

# Using a rich external valency dictionary with an implemented XLE/LFG grammar

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# Plan



- Walenty: a rich and detailed valency dictionary of Polish
- bird's eye view of conversion
- issues

The aim(s) of this talk:

- show that the task is non-trivial
- discuss problems and challenges
- spark discussion, trigger changes?



## POLFIE grammar (Patejuk and Przepiórkowski 2012):

- **Lexical-Functional Grammar** approach (LFG),
- implemented in **XLE** (platform dedicated to LFG),
- created by maximising the use of existing Polish resources:
  - **previous implemented grammars** (DCG, HPSG),
  - **morphosyntactic** information from **Morfeusz**,
  - **valency** information from **Walenty**,
- **used** for the construction of **structure bank**,
- uses **OT marks** for disambiguation,
- available on an open source license: **GPL3**.

# About Walenty



## General information:

- 84548 schemata for 15195 lemmata,
- **human- and machine-readable,**
- **framework-independent,** uses its own formalism,
- **can be converted** to various formalisms,
- schemata illustrated with **attested examples,**
- **open source,** available from: <http://walenty.ipipan.waw.pl/>,
- **formats:** plain text (syntax only), XML.

## Linguistic features (Przepiórkowski *et al.* 2014):

- 2 levels: **morphosyntax, semantics,**
- **structural case, passivisation, control relations,**
- explicit account of **coordination** (unlike category coordination),
- some arguments defined by **semantics** rather than category (e.g. manner, location, duration, path),
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# Conversion: bird's eye view



- choose the grammatical function (GF) for each dependent
- construct the PRED attribute
- impose relevant constraints

Looks easy?

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# Conversion: issues



Turns out not to be easy:

- choosing the common GF under unlike coordination
- imposing constraints under unlike coordination
- complex phenomena:
  - structural case assignment
  - passive: active/passive schemata
  - reduction: which dependents are obligatory, what it means
  - constraints for lexicalised arguments



# Conversion: how is it done?



- Python script:
  - everything is converted automatically
  - there is no manual pre- or postprocessing
  - so the entire problem is solved algorithmically
  - ensures consistency
- originally based on the plain text format:
  - implemented by me (not a programmer)
  - only syntactic layer
  - only verbs
- new version based on XML:
  - implemented by Katarzyna Krasnowska-Kieraś
  - both layers
  - not only verbs
- the manual is currently 42 pages long and still growing

# Choosing the grammatical function



Only 2 GFs marked in Walenty, regardless of category (and case):

- SUBJ: subject
- OBJ: passivisable argument

GF assignment depends on:

- the entire set of realisations
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- other GFs assigned (GF uniqueness)

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# Only one realisation



- $[\text{np} \vee \text{ncp} \vee \text{adjp}] \wedge$ 
  - `controllee` → `XCOMP-PRED`
  - `case == dat` → `OBJ-TH`
  - $[\text{case} == \text{str} \vee \text{case} == \text{part}] \rightarrow \text{OBL-STR}$
  - `case == gen` → `OBL-GEN`
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- $[\text{prepn} \vee \text{prepn} \vee \text{prepadjp} \vee \text{comprepn}] \rightarrow$ 
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  - `OBL` (numerical index appended when more than one: `OBL2`, etc.)
- `cp` → `COMP`
- `infp` → `XCOMP`
- `xp(sem)` → `OBL-SEM` (e.g. `xp(abl)` → `OBL-ABL`)
- `refl` → marker (co-head, not a GF) – could be analysed differently

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# Example: ADRESOWAĆ 'address'



- Jan adresował list do Marii.  
Jan.NOM addressed letter.ACC to Maria.GEN  
'Jan addressed a/the letter to Maria.'
- adresować: \_: imperf:  
subj{np(str)} + obj{np(str)} + {prepnp(do,gen)}

GF assignment:

- subj → SUBJ (given)
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Jan.NOM ordered Maria.DAT sing.INF  
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- Jan dobrze funkcjonuje w nowej roli.  
Jan.NOM well functions in new.LOC role.LOC  
'Jan functions well in his new role.'
- funkcjonować: \_: imperf:  
subj{np(str)} + {xp(mod)} + {xp(locat)}

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# More than one realisation



Choosing the common GF:

- for each realisation, choose the GF as shown earlier
- make a list of candidate GFs
- choose the highest ranked GF:

#	GF
4	OBL-<SEM>
3	OBL
2	OBL-GEN, OBL-INST, OBL-STR, OBJ-TH
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Result: COMP and XCOMP treated as elsewhere GFs. But they could be removed altogether – as in Forst 2006 for COMP.

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- Boisz się bezrobocia i że zabraknie Ci środków na utrzymanie?  
fear.2.SG RM unemployment.GEN and that lack you means for subsistence  
'Are you afraid of unemployment and that you'll have no means of subsistence?'
- bać się: \_: imperf:  
subj{np(str)} + {np(gen); cp(że)}

Some features:

- inherent reflexive marker is part of lemma (unlike reflexive pronouns),
- syntactic positions explicitly defined via the coordination test,
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  - np(gen) → OBL-GEN (2),
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subsistence

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# Two ways of formalising constraints in LFG



Owinął dziecko w koc i ręcznikiem.

wrapped baby in blanket.ACC and towel.INST

'He wrapped the baby in a blanket and with a towel.' (Kosek 1999)

$$\text{GF } [0] \left[ \left[ [1] \begin{bmatrix} \text{PRED} & \text{'KOC'} \\ \text{PFORM} & \text{W} \\ \text{CASE} & \text{ACC} \end{bmatrix}, [2] \begin{bmatrix} \text{PRED} & \text{'RĘCZNIK'} \\ \text{CASE} & \text{INST} \end{bmatrix} \right] \right]$$

- $\{(\wedge \text{GF PFORM})=c \text{ w } (\wedge \text{GF CASE})=c \text{ acc} \mid (\wedge \text{GF CASE})=c \text{ inst}\}$
- $(\wedge \text{GF PRED}: \{(\leftarrow \text{PFORM})=c \text{ w } (\leftarrow \text{CASE})=c \text{ acc} \mid (\leftarrow \text{CASE})=c \text{ inst}\})$

