

## Theta-head binding in the German locative alternation<sup>1</sup>

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### 1. Introduction

- It is well known that in German, as well as in English, possessive pronouns can be used anaphorically, or they can be bound.

- (1) *Der Udo zeigte dem Peter sein Schienbein.* (lexical dative)  
 the Udo showed the Peter<sub>DAT</sub> his shin  
 (i) ‘Udo showed Peter<sub>i</sub> his<sub>i</sub> shin.’  
 (ii) ‘Udo<sub>j</sub> showed Peter his<sub>j</sub> shin.’  
 (iii) ‘Udo<sub>i</sub> showed Peter<sub>j</sub> his<sub>k</sub> shin.’

- In the extra-argumental (“possessor”) dative construction in German (henceforth “free dative”), the binding possibilities are more restricted.<sup>2</sup>

- (2) *Der Udo trat dem Ede gegen sein/das Schienbein.* (free dative)  
 the Udo kicked the Ede<sub>DAT</sub> against his/the shin  
 (i) ‘Udo kicked Ede<sub>j</sub> in his<sub>j</sub>/the<sub>j</sub> shin.’  
 (ii) \*‘Udo<sub>j</sub> kicked Ede in his<sub>j</sub>/the<sub>j</sub> shin.’  
 (iii) \*‘Udo<sub>i</sub> kicked Ede<sub>j</sub> in his<sub>k</sub>/the<sub>k</sub> shin.’

- A crucial difference between (1) and (2) is that the dative argument in (1) is a lexical argument of the verb, while the dative argument in (2) is an extra argument in an applicative-like construction.
- Hole (2008, 2012, 2014) suggests that free datives as in (2), unlike the lexical datives in (1), are introduced by a verbal functional head, or a theta head.
- According to Kratzer, “semantic binders ( $\lambda$ -operators represented as binder indices) are introduced by verbal functional heads, rather than by “antecedent” DPs, as assumed in Heim and Kratzer (1998), for example. Verbal functional heads, rather than DPs, are then the true syntactic antecedents for bound pronouns” (Kratzer 2009:193).
- We would like to propose that quite a few syntactic constructions should be analyzed in terms of theta-induced binding (Geist submitted., Hole in prep.).

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<sup>2</sup> Bound Bridging Definites are definite lexical DPs which receive an interpretation equaling (or very similar to) that of the same DP with a possessive pronoun. Crucially, the possessive pronoun in such a paraphrase is locally bound (Hole 2008, 2012, 2014).

- (3) a. *Paula hat Eigelb auf den Kuchen gestrichen*  
 Paula has egg.yolk<sub>ACC</sub> on the cake smeared  
 ‘Paula spread egg yolk on the cake.’
- b. *Paula hat den Kuchen mit Eigelb **be**-strichen* (*be*-locative alternation)  
 Paula has the cake<sub>ACC</sub> with egg.yolk *be*-smeared  
 ‘Paula coated the cake with egg yolk’

- Similar to the free dative construction in (2), the locative alternation construction in (3b), contains a direct object *den Kuchen* ‘the cake’, which binds a possessor variable in a local domain.
- Curly brackets in (3’) indicate material that is, we assume, PF-optional but semantically active, irrespective of whether it is pronounced.

(3’) *den Kuchen<sub>i</sub> {an seiner<sub>i</sub> Oberfläche} mit Eigelb **be**-streichen*  
 the cake<sub>ACC</sub> on its surface with egg.yolk *be*-smear  
 ‘coat the cake with egg yolk {on its surface<sup>3</sup>}’

- We develop an analysis of this construction on the basis of the analysis of free datives (Hole 2012, 2014).
- The core of our analysis elaborates upon Kratzer’s (2009:194) proposal to implement reflexivity in an agent-severed system with theta heads; these heads introduce bare binder indices into the structure.
- The extension of the proposal beyond free datives (Hole 2014) to the *be*-marked locative alternation forms part of a larger endeavor to demonstrate the necessity of describing many well-known argument alternations as dependent on the presence of binder theta heads.

The structure of the paper:

Section 2: our general theoretical proposal (Hole 2012, 2014)

Section 3: application to the *be*-locative alternation in German.

