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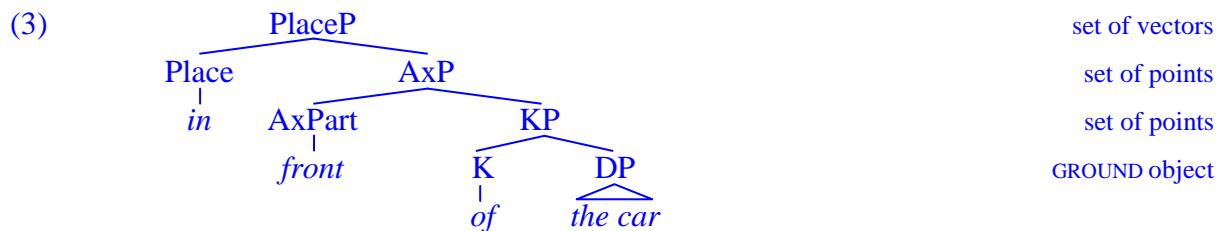
THE PARTIAL NOMINALITY OF AXIAL PARTS
Syntax-interface meetings, Utrecht University, January 22, 2018

1. BACKGROUND

Axial prepositional complexes are widespread cross-linguistically:

(1) a. El libro está **de-l-ante**   **de la   mesa**.   Spanish, Fábregas 2007
        the book is   from-the-front of the   table
        The book is in front of the table.

   b. hu haya **mi-taxat**   **la-bayit/ha-bayit**.   Hebrew, Botwinik-Rotem 2008a
       he   was   from-bottom to.DEF-house/ DEF-house
       He was under the house.

   c. **S-pered-i**   **ot   dom-a**   roslo derevo.
       down.from-front-LOC   from house-GEN grew tree
       A tree grew in front of the house.   Russian, Mitrofanova and Minor 2013

(2) Maria   a-mami   **î-gûrû ri-a   metha**.   Kîîtharaka, Muriungi 2006
    1.Maria SM1-sleep 5-top   5-AS 9.table
    Maria is sleeping/lying on top of the table.

Svenonius 2006, 2010, etc.: axial elements (AxParts) are regarded as **purely functional**:

(3)   PlaceP   set of vectors
         Place   AxP   set of points
          |
          in   AxPart   KP   set of points
                      |
                    front   K   DP   GROUND object
                                 |
                                 of   *the car*

The structure is associated with rudimentary compositional semantics (Roy and Svenonius 2009), where K (case-marker or preposition) is taken to correspond to the function EIGEN (cf. Wunderlich 1991) creating a region that an AxPart operates upon

Lots of followers (Pantcheva 2006, Muriungi 2006, Svenonius 2006, 2010, Fábregas 2007, Botwinik-Rotem 2008a, etc.)

2. PROBLEMS

Core issue: axial elements seem to be lexical

2.1. Axial objects

For the majority of axial elements a corresponding noun exists showing nominal syntax and a clearly related lexical meaning:

(4) a. A hat is **on top of your head**.   AxPart
    b. Your forehead is **at the top of your head**.   noun

(5) **Î-gûrû i-rî**   ciat-ir-w-e.   Kîîtharaka, Muriungi 2006
    5-top   F-SM5 sweep-PERF-PASS-FV
    The top [of something] was swept.

Natural question: what is the syntactic and semantic **connection between an AxPart and the corresponding lexical noun**?

2.2. Axial nouns may show case morphology

Russian: the locative vs. directional interpretation of some PPs is encoded by the case on the NP (cf. Bierwisch 1988, den Dikken 2003, 2010, Zwarts 2005, 2006, Caha 2010):

(6) a.   Marina bežit v gorod.   Russian
          Marina runs in city.ACC
          Marina is running to the city.

     b.   Marina bežit v gorode.
          Marina runs in city.LOC
          Marina is running in the city.

The same can be observed with axial complexes:

(7) a.   Marina bežit v.perëd.   Russian
          Marina runs in.front.ACC
          Marina is running forward.

     b.   Marina bežit v.peredi.
          Marina runs in.front.LOC
          Marina is running in front.