# Two ways of formalising constraints in LFG



Owinął dziecko **w koc** i ręcznikiem.

wrapped baby in blanket.ACC and towel.INST

'He wrapped the baby in a blanket and with a towel.' (Kosek 1999)

$$GF \ [0] \left[ \left[ \begin{array}{l} \boxed{1} \left[ \begin{array}{ll} \text{PRED} & \text{'KOC'} \\ \text{PFORM} & \text{w} \\ \text{CASE} & \text{ACC} \end{array} \right], \boxed{2} \left[ \begin{array}{ll} \text{PRED} & \text{'RĘCZNIK'} \\ \text{CASE} & \text{INST} \end{array} \right] \end{array} \right]$$

- $\{(\wedge GF \text{ PFORM})=c \ w \ (\wedge GF \text{ CASE})=c \ \text{acc} \mid (\wedge GF \text{ CASE})=c \ \text{inst}\}$
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# Example: ADRESOWAĆ 'address' – prepositional complement



- Jan        adresował list        do Marii.  
Jan.NOM addressed letter.ACC to Maria.GEN  
'Jan addressed a/the letter to Maria.'
- adresować:   \_: imperf:  
subj{np(str)} + obj{np(str)} + {prepnp(do,gen)}
- non-coordinate position
- preposition is non-semantic: PFORM, no PRED
- GF: prepnp → OBL
- constraints for prepnp:
  - preposition form is DO: (^ OBL PFORM)=c do
  - case required by the preposition is GEN: (^ OBL CASE)=c gen

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subj{np(str)} + obj{np(str)} + {prepnp(do, **gen**)}
- non-coordinate position
- preposition is non-semantic: PFORM, no PRED
- GF: prepnp → OBL
- constraints for prepnp:
  - preposition form is do: (^ OBL PFORM)=c do
  - case required by the preposition is **GEN**: (^ OBL CASE)=c gen



# Example: ADRESOWAĆ 'address' – structural subject (simplified)



- **Jan** adresował listę do Marii.  
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- **non-coordinate** position
- GF: SUBJ (given)
- constraint for np: case – structural, depends on syntactic context:
  - gen when gerund head: {(^ CAT)=c ger (^ SUBJ CASE)=c gen
  - otherwise NOM: | (^ CAT)~= ger (^ SUBJ CASE)=c nom}

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 $\text{subj}\{\text{np}(\text{str})\} + \text{obj}\{\text{np}(\text{str})\} + \{\text{prepn}(\text{do}, \text{gen})\}$
- non-coordinate position
- GF: SUBJ (given)
- constraint for np: case – **structural**, depends on syntactic context:
  - gen when gerund head:  $\{(\hat{\text{CAT}})=c \text{ ger } (\hat{\text{SUBJ CASE}})=c \text{ gen}$
  - **otherwise NOM**:  $\mid (\hat{\text{CAT}})\sim= \text{ger } (\hat{\text{SUBJ CASE}})=c \text{ nom}\}$

# Example: ADRESOWAĆ 'address' – structural object (simplified)



- Jan adresował **list** do Marii.  
Jan.NOM addressed letter.ACC to Maria.GEN  
'Jan addressed a/the letter to Maria.'
- adresować: \_: imperf:  
**subj{np(str)}** + **obj{np(str)}** + {prepnp(do,gen)}
- **non-coordinate** position
- GF: OBJ (given) → passivisation possible
- constraint for np: case – structural, depends on syntactic context:
  - gen when negation present:  $\{(\hat{\ } \text{NEG})=c + (\hat{\ } \text{OBJ CASE})=c \text{ gen}$
  - otherwise ACC:  $|\sim(\hat{\ } \text{NEG}) (\hat{\ } \text{OBJ CASE})=c \text{ acc}\}$

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- adresować: \_: imperf:  
subj{np(str)} + obj{np(str)} + {prepnp(do,gen)}
- non-coordinate position
- GF: **OBJ** (given) → passivisation possible
- constraint for np: case – structural, depends on syntactic context:
  - gen when negation present:  $\{(\hat{\ } \text{NEG})=c + (\hat{\ } \text{OBJ CASE})=c \text{ gen}$
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# Structural object – not simplified



```

STRCO-LEX(GF) = "structural case assignment for objects"
{
"gerunds always require genitive as structural case"
(^ CHECK _CAT)=c ger (^ GF CASE)=c gen
|
"heads other than gerunds"
(^ CHECK _CAT)~= ger
  {
    "no negation at all: accusative"
    ~((({XCOMP|XCOMP-PRED}* ^) NEG) (^ GF CASE)=c acc
    |
    "negation present at some level"
    ((({XCOMP|XCOMP-PRED}* ^) NEG)=c +
      {
        "local negation: obligatory GoN"
        (^ NEG)=c + (^ GF CASE)=c gen
        |
        "no local negation, only transferred: optional GoN"
        ~(^ NEG) (^ GF CASE) $c {acc gen}
      }
  } } .

```

# Issue: where should structural case be formalised?



- in c-structure rules:
  - more economic than in the lexicon
  - but:
    - unlike coordination (*Dziwiło ją zachowanie Marka i że...*)
    - dependent sharing (*Lubi, ale boi się Marka*)
- in the lexicon:
  - less economic (but: templates)
  - accounts for phenomena above

## Example: BAĆ SIĘ 'fear'



- Boisz się bezrobocia i że zabraknie Ci środków na utrzymanie?  
fear.2.SG RM unemployment.GEN and that lack you means for subsistence  
'Are you afraid of unemployment and that you'll have no means of subsistence?'
- bać się: \_: imperf:  
subj{np(str)} + {np(gen); cp(że)}

### Constraints:

- subj → SUBJ (given),
- coordinate position (by definition):
  - GF: OBL-GEN,
  - np(gen): (^ GF CASE)=c gen,
  - cp(że): (^ GF COMP-FORM)=c że,
  - off-path constraint:  
(^ GF PRED: {(← CASE)=c gen | (← COMP-FORM)=c że})