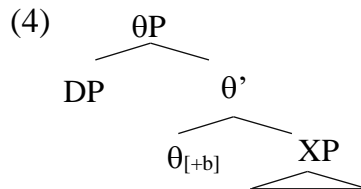
## 2. Free datives: analysis and implications (Hole 2012, 2014)

### 2.1. The Landmark theta head with a binder feature

- Hole (2008, 2012, 2014) analyzes free datives in (2) in terms of theta heads that license extra arguments, combined with reflexivization as in Kratzer (2009). This is achieved by the mechanism of a binder feature [+b] of the theta head.

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<sup>3</sup> SURFACE and OUTSIDE are taken here to be instantiations of a single neighborhood region.



- One of the possible thematic contributions of the free dative DP is a locative Landmark entailment, requiring the VP eventuality to hold within the neighborhood regions of the Landmark DP referent.
- Another possible thematic entailment for free dative referents is the ability to perceive the VP eventuality, an entailment that Hole (2008, 2012, 2014) dubs P-Experiencerhood.
- In many cases the Landmark property co-occurs with the P-Experiencer property, as in (5) and (6). However, pure Landmarkhood is also available, cf. (7).

(5) *dem Ede*  $\theta_i$  *gegen* *sein\_i / das\_i* *Schienbein treten* (Landmark(&P-Experiencer))  
 the Ede<sub>DAT</sub> against his/ the shin kick  
 ‘kick Ede in the shin’

(6) *jedem*  $\theta_i$  *streng auf* *sein\_i/\*j / das\_i/\*j* *Steak gucken* (P-Exp (& Landmark))  
 everyone<sub>DAT</sub> strictly on his /the steak look  
 ‘look at everybody’s steak in a strict manner’

(7) *Jedem Jungen*  $\theta_i$  *hängt ein Taschentuch aus* *seiner\_i / der\_i* *Hose* (Landmark)  
 Every boy<sub>DAT</sub> hangs a handkerchief out-of his / the trousers  
 ‘A handkerchief is hanging out of every boy’s trousers’

(8)  $\llbracket \theta_{LDM} \rrbracket = \lambda y. \lambda s. y$  is the landmark of  $s$

- The Landmark theta head is a verbal Voice head much like Kratzer’s (1996) (agentive) Voice. The free dative Voice, which always involves binding, turns out to be very similar to run-of-the-mill cases of reflexivity; those must likewise be modeled as triggered by Voice.
- Obligatory theta-head binding abides by locality constraints.

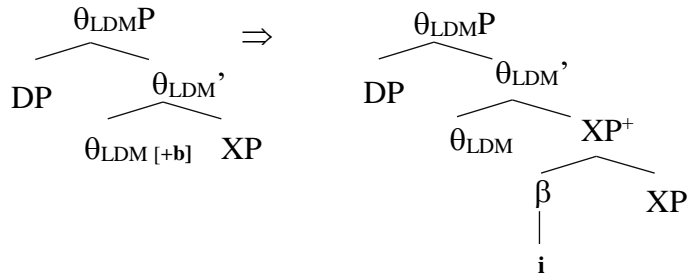
(9) *Klara guckte jedem<sub>DAT</sub>*  $\theta_i$  *so streng auf sein\_i/\*j / das\_i/\*j* *Steak, dass sein\_i / der\_i* *Appetit verschwand.*  
 Klara looked everyone so strictly on his /the steak that his/the appetite disappeared  
 ‘Klara was looking at everybody’s steak in such a strict manner that their appetite disappeared.’

(10) a. *They arrived in a small village. The church was locked.*

b. *They passed through every small village. #The church was locked.*

- We assume that the Landmark theta head comes with a binder feature [+b] which leads to structure expansion along the lines of Hole's (2014) Generalized Binder Rule in the tradition of Büring's (2005) Binder Rule; cf. (11).

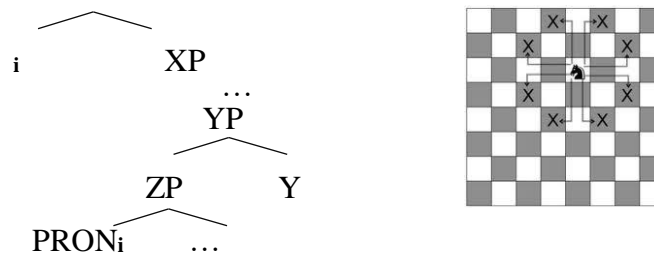
(11) Generalized Binder Rule (Hole 2008, 2012, 2014)



## 2.2. Knight Move Binding

(12) Knight Move Binding

Binding configuration in which the binder targets the left branch of a c-commanded co-phasal DP.