2.3. Non-axial AxParts

AxParts can be highly idiosyncratic and semantically conditioned by the ground:

(8) a.   There is a defibrillator **on board this train/aircraft/spaceship/#theater**.

     b.   Les fleurs   poussent **au   pied de l'arbre**.
          the flowers grow   at.the foot of the.tree
          Flowers grow at the foot of the tree. [i.e., on the soil around the tree]

2.4. Nominal syntax of AxParts

The presence of a **definite article** in axial complexes is unexpected if they are functional, and the article agrees for **gender** and undergoes the *en/au* alternation (cf. Cornulier 1972, Zwicky 1987, Miller, Pullum and Zwicky 1997, Matushansky 2015a) in French:

(9) a.   à la tête   du   train   Roy 2006
          to the.F head.F of.the train
          in the front section of the train

     b.   en tête du   train
          in head of.the train
          in the front section of the train

KP is moreover generally possessive (with some exceptions), yet in Roy and Svenonius 2009 K is supposed to lexicalize the EIGEN function (which is also problematic because regions do not have the wherewithal to determine what their front is)

2.5. Connection to weak definites

The choice of the AxPart determines the presence of the article:

(10) a.   **in (#the) front** of the car
     b.   **at *(the) foot** of the bed

(11) a. **au/*à**   **pied** du   lit
to.DEF.M/to foot.M of.DEF.M bed
at the foot of the bed

b. **à/#au**   **côté** de chez Swann
to/to.DEF.M side.M of at   Swann
by the Swann's house

This is very similar to what happens with bare weak definites, like *in bed* (Ross 1996, Stvan 1998, 2007, Carlson and Sussman 2005, Aguilar Guevara and Zwarts 2010, 2013, Aguilar Guevara 2014, etc.), where the presence or absence of the article is intimately linked to the choice of the noun.

Further support: similar restrictions on syntax (Ross 1996): modification, pronominalization, pluralization and preposing are equally broadly impossible with both, and the presence of an **outer preposition** and its rigid choice is a further indication of this similarity.

2.6. Adjectival AxParts

The AxPart can be deadjectival, with or without an article:

(12) a. **à droite** de la porte   French
to right.F of the door
to the right of the door

b. **au**   **long** de la rivière
to.DEF.M long.M of the river
along the river

Such deadjectival AxParts retain gender morphology and trigger appropriate agreement

2.7. Unexpected prepositions

In a number of languages an **overt source preposition** introduces the AxPart:

(13) a. El libro está **de.**l.ante   de la mesa.   Spanish, Fábregas 2007
the book is   from.the.front of the table
The book is in front of the table.

b. hu haya **mi.**taxat   la-bayit/ha-bayit.   Hebrew, Botwinik-Rotem 2008a
he was   from.bottom DIR+DEF-house/ DEF-house
He was under the house.

c. **S-**pered-i   ot   dom-a   roslo derevo.
down.from-front-LOC from house-GEN grew tree
A tree grew in front of the house.   Russian, Mitrofanova and Minor 2013

There is no obvious reason why Place in Svenonius' structure should be lexicalized as source, or why this lexicalization systematically targets AxParts.

2.8. Summary

AxParts have nominal distribution and axial complexes may contain **an axial DP**

Assuming AxParts are nouns explains a number of facts:
- ➢ the presence of the article and its variable absence
- ➢ gender agreement on it
- ➢ idiosyncratic axial parts
- ➢ connection to axial objects

Needs to be explained:

- ➢ the overt source preposition
- ➢ the semantics of AxParts and axial objects
- ➢ the weak definite connection
- ➢ non-prepositional axial complexes (*north of the border*)

Core proposal: semantic decomposition of an axial complex:

(14) $INST_1$ (DEF_1 (NOM_1 (PROJECT ($INST_2$ (DEF_2 (NOM_2 (AXIS (GROUND)))))))))