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subsistence  
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  - np(gen)**: ( $\wedge$  GF CASE)=c gen,
  - cp(że): ( $\wedge$  GF COMP-FORM)=c że,
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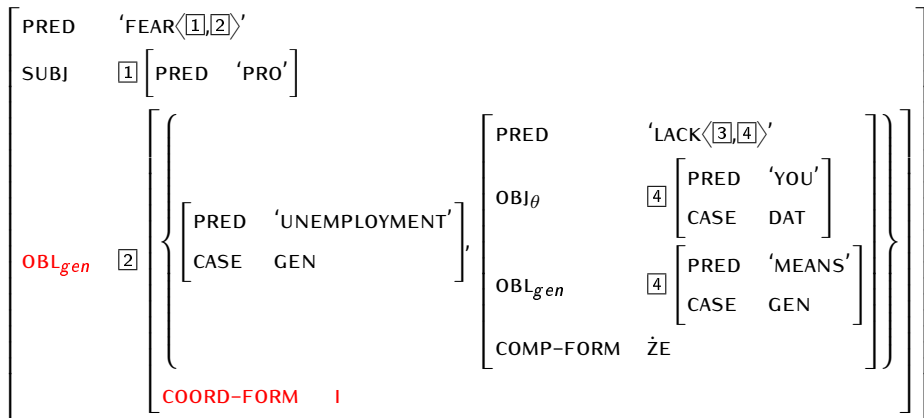
'Are you afraid of unemployment and that you'll have no means of subsistence?'

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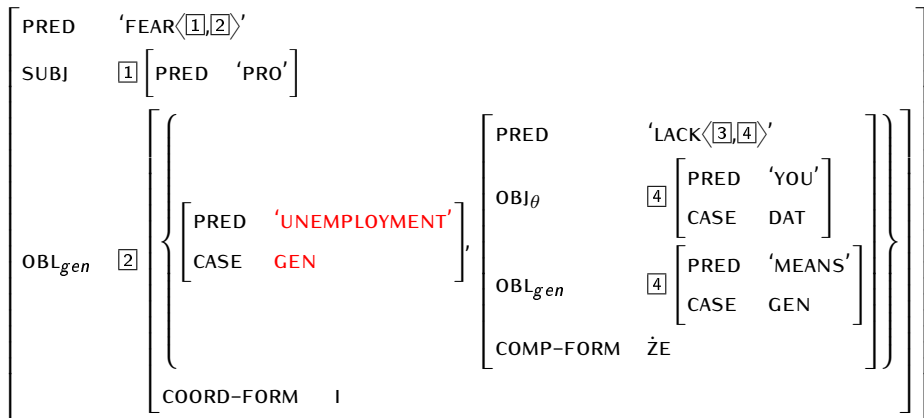
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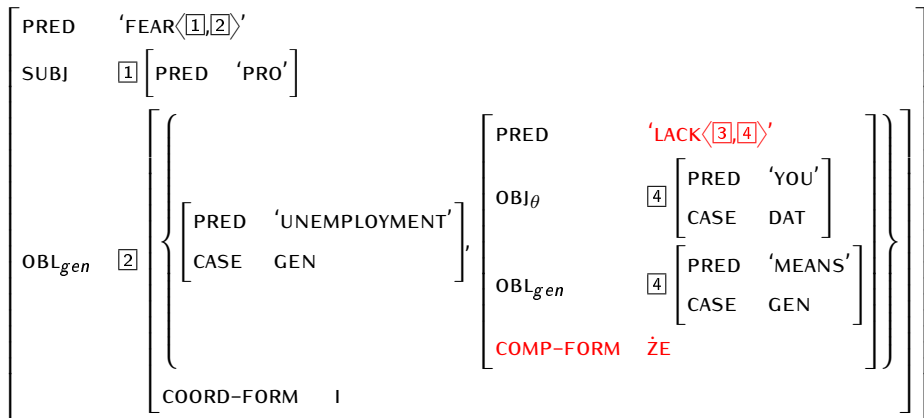
# F-structure for ΒΑĆ ΣΙΕ: unlike coordination



# F-structure for БАЃ СИЃ: unlike coordination



# F-structure for ΒΑĆ ΣΙΕ: unlike coordination



## Issue: off-path vs plain constraints



Unlike coordination must be formalised using off-path constraints:

- more difficult to read than plain ones
- non-constructive (only checking in XLE)
- force using constraining rather than defining equations
- for consistency, the same should be used with plain constraints
- this changes the way the grammar is written
- making some things difficult or impossible

## Example: FUNKCJONOWAĆ 'function'



- Jan dobrze funkcjonuje w nowej roli.  
Jan.NOM well functions in new.LOC role.LOC  
'Jan functions well in his new role.'
- funkcjonować: \_: imperf:  
subj{np(str)} + {xp(mod)} + {xp(locat)}

### Constraints:

- subj → SUBJ (given)
- xp(mod) →:
  - OBL-MOD, coordinate position
  - off-path constraint with all realisations
- xp(locat) →:
  - OBL-LOCAT, coordinate position
  - off-path constraint with all realisations

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- xp(mod) →:
  - OBL-MOD, coordinate position
  - off-path constraint with all realisations
- xp(locat) →:
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  - off-path constraint with all realisations

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- funkcjonować: \_: imperf:  
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  - **OBL-MOD**, coordinate position
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# Converting semantically defined xp(sem) phrases



List (abbreviated) of realisations of xp(locat):

xp(locat)-->

advp(locat)

prepnp(między, inst)

prepnp(nad, inst)

prepnp(pod, inst)

prepnp(ponad, inst)

prepnp(przy, loc)

prepnp(w, loc)

xp(locat)-->

advp(locat)

prepnp(between, inst)

prepnp(above, inst)

prepnp(under, inst)

prepnp(over, inst)

prepnp(near, loc)

prepnp(in, loc)

Off-path constraint where each disjunct corresponds to one realisation:

```
(^ GF PRED: { ... | (-> FN)=c między (<- OBJ CASE)=c inst |
... | (-> FN)=c w (<- OBJ CASE)=c loc | ...})
```