Knight Move Binding is the single massively-privileged binding configuration in natural language:

- grammaticalization of reflexive pronouns is from body part DPs 'x's body part', never from representation nouns like 'picture/statue/... representing x';
- bound pronouns in argument positions move to the left edge of their DPs (Reuland 2011:275);
- free datives and other extra arguments typically bind in a Knight Move Binding configuration (Hole 2006).

## 2.3. A sample derivation

- (13) a. *dass* [*jedem Jungen*  $\theta_i$  *ein Taschentuch aus seiner<sub>i</sub>* /*der<sub>i</sub> Hose hängt*]  
 that every boy<sub>DAT</sub> a handkerchief out-of his the trousers hangs  
 ‘that a handkerchief hangs out of every boy’s trousers’

b. For any assignment  $g$  and number  $i$ :<sup>4</sup>

$\llbracket \text{jedem Jungen } \theta_{LDM} \text{ } i \text{ ein Taschentuch aus der}_i \text{ Hose häng-} \rrbracket^{g[i \rightarrow y]} = \lambda s. \forall x$  [FA]  
 [boy(x)(s) = 1  $\rightarrow$  s is a state of a handkerchief hanging out of x’s trousers &  
 x is the landmark of s = 1]

$\llbracket \text{jedem Jungen} \rrbracket = \lambda P. \lambda s. \forall x$  [boy(x)(s) = 1  $\rightarrow$  P(x)(s) = 1]  
 $\llbracket \theta_{LDM} \text{ } i \text{ ein Taschentuch aus der}_i \text{ Hose häng-} \rrbracket^{g[i \rightarrow y]} = \lambda y. \lambda s.$  [FA]  
 s is a state of a handkerchief hanging out of y’s trousers &  
 y is the landmark of s

$\llbracket \theta_{LDM} \rrbracket = \lambda y. \lambda s.$   
 y is the landmark of s  
 $\llbracket i \text{ ein Taschentuch aus der}_i \text{ Hose häng-} \rrbracket^{g[i \rightarrow y]} = \lambda y. \lambda s. s$  is a state of a handkerchief hanging out of y’s  
 trousers [DPM]

$i$   
 $\llbracket \text{ein Taschentuch aus der}_i \text{ Hose häng-} \rrbracket^g = \lambda s. s$  is a state of a handkerchief hanging out of g(i)’s  
 trousers [PA]

‘Every boy  $x$  is such that  $x$  is the landmark of the state  $s$  of a handkerchief hanging out of  $x$ ’s trousers, and  $s$  holds in  $x$ ’s neighborhood’.

3. Analysis of the locative alternation with *be*-verbs3.1. General properties of the locative alternation with *be*-verbs

- The locative alternation with *be*-verbs in German corresponds to the so-called *spray/load*-type locative alternation in English as described in Levin (1993:50).
- According to Wunderlich (1987), *be*- expresses some (external or internal) contact of the moved object with the location object (or, more generally, that the former is located in the topological proximity of the latter).
- verbs of directed motion relating to putting and covering

(14) Base: *Eigelb*<sub>Locatum</sub> *auf den Kuchen*<sub>Location</sub> *streichen*  
 egg.yolk<sub>ACC</sub> on the cake spread

(15) *Be*-applicative: *den Kuchen*<sub>Location</sub> (*mit Eigelb*<sub>Locatum</sub>) *be-streichen*  
 the cake<sub>ACC</sub> with egg.yolk *be-spread*

<sup>4</sup> We use the following abbreviations: DPM: Davidsonian Predicate Modification, FA: Functional Application, PA: Predicate Abstraction.

- Transformational analyses: Eroms (1980), Günther (1987) and Wunderlich (1987)
- Non-transformational, constructionist analyses (Michaelis & Ruppenhofer 2000, 2001): the verbal root can be associated with two different constructions.
- Our analysis: a neo-constructionist one (cf. Arad 1998, Borer 2003, who assume that the verbal root can be associated with two different syntactic structures).
- The phenomenon of co-argumental binding in *be*-locative constructions has not received any attention yet.