Key intuitions: **the projective component** and the **variable entity/region denotation**

3.   PROPOSAL: COMPOSITION

Cross-linguistic evidence points towards **a source component in axial complexes** (13) that is not expected under any standard assumption

In Romance the putative source component *de* could be analyzed as possessive (*de* is also the genitive 'of')

But in Hebrew, it is identical to the **directional preposition** *mi-* 'from':

(15) a.   **mi**mul   *(le) batim   gvohim ve- atikim   Hebrew, Botwinik-Rotem 2008a
             opposite (to) houses   tall   and old
             opposite tall and old houses

       b.   **me**'al/**mi**taxat   (le) batim   gvohim ve- atikim
             above/under   (to) houses   tall   and old
             above/under tall and old houses

This source element is compatible with a higher directional (allative) layer, showing that **the meaning of the axial complex PP** (*mi.taxat ha-šulxan*) **is locative**:

(16) hu   hitgalgel el   mi.taxat   ha-šulxan.   Hebrew, Botwinik-Rotem 2008b
       he   rolled   to   from.bottom the-table
       It/he rolled under the table.

Adding the directional component PathP (cf. Jackendoff 1983, Koopman 2000):

(17)
```
              PathP
          ┌─────┴─────┐
        Path          PP
         │       ┌─────┴─────┐
         el      P          AxP
                 │      ┌─────┴─────┐
                mi   AxPart        DP
                       │        ┌───┴───┐
                     taxat   ha-šulxan
```
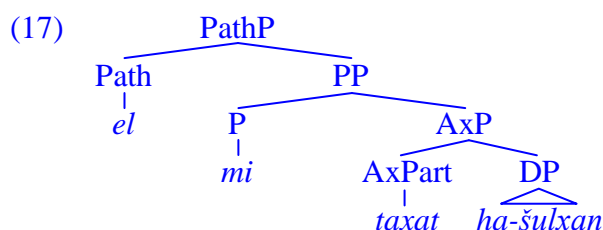
How come that a source preposition like *mi-* is used to describe a location?

Answer: axial complexes describe locations through **projection** away from a ground

The semantic component unifying projective axial complexes and source Ps: directions, either **vectors** or **paths**, pointing **away from** the ground

Botwinik-Rotem 2008a: *mi-* is semantically vacuous. Unlikely: *dedans* 'inside', etc., in French, *delante* 'in front of', etc., in Spanish (which also has *alante* 'in front of'), but also a source component in *99 miles from LA*

(18) Vector-space approach to projective axial complexes

the car

in front of the car   *the front of the car*
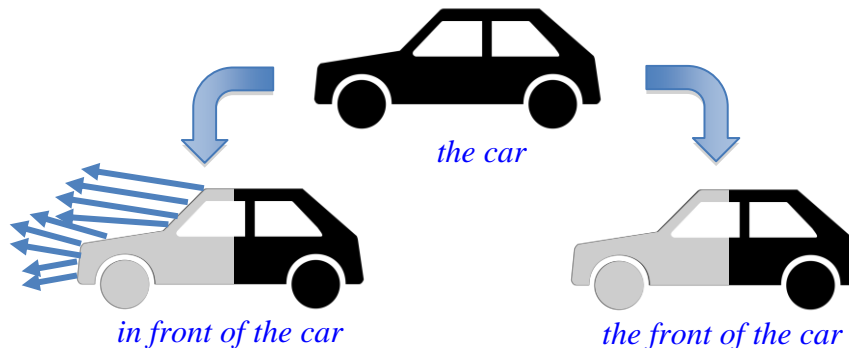
Projective axial complexes (*in front of the car*) have a component that is absent from axial part objects (*the front of the car*):

➢   *in front of the car* denotes a set of vectors, which is the denotation of locative PPs in vector-space semantics (Zwarts and Winter 2000)
➢   *the front of the car* denotes an object, which is the denotation of referential DPs

As we will see below, this is not true for all axial complexes (cf. *on top of the car*)

3.1.   The axial starting point

Core principles of spatial language and cognition (cf. Herskovits 1986 and many others) allow for the assignment of **axes** (like tops and fronts) to an object on the basis of its shape, function, the position of the perspective holder, etc.