# Converting semantically defined xp(sem) phrases



List (abbreviated) of realisations of xp(locat):

xp(locat)-->

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xp(locat)-->

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prepnp(under, inst)

prepnp(over, inst)

prepnp(near, loc)

prepnp(in, loc)

Off-path constraint where each disjunct corresponds to one realisation:

```
(^ GF PRED: { ... | (-> FN)=c między (<- OBJ CASE)=c inst |
... | (-> FN)=c w (<- OBJ CASE)=c loc | ...})
```

# Converting semantically defined xp(sem) phrases



List (abbreviated) of realisations of xp(locat):

xp(locat)-->

advp(locat)

prepnp(między, inst)

prepnp(nad, inst)

prepnp(pod, inst)

prepnp(ponad, inst)

prepnp(przy, loc)

prepnp(w, loc)

xp(locat)-->

advp(locat)

prepnp(between, inst)

prepnp(above, inst)

prepnp(under, inst)

prepnp(over, inst)

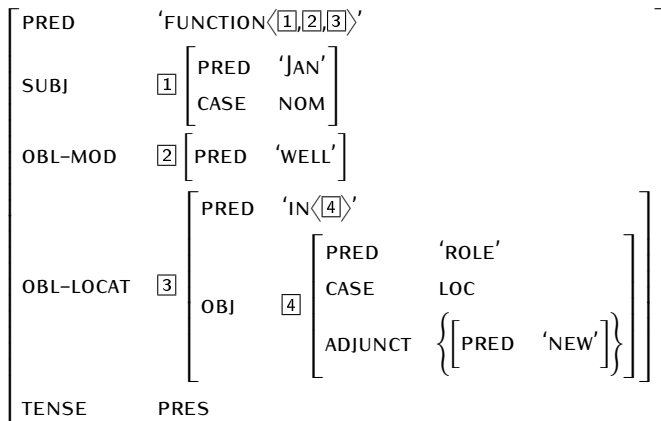
prepnp(near, loc)

prepnp(in, loc)

Off-path constraint where each disjunct corresponds to one realisation:

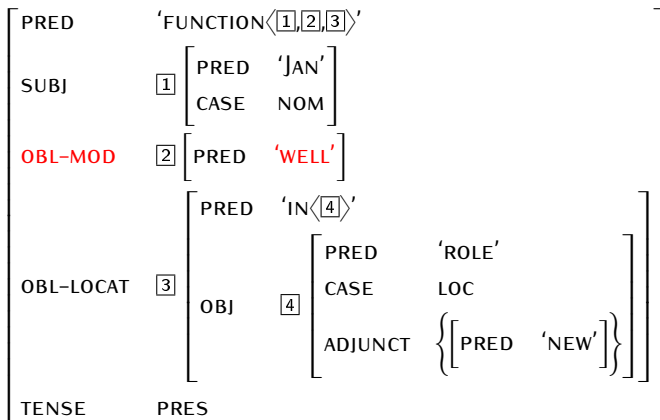
(^ GF PRED: { ... | (-> FN)=c między (<- OBJ CASE)=c inst |  
... | (-> FN)=c w (<- OBJ CASE)=c loc | ...})

# F-structure for FUNKCJONOWAĆ: semantic arguments

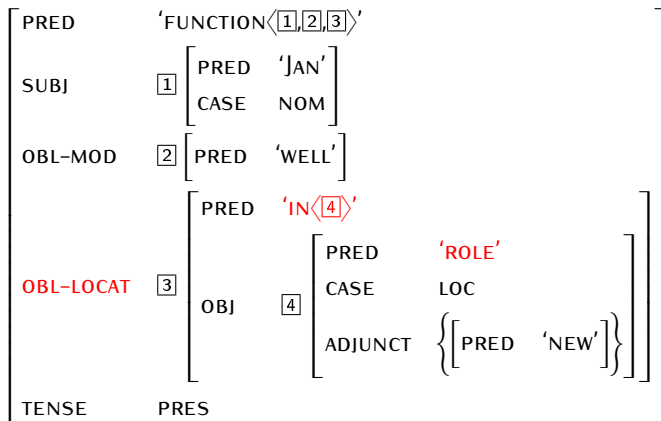




# F-structure for FUNKCJONOWAĆ: semantic arguments



# F-structure for FUNKCJONOWAĆ: semantic arguments





- lexical rule: traditional solution
  - active object becomes the passive subject:
    - (<sup>^</sup> OBJ) --> (<sup>^</sup> SUBJ)
  - active subject:
    - becomes the passive oblique: (<sup>^</sup> SUBJ) --> (<sup>^</sup> OBL-AG)
    - or is dropped: (<sup>^</sup> SUBJ) --> NULL
- creating separate entries that emulate the effect of a lexical rule:
  - easier to transform all constraints related to an argument:
    - structural case assignment
    - control relations
  - possible to introduce extra constraints (e.g. adding correlative pronouns with OBL-AG when the active SUBJ is not nominal)

# Argument reduction



- Walenty provides maximal schemata
- it assumes that all arguments are optional
- with some exceptions:
  - the word  $\sigma\epsilon\tau$  (many functions)
  - lexicalised arguments
- interpreting optionality:
  - dropping: removing from representation
  - implicit: represented syntactically, when motivated:
    - subject
    - controller (controllee must not be left without it)

## F-structure for KAZAĆ: implicit object control



Lekarz kazał odpoczywać.

doctor ordered rest.INF

'The doctor ordered (her/him/it) to rest.'