(16) *den Kuchen<sub>i</sub> {an seiner<sub>i</sub> Oberfläche} mit Eigelb*      *be-streichen*  
 the cake<sub>ACC</sub> on its surface with egg.yolk      *be-smear*  
 ‘coat the cake with egg yolk on its surface’

(17) a. *\*das Loch {innen} mit Wachs*      *be-stopfen*  
 the hole<sub>ACC</sub> inside with wax      *be-stuff*  
 int.: ‘stuff the hole with wax’  
 base: *Wachs in das Loch stopfen*

b. *den Tank {innen} mit Benzin*      *be-füllen*      **[not productive]**  
 the tank<sub>ACC</sub> inside with gasoline *be-fill*  
 ‘fill the tank with gas’  
 base: *Benzin in den Tank füllen*

c. *das Buch {von außen /\*von innen}*      *be-malen*      **[productive]**  
 the book<sub>ACC</sub> from outside/from inside *be-paint*  
 ‘paint the book {on the outside/\*on the inside}’  
 base: *etw. in/auf das Buch malen*

- The topological restriction of the prefix *be-* to a particular substructure of the location – its SURFACE – must be part of the meaning of the *be*-locative construction.

### 3.2. Decomposing prepositional phrases

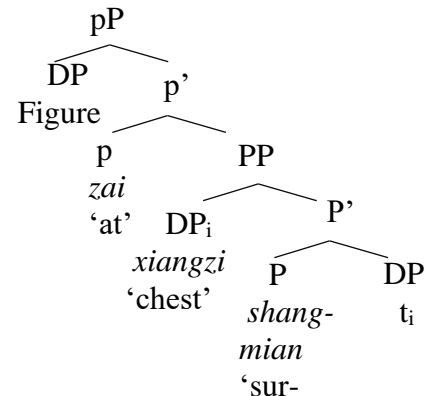
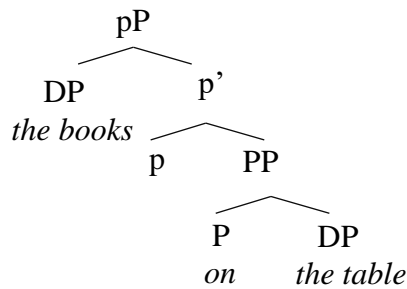
- A preposition typically relates two arguments in a spatial configuration: the Figure and the Ground.

(18) The kids put the books<sub>i</sub> [e<sup>FIGURE</sup><sub>i</sub> on the table<sup>GROUND</sup>].

(19) [FIGURE [on GROUND]]

- It was suggested to apply the idea of syntactic severance of non-internal arguments of Kratzer (1996) to prepositional phrases (cf. split-P hypothesis Svenonius 2003).

- (20) a. Split-P hypothesis of Svenonius (2003) *the books on the table*  
 b. Split-P hypothesis of Zhang (2002) (our labels; L.G. & D.H.)  
 <Chin.> *on the chest*



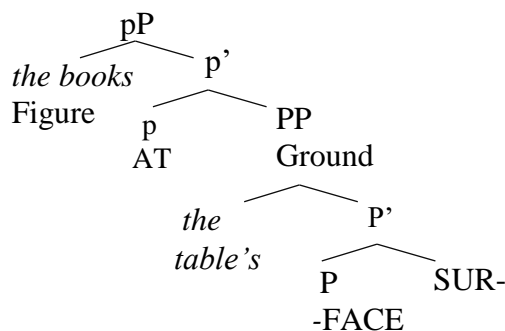
- Although neighborhood regions, such as inside or outside, are an integral part of the meaning and of the prepositional phrase structure, they are not represented in the Split-P structure of Svenonius (2003).
- In Chinese, such neighborhood regions are overtly specified if a preposition is used, and an optional overt relational P element *-mian* meaning 'side/face' may be used.

- (21) Chinese (Zhang 2002:49)

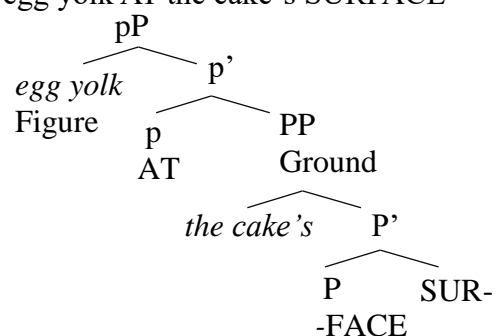
- a. *zai xiangzi shang(-mian)*    b. *wang xiangzi li(-mian)*  
 at chest sur-face                    to chest in-side  
 'on the chest'                        'in(to) the chest'

- (22) The new split-P hypothesis

- a. *the books on the table*  
 = 'the books AT the table's SURFACE'



- b. *egg yolk on the cake*  
 = 'egg yolk AT the cake's SURFACE'



### 3.3. Analysis

Properties of free datives:

- Free datives obligatorily bind a possessor variable in the local tense domain.
- Free datives are introduced in the syntax.