For the sake of simplicity we abstract away from the complications added by the frame of reference (intrinsic *at the top of the truck* vs. relative *to the left of the tree* vs. absolute *north of the border*), cf. Levinson 1996a, b

These axes can be represented in terms of **sets of vectors** (combining shape and orientation)

(19) $\text{FRONT} = \lambda x \in D_e \, . \, \lambda u \in D_v \, . \, \text{START}(u) = \text{CENTER}(x) \textit{ and } \text{END}(u) \in \text{BOUNDARY}(x) \textit{ and } \text{FORWARD } (u,x)$

Spatial core of *front*: a function FRONT that maps an object *x* to the **set of vectors** starting from its center, ending at the boundary and directed forward

From this spatial core we can define the **axial part object** (the object that occupies the space defined by (19)) and the **axial projection** (the space outside the ground directed away from the axial object)

(20)   Axial derivatives

FRONT (the-car)

in front of the car   *the front of the car*
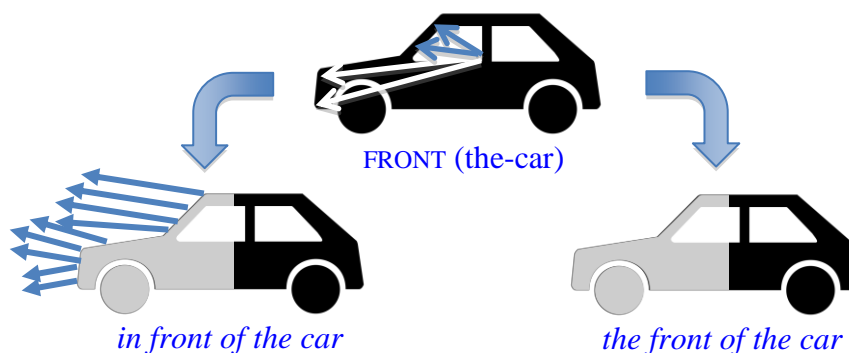
Crucial: the projection *in front of the car* cannot be derived from the part denoted by *the front of the car*: a projection of an object would be in all directions, including the interior of the car

(21) projecting the axial object

*
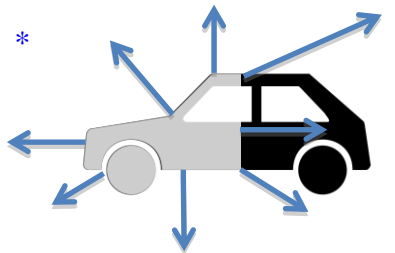
PROJECT (the-front-of-the-car)

Possible solution: *front*, *bottom*, *top*, etc., are special objects with only one defined exterior. Factually incorrect: *under the front of the thalamus* is perfectly fine

3.2. Deriving the axial part noun

Object part meaning of *front* (in *the front of the car*, for instance)

(22) $\llbracket \text{front}_{\text{PART}} \rrbracket = \lambda x \in D_e$. OBJECT (FRONT (x))
- ➢ FRONT maps an object x to its front axis (the set of vectors pointing from the center of x to the boundary of x, as in (19))
- ➢ OBJECT maps an axis A to the unique object corresponding to it
- ➢ The uniqueness of the axial part object explains the regular definite article

Important: OBJECT does not seem to be a compositional part of *front* either syntactically or in the lexicon (as an affix); it is merely a shorthand description permitting to identify the spatial core

The Russian *perëd* 'front': OBJECT (FRONT (x)) = σ (LOC$^-$ (FRONT (x))), cf. *voorkant*

The English *front* is not restricted to the boundary
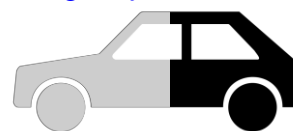
(23) Cross-linguistic variation in axial objects
   a. Russian *perëd* 'front'   b. English *front*

perëd mašiny   *the front of the car*

The **diachronic derivation** is obviously from the concrete part to the axial noun (see Appendix)