PRED	'ORDER<1,2,3>'						
SUBJ	<table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px 5px;">1</td> <td style="padding: 2px 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'DOCTOR'</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">NOM</td> </tr> </table> </td> </tr> </table>	1	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'DOCTOR'</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">NOM</td> </tr> </table>	PRED	'DOCTOR'	CASE	NOM
1	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'DOCTOR'</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">NOM</td> </tr> </table>	PRED	'DOCTOR'	CASE	NOM		
PRED	'DOCTOR'						
CASE	NOM						
OBJ <sub>θ</sub>	<table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px 5px;">2</td> <td style="padding: 2px 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'PRO'</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">DAT</td> </tr> </table> </td> </tr> </table>	2	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'PRO'</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">DAT</td> </tr> </table>	PRED	'PRO'	CASE	DAT
2	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'PRO'</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">DAT</td> </tr> </table>	PRED	'PRO'	CASE	DAT		
PRED	'PRO'						
CASE	DAT						
XCOMP	<table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px 5px;">3</td> <td style="padding: 2px 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'REST&lt;2&gt;'</td> </tr> <tr> <td style="padding: 2px 5px;">SUBJ</td> <td style="padding: 2px 5px;">2</td> </tr> </table> </td> </tr> </table>	3	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'REST&lt;2&gt;'</td> </tr> <tr> <td style="padding: 2px 5px;">SUBJ</td> <td style="padding: 2px 5px;">2</td> </tr> </table>	PRED	'REST<2>'	SUBJ	2
3	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'REST&lt;2&gt;'</td> </tr> <tr> <td style="padding: 2px 5px;">SUBJ</td> <td style="padding: 2px 5px;">2</td> </tr> </table>	PRED	'REST<2>'	SUBJ	2		
PRED	'REST<2>'						
SUBJ	2						
TENSE	PAST						

# Conversion of lexicalised dependents: bird's eye view



- choose the grammatical function for each dependent
- impose relevant constraints:
  - as in base category,
  - lexicalised:
    - lemma,
    - extra morphosyntactic constraints,
    - modification.

# Conversion of lexicalised dependents: bird's eye view



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    - extra morphosyntactic constraints,
    - modification.

# Modification types



- `natr`: no further modification
- `atr(...)`: modification allowed (optional)
- `atr1(...)`: only one modifier allowed
- `ratr(...)`: modification required (obligatory)
- `ratr1(...)`: only one modifier required

# No further modification: `natr`



Janek wziął na wstrzymanie.

Janek.NOM took on stoppage.ACC

'Janek decided to wait / not to take action.'

wziąć: `subj{np(str)} +`

`{lex(prepnp(na, acc), sg, 'wstrzymanie', natr)}`

- `(^ OBL PFORM)=c na (^ OBL CASE)=c acc`
- `(^ OBL NUM)=c sg`
- `(^ OBL PRED FN)=c wstrzymanie`
- `~(^ OBL GF), where GF = {SUBJ|OBJ|OBL|...|ADJUNCT}`

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`{lex(prenp(na, acc), sg, 'wstrzymanie', natr)}`

- ( $\wedge$  OBL PFORM)=c **na** ( $\wedge$  OBL CASE)=c **acc**
- ( $\wedge$  OBL NUM)=c **sg**
- ( $\wedge$  OBL PRED FN)=c **wstrzymanie**
- $\sim(\wedge$  OBL GF), where GF = {SUBJ|OBJ|OBL|...|ADJUNCT}



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- `~(^ OBL GF)`, where `GF = {SUBJ|OBJ|OBL|...|ADJUNCT}`

# F-structure for WZIĄĆ NA WSTRZYMANIE



PRED	'TAKE<1,2>'						
SUBJ	<div style="display: inline-block; border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px 5px 5px 5px;"> <span style="border: 1px solid black; padding: 2px;">1</span> </div> <div style="display: inline-block; border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px 10px 5px 5px;"> <table style="border-collapse: collapse; margin: 0;"> <tr> <td style="padding: 5px 10px 5px 10px;">PRED</td> <td style="padding: 5px 10px 5px 10px;">'JANEK'</td> </tr> <tr> <td style="padding: 5px 10px 5px 10px;">CASE</td> <td style="padding: 5px 10px 5px 10px;">NOM</td> </tr> </table> </div>	PRED	'JANEK'	CASE	NOM		
PRED	'JANEK'						
CASE	NOM						
OBL	<div style="display: inline-block; border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px 5px 5px 5px;"> <span style="border: 1px solid black; padding: 2px;">2</span> </div> <div style="display: inline-block; border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px 10px 5px 5px;"> <table style="border-collapse: collapse; margin: 0;"> <tr> <td style="padding: 5px 10px 5px 10px;">PRED</td> <td style="padding: 5px 10px 5px 10px;">'STOPPAGE'</td> </tr> <tr> <td style="padding: 5px 10px 5px 10px;">PFORM</td> <td style="padding: 5px 10px 5px 10px;">NA</td> </tr> <tr> <td style="padding: 5px 10px 5px 10px;">CASE</td> <td style="padding: 5px 10px 5px 10px;">ACC</td> </tr> </table> </div>	PRED	'STOPPAGE'	PFORM	NA	CASE	ACC
PRED	'STOPPAGE'						
PFORM	NA						
CASE	ACC						
TENSE	PAST						

# F-structure for WZIĄĆ NA WSTRZYMANIE



PRED	'TAKE<1,2>'									
SUBJ	<table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px 5px;">1</td> <td style="border-right: 1px solid black; padding: 10px 10px 10px 10px;">PRED</td> <td style="padding: 10px 10px 10px 10px;">'JANEK'</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px 5px;"></td> <td style="border-right: 1px solid black; padding: 10px 10px 10px 10px;">CASE</td> <td style="padding: 10px 10px 10px 10px;">NOM</td> </tr> </table>	1	PRED	'JANEK'		CASE	NOM			
1	PRED	'JANEK'								
	CASE	NOM								
OBL	<table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px 5px;">2</td> <td style="border-right: 1px solid black; padding: 10px 10px 10px 10px;">PRED</td> <td style="padding: 10px 10px 10px 10px;">'STOPPAGE'</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px 5px;"></td> <td style="border-right: 1px solid black; padding: 10px 10px 10px 10px;">PFORM</td> <td style="padding: 10px 10px 10px 10px;">NA</td> </tr> <tr> <td style="border: 1px solid black; padding: 2px 5px;"></td> <td style="border-right: 1px solid black; padding: 10px 10px 10px 10px;">CASE</td> <td style="padding: 10px 10px 10px 10px;">ACC</td> </tr> </table>	2	PRED	'STOPPAGE'		PFORM	NA		CASE	ACC
2	PRED	'STOPPAGE'								
	PFORM	NA								
	CASE	ACC								
TENSE	PAST									

## Modification allowed: atr



Jan bije Marii (gromkie) brawo.