- (23) *Jedem Jungen<sub>i</sub> hängt ein Taschentuch aus der<sub>i</sub> Hose*  
 every boy<sub>DAT</sub> hangs a handkerchief out-of the trousers  
 'A handkerchief hangs out of every boy's trousers'  
 base: *ein Taschentuch hängt aus der Hose*

Properties of *be*-constructions:

- (i) The location argument obligatorily binds a possessor argument in the local tense domain. Thus, *be*-constructions share the binding property with free datives.
- (ii) The location argument is introduced in the syntax.

(24) (=3') *den Kuchen<sub>i</sub> mit Eigelb {an seiner<sub>i</sub> Oberfläche} be-streichen*<sup>5</sup>  
 the cake<sub>ACC</sub> with egg.yolk on its surface *be-smear*  
 'coat the cake with egg yolk on its surface'  
 base: *Eigelb auf den Kuchen streichen*

- Surface contact verbs, such as *streichen* 'smear', belong to the class of directed motion verbs. Such verbs describe activities (manner verbs in Levin & Rappaport's terms).

(25)  $\llbracket \textit{streich-} \rrbracket = \lambda x. \lambda e. [e \text{ is an event of smearing } x]$

- *Streich-* is combined with a causative event structure and entails causation of a resultant state introduced by the pP. Such a causative shift can be represented following Kratzer (2005:200) and adjusted to our conventions, as in (26).

(26)  $\lambda P. \lambda e. \exists s [P(s) \ \& \ \text{CAUSE}(s)(e)]$

- The prefix *be-* with the meaning AT is merged in p. It relates the Figure *Eigelb* in its specifier to the Ground denoted by the PP. *Be-* selectionally restricts its PP-complement. It must refer to the surface of some reference object.
- We assume that in the *be*-variant the object argument slot of *streich-* is existentially bound, and only the event argument is left compositionally active.
- Parallel to our analysis of free datives, the location argument *den Kuchen* is introduced by the Landmark theta head  $\theta_{\text{LDM}}$ . This head enters the derivation above the VP. This means, then, that the cake is the landmark of the complex e-causes-s event, and not just of the result state.
- The Landmark theta head as proposed by Hole (2012, 2014) comes with a binder feature [+b].

(27)  $\exists e \exists s [s \text{ is a state of egg-yolk being AT the surface of the cake} \ \& \ e \text{ is an event of smearing something} \ \& \ \text{CAUSE}(s)(e) \ \& \ \text{the cake is the landmark of } e]$   
 'There is an activity of smearing something that causes the result state in which the egg yolk is on the surface of the cake.'

- We subscribe to the syntactic assumption of derivation by phases. This means that the binding relations discussed here must all hold within a single phase; however, the pP in (25b) ought to be a phase itself.