3.3. Deriving the axial projection

Projective meaning of *front* (for *in front of the car*, for instance)

(24) $\llbracket \text{front}_{\text{PROJ}} \rrbracket = \lambda x \in D_e$. PROJECT (FRONT (x))   vector-based semantics for *front*
- ➢ FRONT maps x to its front axis
- ➢ PROJECT maps an axis A to the set of vectors that extend it

Unlike axial objects, which are defined relative to the ground (intrinsic frame of reference), axial projections can be defined relative to the ground, relative to the viewer or absolute. While this is a further reason not to derive the latter from the former, the need to parameterize FRONT for the frame will be left as a topic for the future.

(25) PROJECT = $\lambda f \in D_{\langle v, t \rangle}$. $\lambda u \in D_v$. $\exists w$ [f(w) and START (u) = END (w) and DIR (u) = DIR (w)]

Problem: if *front*$_{\text{PROJ}}$ *of the car* denotes a set of vectors, then why it would not behave like a locative (e.g., like *home*)?

In many languages (some) axial nouns do in fact not need prepositions:

(26) a. Maria   a-ciat-ir-e   **rû-teere**   rw-a   î-kurungu.   Kîîtharaka, Muriungi 2006
         1.Maria SM1-sweep-PRV-FV 11-side   11-AS   5-cave
         Maria swept the side of the cave.

     b. Maria   a-ciat-ir-e   **rû-teere**.
         1.Maria SM1-sweep-PRV-FV 11-side
         Maria swept (on) the side [of something].

     c. Maria   a-kari   **ru-ngu**   rw-a   ndagaca.
         1.Maria SM1-sit   11-under   11-AS   bridge.9
         Maria is sitting under the bridge.

(27) yeš   hadaš **taxat**   la-šemeš.   Hebrew
     there.is new   bottom   to.DEF-sun
     There is something new under the sun.

(28) The town is located **north of the border**.

This is actually what is expected under the analysis above: PROJECT is a function to a set of vectors, i.e., a locus

What is not expected:
  ➢ the outer preposition: *in front of the car* (because a preposition requires an entity)
  ➢ the definite article: *at the foot of the bed* (because an article requires a predicate)

What do the axial projections *front of the car* and *foot of the bed* denote in such cases?

4.   AXIAL NOUNS AS WEAK NOUNS

Intuition: axial NPs like *front of the car* or *foot of the bed* are **weak** definites (cf. Carlson and Sussman 2005)
  ➢ like *school* in *at school* and *hospital* in *at the hospital*
  ➢ lexically specified presence/absence of article
  ➢ lack of modification and other restrictions
  ➢ typical occurrence in the context of (pre-determined) prepositions

(29) Implementation: weak NPs as **"kind"**-referring (Aguilar Guevara and Zwarts 2010)
  ➢ *front of the car* and *foot of the bed* denote **spatial "kinds"**
  ➢ spatial version of Chierchia's (1998) nominalization operator NOM maps a set of vectors to the singleton set consisting of the corresponding **entity-correlate** (or a "kind"-predicate)
  ➢ depending on the noun, there is an overt definite article to mark the uniqueness
  ➢ prepositions are there to go from the entity-correlate "back" to vectors

We thus obtain a variety of compositional possibilities, of increasing complexity

4.1.   **Non-projective axial parts**

Some axial nouns do not involve a space outside an object, but only the relevant boundary:

(30) TOP = $\lambda x \in D_e$. $\lambda u \in D_v$. START (u) = CENTER (x) *and* END (u) $\in$ BOUNDARY (x)
     and UP (u),
     the primitives START, END, BOUNDARY, etc., are defined as in Zwarts and Winter 2000

(31) Maria   a-mami   **î-gûrû ri-a   metha**.   Kîîtharaka, Muriungi 2006
     1.Maria SM1-sleep 5-top   5-AS   9.table
     Maria is sleeping/lying on top of the table.

