FIRST LOC} & \begin{bmatrix} \text{CAT HEAD CASE} & \textit{accusative} \\ \text{CONTENT INDEX} & \boxed{2} \end{bmatrix} \\ \text{REST} & \begin{bmatrix} \text{FIRST LOC} & \begin{bmatrix} \text{CAT HEAD CASE} & \textit{nominative} \\ \text{CONTENT INDEX} & \boxed{3} \end{bmatrix} \\ \text{REST} & \textit{elist} \end{bmatrix} \end{bmatrix}$$

c.
$$\begin{bmatrix} \text{FIRST LOC} & \begin{bmatrix} \text{CAT HEAD CASE} & \textit{dative} \\ \text{CONTENT INDEX} & \boxed{1} \end{bmatrix} \\ \text{REST} & \begin{bmatrix} \text{FIRST LOC} & \begin{bmatrix} \text{CAT HEAD CASE} & \textit{accusative} \\ \text{CONTENT INDEX} & \boxed{2} \end{bmatrix} \\ \text{REST} & \begin{bmatrix} \text{FIRST LOC} & \begin{bmatrix} \text{CAT HEAD CASE} & \textit{nominative} \\ \text{CONTENT INDEX} & \boxed{3} \end{bmatrix} \\ \text{REST} & \textit{elist} \end{bmatrix} \end{bmatrix} \end{bmatrix}$$

The lexical entry (2b) is determined by the Target of (7) in conjunction with (2a) in that expression (8a) is the INHER SLASH FIRST value of (2b), and expression (8b) replaces expression (8c) just as the Target indicates. Thus, given (7), any Lexicon that contains (2a) must also contain (2b).

16 Notice that all other differences between (2a) and (2b) are intended to be consequences of (7). If pairs of tags in (2a) and in (2b) are viewed as abbreviations of path equations, conventions must be defined that replace all relevant path equations of (2a) by the corresponding equations in (2b). Defining such conventions (and applying them correctly) is difficult. Intuitions might be better supported by viewing pairs of tags as pairs of identical variables (even if that might create problems of its own).

17 The existence of lexical entry (6) follows from (7) and the existence of (4). In fact, many more lexical entries are required to exist. According to Pollard & Sag (1994), for a lexical entry to match a Pattern, the expressions in the Pattern need

not be contained in the lexical entry. Rather, lexical entry E matches Pattern P of lexical rule R if there is a consistent description D that contains the expressions of E and the expressions of P. Call the smallest such description D^E. There must be a lexical entry E′ that is determined by R's Target and D^E. Take the Pattern of (7) with $n = 1$:

(9)
$$\left[\textsc{ss}\left[\begin{array}{l}\textsc{loc cat subcat rest}\begin{bmatrix}\textsc{first loc} & \boxed{1}\\ \textsc{rest} & \boxed{2}\end{bmatrix}\\ \textsc{nonloc inher slash}\ \boxed{3}\end{array}\right]\right]$$

The expressions in (9) are not contained in (4). But there is a description $D^{(4)}$ as in (10):

(10)
$$\begin{bmatrix}\textsc{phon}\left\langle \text{hat}\right\rangle\\ \textsc{ss}\begin{bmatrix}\textsc{loc}\ \textsc{cat}\begin{bmatrix}\textsc{head vform}\ \textit{finite}\\ \textsc{subcat}\begin{bmatrix}\textsc{first}\begin{bmatrix}\textit{w-ss}\\ \textsc{loc}\begin{bmatrix}\textsc{cat}\begin{bmatrix}\textsc{head vform} & \textit{past-part}\\ \textsc{subcat} & \boxed{2}\end{bmatrix}\\ \textsc{content}\ \boxed{1}\end{bmatrix}\end{bmatrix}\\ \textsc{rest}\ \boxed{2}\begin{bmatrix}\textsc{first loc} & \textit{loc}\\ \textsc{rest} & \textit{list}\end{bmatrix}\end{bmatrix}\\ \textsc{content}\begin{bmatrix}\textit{perfect}\\ \textsc{soa-arg}\ \boxed{1}\ \textit{psoa}\end{bmatrix}\end{bmatrix}\\ \textsc{nonloc}\begin{bmatrix}\textsc{inher slash} & \textit{elist}\\ \textsc{to-bind slash} & \textit{elist}\end{bmatrix}\end{bmatrix}\end{bmatrix}$$