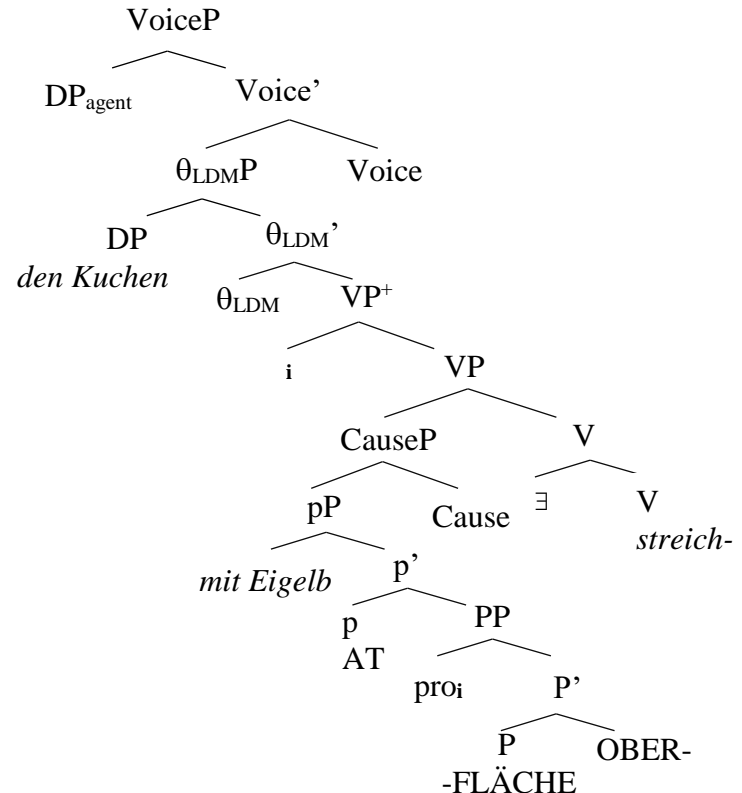
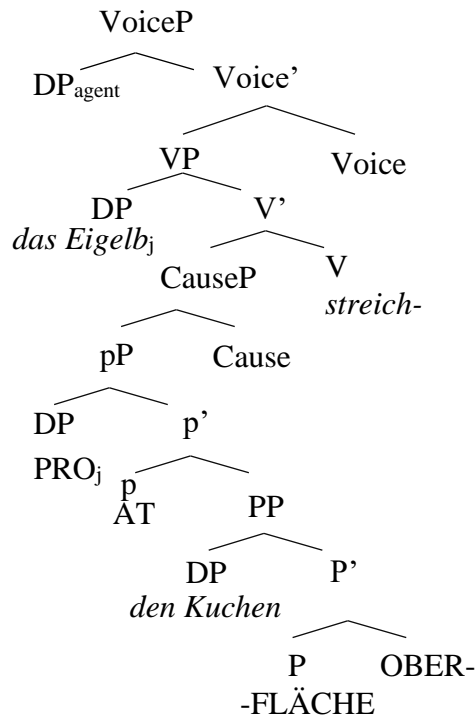
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<sup>5</sup> A quantifier as *jeden Kuchen* 'every cake' would yield the clear binding interpretation. For lack of space we use a definite DP *den Kuchen* 'the cake' here.