Such axial complexes are not compatible with measure phrases or modifiers:

(32) a. *twenty meters on top of the house
      b. *diagonally on top of the house

Non-projective axes can be syntactically nominal, as witnessed by the presence of an article or a preposition: NOM combining directly with the axial core

No reason to assume that the axial element in (31) is not lexically a noun; there is **a difference between lexical category and denotation**

(33) at the foot of the bed

    a. $\llbracket$foot$\rrbracket = \lambda x \in D_e$. NOM (FOOT (x))
         (lexical meaning of the AxPart *foot*)

    b. $\llbracket$foot of the bed$\rrbracket$ = NOM (FOOT (THE-BED))
         (the singleton set consisting of the entity-correlate of the bed's foot axis)

    c. $\llbracket$the foot of the bed$\rrbracket$ = DEF (NOM (FOOT (THE-BED)))   DEF = *the*
         (DP denoting the entity-correlate of the bed's foot axis)

    d. $\llbracket$at the foot of the bed $\rrbracket$ = AT (DEF (NOM (FOOT (THE-BED))))
         (the entity-correlate of the bed's foot axis is the ground for the external argument of AT)

The bare axial complex has the same internal compositional semantics, but the definite article is realized as a zero, or m-merged, or not realized…

(34) on top of the car

    a. $\llbracket$top$\rrbracket = \lambda x \in D_e$. NOM (TOP (x))
         (lexical meaning of the AxPart *top*)

    b. $\llbracket$top of the car$\rrbracket$ = NOM (TOP (THE-CAR))
         (the singleton set consisting of the entity-correlate of the car's top axis)

    b. $\llbracket$Ø top of the car$\rrbracket$ = DEF (NOM (TOP (THE-CAR)))   DEF = Ø
         (DP denoting the entity-correlate of the car's top axis)

    c. $\llbracket$on Ø top of the car$\rrbracket$ = ON (DEF (NOM (TOP (THE-CAR))))
         (the entity-correlate of the car's top axis is the ground for the external argument of ON; obligatory contact implied)

(35) on <u>the</u> top of the car   axial object

    $\llbracket$top $_{\text{PART}}$ $\rrbracket = \lambda x \in D_e$. OBJECT (TOP (x))
    (lexical meaning of the axial object)

There is no difference between *top* and *foot* where it comes to axial objects.

4.2. A projective axial noun denoting a location: *north of*

The simple case, no article or preposition (like Kîîtharaka)

(36) north of the city

    a. $\llbracket$north $_{\text{PROJ}}$ $\rrbracket = \lambda x \in D_e$. PROJECT (NORTH (x))
         (lexical meaning of AxPart *north*, maps directly to a set of vectors)

    b. $\llbracket$north $_{\text{PROJ}}$ of the city $\rrbracket$ = PROJECT (NORTH (THE-CITY))
         (the set of vectors pointing north from the northern boundary of the city)

Axes not denoting cardinal points require nominal structure in English, with or without an article

4.3. A projective axial noun denoting a kind: *to the north of*

The more complex case, with an article and a preposition
This is not a complex PathP: *of the city* is not path-denoting, so *north* is not entity-denoting

NOM lexically combines with the projection (PROJECT) of the axis:

(37) to the north of the city

    a.   ⟦north $_{PROJ}$ ⟧ = $\lambda x \in D_e$. NOM (PROJECT (NORTH (x)))
             (lexical meaning of AxPart *north*, the "nominalized" variant of (36))

    b.   ⟦north $_{PROJ}$ of the city⟧ = NOM (PROJECT (NORTH (THE-CITY)))
             (the singleton set consisting of the entity-correlate of the set of the vectors pointing north from the city)

    c.   ⟦the north $_{PROJ}$ of the city⟧ = DEF (NOM (PROJECT (NORTH (THE-CITY))))
             (DP denoting the entity-correlate of the relevant external region)

    d.   ⟦to the north $_{PROJ}$ of the city ⟧ = INST (DEF (NOM (PROJECT (NORTH (THE-CITY)))))
             (preposition *to* mapping to the set of vectors instantiating entity-correlate)