Jan.NOM strikes Maria.DAT loud.ACC applause.ACC

'Jan (loudly) applauds Maria.'

bić: `subj{np(str)} + {np(dat)} +  
{lex(np(str),_, 'brawo', atr)}`

- `{~(^ NEG) (^ OBL-STR CASE)=c acc  
| (^ NEG)=c + (^ OBL-STR CASE)=c gen}`
- no number constraint
- `(^ OBL-STR PRED FN)=c brawo`
- `{(^ OBL-STR ADJUNCT | ~(^ OBL-STR GF))}`

## Modification allowed: atr



Jan bije Marii (gromkie) **brawo**.

Jan.NOM strikes Maria.DAT loud.ACC applause.ACC

'Jan (loudly) applauds Maria.'

bić: `subj{np(str)} + {np(dat)} +`  
`{lex(np(str), _, 'brawo', atr)}`

- $\{ \sim (\wedge \text{NEG}) (\wedge \text{OBL-STR CASE}) = c \text{ acc}$   
 $| (\wedge \text{NEG}) = c + (\wedge \text{OBL-STR CASE}) = c \text{ gen} \}$
- no number constraint
- $(\wedge \text{OBL-STR PRED FN}) = c \text{ brawo}$
- $\{ (\wedge \text{OBL-STR ADJUNCT} | \sim (\wedge \text{OBL-STR GF})) \}$

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'Jan (loudly) applauds Maria.'

bić: subj{np(str)} + {np(dat)} +  
 {lex(np(str), \_, 'brawo', atr)}

- {~(^ NEG) (^ OBL-STR CASE)=c **acc**  
 | (^ NEG)=c + (^ OBL-STR CASE)=c gen}
- no number constraint
- (^ OBL-STR PRED FN)=c brawo
- {(^ OBL-STR ADJUNCT | ~(^ OBL-STR GF))}



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{lex(np(str), _, 'brawo', atr)}`

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| (^ NEG)=c + (^ OBL-STR CASE)=c gen}`
- **no number constraint**
- `(^ OBL-STR PRED FN)=c brawo`
- `{(^ OBL-STR ADJUNCT | ~(^ OBL-STR GF))}`

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Jan bije Marii (gromkie) **brawo**.

Jan.NOM strikes Maria.DAT loud.ACC applause.ACC

'Jan (loudly) applauds Maria.'

bić:  $\text{subj}\{\text{np}(\text{str})\} + \{\text{np}(\text{dat})\} +$   
 $\{\text{lex}(\text{np}(\text{str}), \_, \text{'brawo'}, \text{atr})\}$

- $\{\sim(\wedge \text{NEG}) (\wedge \text{OBL-STR CASE})=c \text{ acc}$   
 $| (\wedge \text{NEG})=c + (\wedge \text{OBL-STR CASE})=c \text{ gen}\}$
- no number constraint
- $(\wedge \text{OBL-STR PRED FN})=c$  **brawo**
- $\{(\wedge \text{OBL-STR ADJUNCT} | \sim(\wedge \text{OBL-STR GF}))\}$

## Modification allowed: atr



Jan bije Marii (gromkie) brawo.

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'Jan (loudly) applauds Maria.'

bić: subj{np(str)} + {np(dat)} +  
 {lex(np(str), \_, 'brawo', atr)}

- {~(^ NEG) (^ OBL-STR CASE)=c acc  
 | (^ NEG)=c + (^ OBL-STR CASE)=c gen}
- no number constraint
- (^ OBL-STR PRED FN)=c brawo
- {(^ OBL-STR ADJUNCT | ~(^ OBL-STR GF))}

# F-structure for BIĆ BRAWO



PRED	'STRIKE<[1],[2],[3]>'
SUBJ	<div style="display: inline-block; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px; margin-right: 5px;">1</div> <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 10px 10px 10px 10px;">           PRED 'JAN'            CASE NOM         </div>
OBL-STR	<div style="display: inline-block; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px; margin-right: 5px;">2</div> <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 10px 10px 10px 10px;">           PRED 'APPLAUSE'            CASE ACC            ADJUNCT { [ PRED 'LOUD' ] }         </div>
OBJ <sub>θ</sub>	<div style="display: inline-block; border-left: 1px solid black; border-right: 1px solid black; padding: 0 5px; margin-right: 5px;">3</div> <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 10px 10px 10px 10px;">           PRED 'MARIA'            CASE DAT         </div>
TENSE	PRES

# F-structure for BIĆ BRAWO



PRED	'STRIKE<[1,2,3]>'						
SUBJ	[1] <table style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px; margin-left: 10px;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'JAN'</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">NOM</td> </tr> </table>	PRED	'JAN'	CASE	NOM		
PRED	'JAN'						
CASE	NOM						
OBL-STR	[2] <table style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px; margin-left: 10px;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px; color: red;">'APPLAUSE'</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px; color: red;">ACC</td> </tr> <tr> <td style="padding: 2px 5px;">ADJUNCT</td> <td style="padding: 2px 5px;">           { [ PRED 'LOUD' ] }         </td> </tr> </table>	PRED	'APPLAUSE'	CASE	ACC	ADJUNCT	{ [ PRED 'LOUD' ] }
PRED	'APPLAUSE'						
CASE	ACC						
ADJUNCT	{ [ PRED 'LOUD' ] }						
OBJ <sub>θ</sub>	[3] <table style="border-left: 1px solid black; border-right: 1px solid black; border-bottom: 1px solid black; padding: 5px; margin-left: 10px;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">'MARIA'</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">DAT</td> </tr> </table>	PRED	'MARIA'	CASE	DAT		
PRED	'MARIA'						
CASE	DAT						
TENSE	PRES						