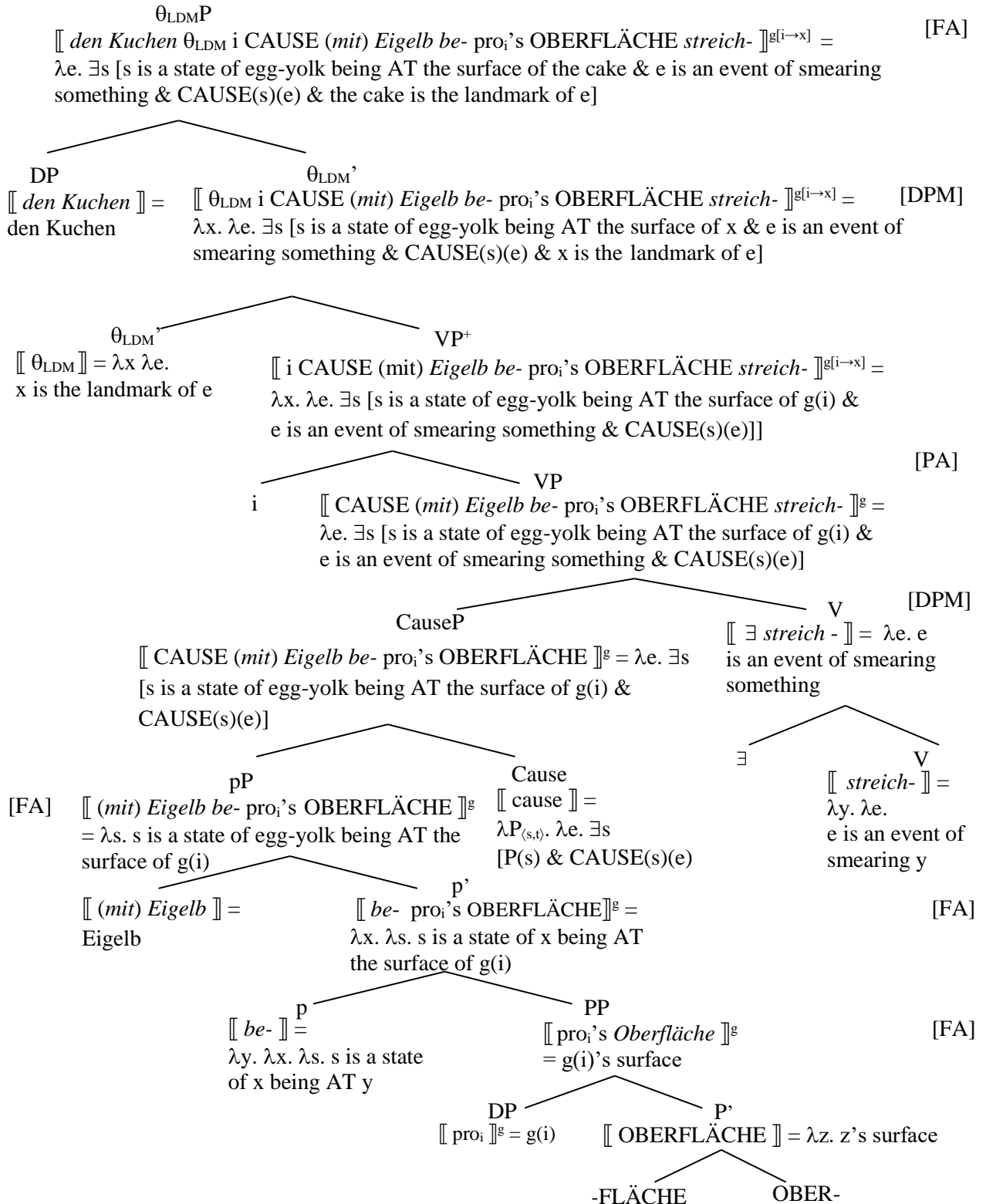
- Making use of the general idea of phase extension of den Dikken (2007), we will assume an analysis that has *be-* incorporate into the verb in the overt syntax. The Landmark phrase inherits phasehood via p-to-CAUSE-to-V-to- $\theta_{LDM}$  movement.
- As *pro* is on the left branch of the PP, the binding configuration within a single (extended) phase corresponds to the configuration we defined as Knight Move Binding in Section 2.

(28) a. *das Eigelb auf den Kuchen streichen*      b. *den Kuchen mit Eigelb be-streichen*  
 the egg.yolk on the cake<sub>ACC</sub> smear      the cake<sub>ACC</sub> with egg.yolk *be*-smear



(29) a. *den Kuchen mit Eigelb be-streichen*<sup>6</sup>  
 the cake<sub>ACC</sub> with egg.yolk *be-smear*

b. For any assignment  $g$  and number  $i$ :



<sup>6</sup> A quantifier as *jeden Kuchen* ‘every cake’ would yield the clear binding interpretation. For lack of space we use a definite DP *den Kuchen* ‘the cake’ here.

#### 4. Conclusion and broader impact

- The locative alternation with *be*-verbs can be modeled with the same general theta-severed system used to model free datives and reflexivity.
- The ingredients of our proposal can be put to use in a wide variety of argument alternations.

##### (30) Stative Locative Alternation

*Der Gang<sub>j</sub> steht voll mit Kartons {am<sub>i</sub>Boden}.* (Hole 2016)  
 the corridor stands full with cardboard-boxes on-the ground  
 ‘The corridor is [standing] full of cardboard boxes.’

##### (31) Predicative Alternation

*Lea<sub>i</sub> ist Schauspielerin {von (ihrem<sub>i</sub>) Beruf (her)}* (Geist submitted)  
 Lea is actor by her profession PART  
 ‘Lea is an actor by profession.’

##### (32) Possessor-Attribute Factoring Alternation

*An ihm<sub>i</sub> gefällt mir seine<sub>i</sub>\*<sub>j</sub> Freundlichkeit.*  
 at him pleases I.DAT his friendliness  
 ‘I like his friendliness.’

##### (33) Experiencer-*have* structure

*Er<sub>i</sub> hat den<sub>i</sub> Arm verbunden.* (Hole 2002)  
 he has the arm bandaged.  
 ‘He has a bandaged arm.’

Questions for further research:

- Why do theta heads and variable binding appear to be such a good match?
- Can the theta-heads-as-binders idea be generalized further?
- Why is Knight Move Binding such a privileged tree-geometrical instantiation of variable binding?

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