Hence, the Target of (7) determines lexical entry (11):

(11)
$$\begin{bmatrix}\textsc{phon}\left\langle \text{hat}\right\rangle\\ \textsc{ss}\begin{bmatrix}\textsc{loc}\ \textsc{cat}\begin{bmatrix}\textsc{head vform}\ \textit{finite}\\ \textsc{subcat}\begin{bmatrix}\textsc{first}\begin{bmatrix}\textit{w-ss}\\ \textsc{loc}\begin{bmatrix}\textsc{cat}\begin{bmatrix}\textsc{head vform} & \textit{past-part}\\ \textsc{subcat} & \boxed{2}\end{bmatrix}\\ \textsc{content}\ \boxed{1}\end{bmatrix}\end{bmatrix}\\ \textsc{rest}\ \boxed{2}\ \textit{list}\end{bmatrix}\\ \textsc{content}\begin{bmatrix}\textit{perfect}\\ \textsc{soa-arg}\ \boxed{1}\ \textit{psoa}\end{bmatrix}\end{bmatrix}\\ \textsc{nonloc}\begin{bmatrix}\textsc{inher slash}\begin{bmatrix}\textsc{first} & \textit{loc}\\ \textsc{rest} & \textit{elist}\end{bmatrix}\\ \textsc{to-bind slash}\ \textit{elist}\end{bmatrix}\end{bmatrix}\end{bmatrix}$$

18 Two aspects of (11) are remarkable. First, the element in the SLASH value is not described as being identical to anything. This follows from the fact that the SUBCAT REST FIRST LOC value in (10) is not – and cannot be – described as being identical to anything. Hence, the word *hat* in (12) might satisfy (11):

(12) * wem [er es meiner Tante gegeben hat]

Second, consider the SUBCAT REST value with tag $\boxed{2}$. The SUBCAT value of the participle bears the same tag; hence (12) should be grammatical, and (3d) should be ungrammatical. (Cf. Hinrichs & Nakazawa 1994: 19 for a similar observation.)

19 Summarizing so far: the conjunction of 3 assumptions – that variable argument raising is described in the manner of Hinrichs & Nakazawa (1993), that extraction is traceless by lexical rule, and that matching of rule Patterns is as liberal as Pollard & Sag (1994) assumes – makes the grammar useless.

20 However, the situation is not that simple. By lexically reducing the valence list, Pollard & Sag (1994: Ch. 9) has lost the account for binding reconstruction phenomena that comes for free with traces. To be able to keep the descriptive results, Pollard & Sag (1994) introduces a series of additional assumptions:

(i) A store for the unreduced valence list is introduced as a *word* attribute. I call it ARGSTORE, Pollard & Sag (1994) calls it SUBCAT.

(ii) (a) In lexical entries with an unreduced valence list, the ARGSTORE value contains just the elements of the valence value in the same order.

(b) The ARGSTORE value is unaffected by lexical rules reducing the valence value.

(c) But it is unknown how assumptions (a) and (b) can be expressed as a general fact in the grammar.

(iii) The notion of obliqueness is (only) explained for the ARGSTORE value. Hence the Binding Theory must refer to the ARGSTORE value (for obliqueness) and to the valence value (for local o-command).

21 By lexically reducing the valence list, Pollard & Sag (1994) has also lost the account for many parasitic gap phenomena that the Subject Condition was thought to provide. Hence, Pollard & Sag (1994) adds yet another stipulation:

(iv) The CELR adds a slash to the *synsem* object in the ARGSTORE value whose LOC value is put into the INHER SLASH value.

The lexical entries – in particular, (4) – and the OELR (7) have to be modified 22
accordingly.