Crucial: because **to the north of is compatible with measure phrases**, the set of vectors that INST gives us should be identical to PROJECT (NORTH (THE-CITY))
Potential objection: *the north of the city* is an axial object, *to* adds direction. Answer: not predicted to be outside

This looks like a classical Duke-of-York derivation (Pullum 1976), with a twist: there is full restoration to the input for all outputs

Reasonable objection: the preposition and the article are semantically vacuous.
We would be happy with this idea, but: **what are the conditions on their distribution** (not even the choice of a specific item, but the presence or absence of a syntactic terminal)?

Until this question is answered, we're stuck with a semantic approach

Issue: **the choice of the preposition is determined by the noun**, as in weak definites:

(38) a.   **in** country, **at** pasture, **on** property   Stvan 1998
      b.   **in** yeshiva, **at** school

But **for bare weak definites the choice is local** (no article)

4.4. A projective <u>bare</u> axial noun denoting a kind: *in front of*

As before, but with a null definite article:

(39) in front of the car

    a.   ⟦front $_{PROJ}$ ⟧ = $\lambda x \in D_e$. NOM (PROJECT (FRONT (x)))
             (lexical meaning of AxPart *front*)

    b.   ⟦front $_{PROJ}$ of the car ⟧ = NOM (PROJECT (FRONT (THE-CAR)))
             (the singleton set consisting of the entity-correlate of the relevant external region)

    c.   ⟦Ø front $_{PROJ}$ of the car⟧ = DEF (NOM (PROJECT (FRONT (THE-CAR))))   DEF = Ø
             (DP denoting the entity-correlate of the relevant external region)

    d.   ⟦in front $_{PROJ}$ of the car ⟧ = INST (DEF (NOM (PROJECT (FRONT (THE-CAR)))))
             (preposition *in* = INST maps entity back to set of vectors)

Crucial: because *in front of* is compatible with measure phrases, the set of vectors INST gives us should be identical to PROJECT (FRONT (THE-CAR))
Modulo some tweaking: only orthogonal vectors count, cf. *diagonally in front of*.

Unresolved issue: why is **in** front, but **to** the left? Is there a system? Russian seems to suggest that there isn't (but Russian axial complexes are even more complex)

5. CROSS-LINGUISTIC VARIATION: SYNTACTIC OR MORPHOLOGICAL COMPOSITION

Lexical derivations above: (39a) introduces a lexically constructed AxPart:

(40) ⟦front $_{PROJ}$⟧ = NOM ° PROJECT ° FRONT
      with ° indicating **function composition**

Natural question: must we build these structures in the lexicon?

Putative answer: no

5.1. Overt evidence for entity-denotation below PROJECT: the Spanish *delante* 'in front'

Assuming that *de* corresponds to PROJECT:

(41) *delante del coche* 'in front of the car'

    a.   ⟦ante⟧ = $\lambda x \in D_e$. NOM (FRONT (x))
        (lexical meaning of *ante*, a "nominalized" axis)

    b.   ⟦ante del coche⟧ = NOM (FRONT (THE-CAR))
        (result of application to the car)

    c.   ⟦l ante del coche⟧ = DEF (NOM (FRONT (THE-CAR)))
        (definite article giving uniqueness)

    d.   ⟦de l ante del coche⟧ = PROJECT (INST (DEF (NOM (FRONT (THE-CAR)))))
        (with INST as type-shift, shifting the entity-correlate of the car's front axis back to
        the corresponding set of vectors, which can then be projected by PROJECT)

It is possible to treat *delante* as a syntactic terminal, defined as the function composition of PROJECT ° FRONT if the article-like *l* is disregarded. Otherwise we need the full combination of the pieces identified above: PROJECT ° INST ° DEF ° NOM ° FRONT