(13) OELR, final version (similar to Pollard & Sag (1994: 378)):

Pattern:
$$\left[\begin{array}{l} \textsc{ss} \left[\begin{array}{ll} \textsc{loc cat subcat (rest)}^n & \left[\begin{array}{l}\textsc{first } \boxed{4} \textsc{ loc } \boxed{1} \\ \textsc{rest } \boxed{2}\end{array}\right] \\ \textsc{nonloc inher slash} & \boxed{3}\end{array}\right] \\ \textsc{argstore (rest)}^m \textsc{ first } \boxed{4}\end{array}\right]$$

Target:
$$\left[\begin{array}{l} \textsc{ss} \left[\begin{array}{ll} \textsc{loc cat subcat (rest)}^n & \boxed{2} \\ \textsc{nonloc inher slash} & \left[\begin{array}{l}\textsc{first } \boxed{1} \\ \textsc{rest } \boxed{3}\end{array}\right]\end{array}\right] \\ \textsc{argstore (rest)}^m \textsc{ first } \left[\begin{array}{ll} \textsc{loc } \boxed{1} & \\ \textsc{nonloc inher slash} & \left[\begin{array}{l}\textsc{first } \boxed{1} \\ \textsc{rest } \textit{elist}\end{array}\right]\end{array}\right]\end{array}\right]$$

(14) lexical entry of unslashed *hat* as in (3a), modified:

$$\left[\begin{array}{l} \textsc{phon} \left\langle \text{hat} \right\rangle \\ \textsc{ss} \left[\begin{array}{ll} \textsc{loc} & \left[\begin{array}{ll} \textsc{cat} & \left[\begin{array}{ll} \textsc{head vform } \textit{finite} & \\ \textsc{subcat} & \left[\begin{array}{ll} \textsc{first } \boxed{3} & \left[\begin{array}{l} \textit{w-ss} \\ \textsc{loc} \left[\begin{array}{ll} \textsc{cat} & \left[\begin{array}{ll}\textsc{head vform} & \textit{past-part} \\ \textsc{subcat} & \boxed{2}\end{array}\right] \\ \textsc{content} & \boxed{1}\end{array}\right]\end{array}\right] \\ \textsc{rest } \boxed{2} & \end{array}\right]\end{array}\right] \\ \textsc{content} & \left[\begin{array}{l}\textit{perfect} \\ \textsc{soa-arg } \boxed{1} \textit{ psoa}\end{array}\right]\end{array}\right] \\ \textsc{nonloc} & \left[\begin{array}{ll}\textsc{inher slash} & \textit{elist} \\ \textsc{to-bind slash} & \textit{elist}\end{array}\right]\end{array}\right] \\ \textsc{argstore} \left[\begin{array}{l}\textsc{first } \boxed{3} \\ \textsc{rest } \boxed{2}\end{array}\right]\end{array}\right]$$

23 How does the $D^{(14)}$ look like for $n = m = 1$? Because of the problem noted in §20 (ii) (c), this cannot be known for sure. One benevolent speculation is (15):

(15)
$$\begin{bmatrix}
\text{PHON} \left\langle \text{hat} \right\rangle \\
\text{SS} \begin{bmatrix}
\text{LOC} \begin{bmatrix}
\text{CAT} \begin{bmatrix}
\text{HEAD VFORM } \textit{finite} \\
\text{SUBCAT} \begin{bmatrix}
\text{FIRST } \boxed{3} \begin{bmatrix} \textit{w-ss} \\ \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD VFORM} & \textit{past-part} \\ \text{SUBCAT} & \boxed{2} \end{bmatrix} \\ \text{CONTENT } \boxed{1} \end{bmatrix} \end{bmatrix} \\
\text{REST } \boxed{2} \begin{bmatrix} \text{FIRST } \boxed{4} \text{ LOC } \textit{loc} \\ \text{REST } \boxed{5} \end{bmatrix}
\end{bmatrix}
\end{bmatrix} \\
\text{CONTENT} \begin{bmatrix} \textit{perfect} \\ \text{SOA-ARG } \boxed{1} \textit{ psoa} \end{bmatrix}
\end{bmatrix} \\
\text{NONLOC} \begin{bmatrix} \text{INHER SLASH} & \textit{elist} \\ \text{TO-BIND SLASH} & \textit{elist} \end{bmatrix}
\end{bmatrix} \\
\text{ARGSTORE} \begin{bmatrix} \text{FIRST } \boxed{3} \\ \text{REST } \boxed{2} \begin{bmatrix} \text{FIRST } \boxed{4} \\ \text{REST } \boxed{5} \end{bmatrix} \end{bmatrix}
\end{bmatrix}$$

In conjunction with (15), the Target of (13) apparently determines lexical entry (16):

(16)
$$\begin{bmatrix}
\text{PHON} \left\langle \text{hat} \right\rangle \\
\text{SS} \begin{bmatrix}
\text{LOC} \begin{bmatrix}
\text{CAT} \begin{bmatrix}
\text{HEAD VFORM } \textit{finite} \\
\text{SUBCAT} \begin{bmatrix}
\text{FIRST } \boxed{3} \begin{bmatrix} \textit{w-ss} \\ \text{LOC} \begin{bmatrix} \text{CAT} \begin{bmatrix} \text{HEAD VFORM} & \textit{past-part} \\ \text{SUBCAT} & \boxed{2} \end{bmatrix} \\ \text{CONTENT } \boxed{1} \end{bmatrix} \end{bmatrix} \\
\text{REST } \boxed{2} \boxed{5}
\end{bmatrix}
\end{bmatrix} \\
\text{CONTENT} \begin{bmatrix} \textit{perfect} \\ \text{SOA-ARG } \boxed{1} \textit{ psoa} \end{bmatrix}
\end{bmatrix} \\
\text{NONLOC} \begin{bmatrix} \text{INHER SLASH} \begin{bmatrix} \text{FIRST } \boxed{40} \\ \text{REST } \textit{elist} \end{bmatrix} \\ \text{TO-BIND SLASH } \textit{elist} \end{bmatrix}
\end{bmatrix} \\
\text{ARGSTORE} \begin{bmatrix} \text{FIRST } \boxed{3} \\ \text{REST } \boxed{2} \begin{bmatrix} \text{FIRST} \begin{bmatrix} \text{LOC } \boxed{40} \\ \text{NONLOC INHER SLASH} \begin{bmatrix} \text{FIRST } \boxed{40} \\ \text{REST } \textit{elist} \end{bmatrix} \end{bmatrix} \\ \text{REST } \boxed{5} \end{bmatrix} \end{bmatrix}
\end{bmatrix}$$

I wrote "$\boxed{2}\,\boxed{5}$" for the value of :SS LOC CAT SUBCAT REST in order to point to a problem. Upon both interpretations of tag pairs – as variables and as path equations – it seems unavoidable to assume that $\boxed{2} = \boxed{5}$. If that is correct, the SUBCAT values of both the participle and the finite verb are cyclic lists. Hopefully, no feature structure will satisfy this lexical entry.

Assume alternatively that for some reason (15) does not contain the pair of 24
tags $\boxed{5}$. Then there is no cyclicity, but the SUBCAT value of the finite verb has an element of just the form that is disallowed by the No Trace Principle (§6).

Apparently, the OELR requires the existence of realistically satisfiable slashed 25
lexical entries only in case some element is extracted that is explicitly mentioned in the valence value. For instance, in (3d) only *gegeben* can be slashed, but not *hat*. That is, Pollard & Sag's (1994) liberal matching conditions are of no consequence for the OELR.

This may seem like a nice result, since it solves the problem noted in §19. 26
But two problems remain. First, inasmuch as the result depends on the slashed member of the ARGSTORE value, it is suspicious, as Pollard & Sag's (1994) Subject Condition is known to be empirically problematic. There seem to be cases of parasitic gaps in subjects that are licensed by extraction out of an adjunct. Second, it appears that some empirical phenomena in German and in Romance languages cannot be described by slashing just the lowest verb.

The possible formal alternatives seem to be the following: 27

(i) Drop this approach to variable argument raising and return to Johnson's idea, from which Hinrichs & Nakazawa took their departure.

(ii) Keep this approach, but replace lexical (extraction) rules by measures situated in Descr. By doing this, all formal problems disappear, and extremely flexible descriptive mechanisms become available.

(iii) Use traces. All formal problems disappear, but the mechanisms are less flexible, apparently just flexible enough to capture the empirical phenomena.

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