5.2. Overt evidence for entity-denotation above PROJECT: the French *au-delà* 'beyond'

We observe the following elements in *au-delà*:

(42) à 'at, to' + le 'the' + de 'of, from' + là 'there'

Preferable solution: lexical construction of *delá* given that *là* by itself only means 'there'

If not, the following semantic composition for *au-delà du pont* 'beyond the bridge'

(43) a.   ⟦là⟧ = $\lambda x \in D_e$. YOND (x)
        (lexical meaning of AxPart *là*: the sets of vectors to the furthest boundary of x)

    b.   ⟦là du pont ⟧ = YOND (THE-BRIDGE)
        (DP denoting entity-correlate corresponding to 'beyond' axis of bridge)

    c.   ⟦de là du pont ⟧ = PROJECT (INST (YOND (THE-BRIDGE)))
        (outward projection of that axis)

    d.   ⟦le de là du pont ⟧ = DEF (NOM (PROJECT (INST (YOND (THE-BRIDGE)))))
        (another round of nominalization ...)

    e.   ⟦à le de là du pont ⟧ = INST(DEF (NOM (PROJECT (INST (YOND (THE-BRIDGE))))))

Because *au delà* 'beyond' is compatible with measure phrases, *à* should be treated as INST
Issue: what about the potentially ground-external *à la tête du train/en tête du train*? Ambiguity?

6. CONCLUSION AND FURTHER QUESTIONS

We get the following maximal semantic structure (ignoring the possessive/genitive marking on the ground)

(44) INST$_1$ (DEF$_1$ (NOM$_1$ (**PROJECT** (INST$_2$ (DEF$_2$ (NOM$_2$ (**AXIS (GROUND)**))))))))

This structure is motivated by
  ➢ the parts we recognize in axial complexes
  ➢ the input/output conditions we assume for each component

But as a result we get Duke of York derivations (45) and intermediate syntactic constituents that are not attested independently

(45) a.   A → B → A
      b.   set of vectors −NOM→ entity −INST→ set of vectors

This problem is, however, an illusion:
 ➢ there is no INST (DEF (NOM ())) sequence in syntax: we have NOM ° AXIS and NOM ° PROJECT in the lexicon
  ➢ the realization of NOM ° PROJECT *de* in Romance does not require that PROJECT be there as an independent syntactic terminal
  ➢ the non-independence of intermediate syntactic constituents can result from their denotation (spatial kinds)

Further extension: the presence or absence of an overt definite article can be derived by the same mechanism as for proper names (cf. Matushansky 2015a, b, 2016): the presence of a relevant phi-feature (for inanimates, [α animate])

7. APPENDIX: HISTORICAL DEVELOPMENT

Axial nouns are derived from the part-whole vocabulary (cf. *front*: MEng. *front* 'forehead'). This is why **axial objects always have intrinsic frames**:

(46) a.   The bike is on top of the car.
      b.   ≠The bike is on the top of the car.
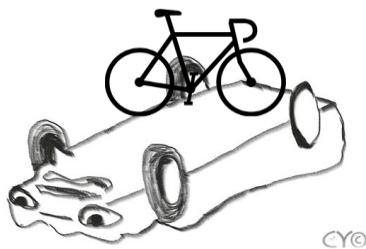
In order to create an AxPart from an axial noun, it is necessary to impoverish its meaning to the corresponding spatial relation (the axis):

(47) *front* 'forehead' → the set of vectors starting at the center of an object and ending at that boundary of the object where its forehead stereotypically is

For this change of interpretation it is necessary to postulate a function that applies both to the function *front* and to the ground (i.e., this **cannot be achieved by function composition**)

Consequences:
  ➢ **no synchronic derivation** of the AxPart from the corresponding axial object
  ➢ **cross-linguistic variation** in the meaning of *front*, etc.: how big an object it is
  ➢ the potential for the emergence of the **absolute** frame of reference: replacing the stereotypical position of the top by the absolute direction (UP)

8.   BIBLIOGRAPHY

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