# F-structure for BIĆ BRAVO



PRED	'STRIKE<[1,2,3]>'
SUBJ	[1 [ PRED 'JAN' CASE NOM ] ]
OBL-STR	[2 [ PRED 'APPLAUSE' CASE ACC ADJUNCT { [ PRED 'LOUD' ] } ] ]
OBJ <sub>θ</sub>	[3 [ PRED 'MARIA' CASE DAT ] ]
TENSE	PRES

## Modification required: `ratr`



\*(Gorąca) krew płynie w \*(jego) żyłach.  
 hot.NOM blood.NOM flows in his.LOC veins.LOC  
 'Hot blood runs in his veins.'

płynąć:

```
subj{lex(np(str),sg,'krew',ratr({adjp(agr)}+{possp}))} +
{lex(prepn(w,loc),pl,'żyła',ratr({adjp(agr)}+{possp}))}
```

- (^ SUBJ CASE)=c nom
- (^ SUBJ NUM)=c sg
- (^ SUBJ PRED FN)=c krew
- {(^ SUBJ ADJUNCT CAT)=c adj | (^ SUBJ POSS)}
- ~(^ SUBJ GF-ADJUNCT-POSS), where GF = {SUBJ|OBJ|OBL|...|ADJUNCT}

# Modification required: `ratr`



\*(**Gorąca**) **krw** płynie w \*(**jego**) **żyłach**.  
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```

- (^ SUBJ CASE)=c **nom**
- (^ SUBJ NUM)=c **sg**
- (^ SUBJ PRED FN)=c **krw**
- {(^ SUBJ ADJUNCT CAT)=c **adj** | (^ SUBJ POSS)}
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 {SUBJ|OBJ|OBL|...|ADJUNCT}

## Modification required: `ratr`



\*(Gorąca) **rew** płynie w \*(jego) żyłach.  
 hot.NOM blood.NOM flows in his.LOC veins.LOC  
 'Hot blood runs in his veins.'

płynąć:

```
subj{lex(np(str), sg, 'rew', ratr({adjp(agr)}+{possp}))} +
{lex(prepn(w, loc), pl, 'żyła', ratr({adjp(agr)}+{possp}))}
```

- (^ SUBJ CASE)=c nom
- (^ SUBJ NUM)=c **sg**
- (^ SUBJ PRED FN)=c **rew**
- {(^ SUBJ ADJUNCT CAT)=c adj | (^ SUBJ POSS)}
- ~(^ SUBJ GF-ADJUNCT-POSS), where GF = {SUBJ|OBJ|OBL|...|ADJUNCT}

## Modification required: `ratr`



\*(Gorąca) **krewn** płynie w \*(jego) żyłach.  
 hot.NOM blood.NOM flows in his.LOC veins.LOC  
 'Hot blood runs in his veins.'

płynąć:

```
subj{lex(np(str),sg,'krew',ratr({adjp(agr)}+{possp}))} +
{lex(prepn(w,loc),pl,'żyła',ratr({adjp(agr)}+{possp}))}
```

- (^ SUBJ CASE)=c nom
- (^ SUBJ NUM)=c sg
- (^ SUBJ PRED FN)=c **krew**
- {(^ SUBJ ADJUNCT CAT)=c adj | (^ SUBJ POSS)}
- ~(^ SUBJ GF-ADJUNCT-POSS), where GF = {SUBJ|OBJ|OBL|...|ADJUNCT}

## Modification required: `ratr`



\*(**Gorąca**) krew płynie w \*(jego) żyłach.  
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subj{lex(np(str),sg,'krew',ratr({adjp(agr)}+{possp}))} +
{lex(prepn(w,loc),pl,'żyła',ratr({adjp(agr)}+{possp}))}
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- (^ SUBJ NUM)=c sg
- (^ SUBJ PRED FN)=c krew
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## Modification required: `ratr`



\*(Gorąca) krew płynie w \*(jego) żyłach.  
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płynąć:

```
subj{lex(np(str),sg,'krew',ratr({adjp(agr)}+{possp}))} +
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```

- (^ SUBJ CASE)=c nom
- (^ SUBJ NUM)=c sg
- (^ SUBJ PRED FN)=c krew
- {(^ SUBJ ADJUNCT CAT)=c adj | (^ SUBJ POSS)}
- ~(^ SUBJ GF-ADJUNCT-POSS), where GF = {SUBJ|OBJ|OBL|...|ADJUNCT}

## Modification required: `ratr`



\*(Gorąca) krew płynie w \*(jego) żyłach.  
 hot.NOM blood.NOM flows in his.LOC veins.LOC  
 'Hot blood runs in his veins.'

płynąć:

```
subj{lex(np(str),sg,'krew',ratr({adjp(agr)}+{possp}))} +
{lex(prepn(w,loc),pl,'żyła',ratr({adjp(agr)}+{possp}))}
```

- (^ SUBJ CASE)=c nom
- (^ SUBJ NUM)=c sg
- (^ SUBJ PRED FN)=c krew
- {(^ SUBJ **ADJUNCT** CAT)=c adj | (^ SUBJ **POSS**)}
- ~(^ **SUBJ GF-ADJUNCT-POSS**), where GF =  
 {SUBJ|OBJ|OBL|...|ADJUNCT}

# F-structure for PŁYŃAĆ W ŻYŁACH



PRED	'FLOW<1,2>'																		
SUBJ	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">1</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 5px;">PRED</td> <td style="padding: 5px;">'BLOOD'</td> </tr> <tr> <td style="padding: 5px;">CASE</td> <td style="padding: 5px;">NOM</td> </tr> <tr> <td style="padding: 5px;">NUM</td> <td style="padding: 5px;">SG</td> </tr> <tr> <td style="padding: 5px;">ADJUNCT</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">{</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">[</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 5px;">PRED</td> <td style="padding: 5px;">'HOT'</td> </tr> </table> </td> <td style="padding: 5px;">]</td> </tr> </table> </td> <td style="padding: 5px;">}</td> </tr> </table> </td> </tr> </table> </td> </tr> </table>	1	<table style="border-collapse: collapse;"> <tr> <td style="padding: 5px;">PRED</td> <td style="padding: 5px;">'BLOOD'</td> </tr> <tr> <td style="padding: 5px;">CASE</td> <td style="padding: 5px;">NOM</td> </tr> <tr> <td style="padding: 5px;">NUM</td> <td style="padding: 5px;">SG</td> </tr> <tr> <td style="padding: 5px;">ADJUNCT</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">{</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">[</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 5px;">PRED</td> <td style="padding: 5px;">'HOT'</td> </tr> </table> </td> <td style="padding: 5px;">]</td> </tr> </table> </td> <td style="padding: 5px;">}</td> </tr> </table> </td> </tr> </table>	PRED	'BLOOD'	CASE	NOM	NUM	SG	ADJUNCT	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">{</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">[</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 5px;">PRED</td> <td style="padding: 5px;">'HOT'</td> </tr> </table> </td> <td style="padding: 5px;">]</td> </tr> </table> </td> <td style="padding: 5px;">}</td> </tr> </table>	{	<table style="border-collapse: collapse;"> <tr> <td style="border-right: 1px solid black; padding: 5px;">[</td> <td style="padding: 5px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 5px;">PRED</td> <td style="padding: 5px;">'HOT'</td> </tr> </table> </td> <td style="padding: 5px;">]</td> </tr> </table>	[	<table style="border-collapse: collapse;"> <tr> <td style="padding: 5px;">PRED</td> <td style="padding: 5px;">'HOT'</td> </tr> </table>	PRED	'HOT'	]	}
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PRED	'HE'																		
TENSE	PRES																		



# F-structure for PŁYŃĆ W ŻYŁACH



PRED	'FLOW< <span style="border: 1px solid black; padding: 0 2px;">1</span> , <span style="border: 1px solid black; padding: 0 2px;">2</span> >'															
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ADJUNCT	{ [ PRED 'HOT' ] }											
SUBJ	1											
		<table border="1"> <tr> <td>PRED</td> <td>'VEIN'</td> </tr> <tr> <td>PFORM</td> <td>W</td> </tr> <tr> <td>CASE</td> <td>LOC</td> </tr> <tr> <td>NUM</td> <td>PL</td> </tr> <tr> <td>POSS</td> <td>[ PRED 'HE' ]</td> </tr> </table>	PRED	'VEIN'	PFORM	W	CASE	LOC	NUM	PL	POSS	[ PRED 'HE' ]
PRED	'VEIN'											
PFORM	W											
CASE	LOC											
NUM	PL											
POSS	[ PRED 'HE' ]											
OBL	2											
TENSE		PRES										

# Modification required exactly once: `ratr1`



Janek wziął stronę \*(Marysi).  
 Janek.NOM took side.ACC Marysia.GEN  
 'Janek took Marysia's side.'

wziąć: `subj{np(str)} +`  
`{lex(np(str),sg,'strona',ratr1({possp}))}`

- $\{ \sim (^ \text{NEG}) (^ \text{OBL-STR CASE}) = c \text{ acc}$   
 $| (^ \text{NEG}) = c + (^ \text{OBL-STR CASE}) = c \text{ gen} \}$
- $(^ \text{OBL-STR NUM}) = c \text{ sg}$
- $(^ \text{OBL-STR PRED FN}) = c \text{ strona}$
- $(^ \text{OBL-STR POSS}) \sim (^ \text{OBL-STR GF-POSS})$ , where GF =  
 $\{\text{SUBJ} | \text{OBJ} | \text{OBL} | \dots | \text{ADJUNCT}\}$

# Modification required exactly once: `ratr1`



Janek wziął stronę \*(Marysi).

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wziąć: `subj{np(str)}` +

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- $\{ \sim (^ \text{NEG}) (^ \text{OBL-STR CASE})=c \text{ acc}$   
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- $\{ \sim (^ \text{NEG}) (^ \text{OBL-STR CASE}) = c \text{ acc}$   
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 'Janek took Marysia's side.'

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`{lex(np(str),sg,'strona',ratr1({possp}))}`

- $\{ \sim (^ \text{NEG}) (^ \text{OBL-STR CASE})=c \text{ acc} \mid (^ \text{NEG})=c + (^ \text{OBL-STR CASE})=c \text{ gen} \}$
- $(^ \text{OBL-STR NUM})=c \text{ sg}$
- $(^ \text{OBL-STR PRED FN})=c \text{ strona}$
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# F-structure for WZIĄĆ STRONĘ



PRED	'TAKE<1,2>'
SUBJ	<div style="display: inline-block; border: 1px solid black; padding: 2px 5px; margin-right: 5px;">1</div> <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 10px;">           PRED 'JANEK'            CASE NOM         </div>
OBL-STR	<div style="display: inline-block; border: 1px solid black; padding: 2px 5px; margin-right: 5px;">2</div> <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 10px;">           PRED 'SIDE'            CASE ACC            POSS <div style="border-left: 1px solid black; border-right: 1px solid black; padding: 10px;">PRED 'MARYSIA'</div> </div>
TENSE	PAST

# F-structure for WZIĄĆ STRONĘ



PRED	'TAKE<1,2>'										
SUBJ	<table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px 5px; text-align: center;">1</td> <td style="padding: 10px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 5px;">PRED</td> <td style="padding: 5px;">'JANEK'</td> </tr> <tr> <td style="padding: 5px;">CASE</td> <td style="padding: 5px;">NOM</td> </tr> </table> </td> </tr> </table>	1	<table style="border-collapse: collapse;"> <tr> <td style="padding: 5px;">PRED</td> <td style="padding: 5px;">'JANEK'</td> </tr> <tr> <td style="padding: 5px;">CASE</td> <td style="padding: 5px;">NOM</td> </tr> </table>	PRED	'JANEK'	CASE	NOM				
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# F-structure for WZIĄĆ STRONĘ



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## Problem with `ratr1` in conversion



Janek zbił łobuza na \*(kwaśne) jabłko.

Janek.NOM beat rascal.ACC to sour apple

'Janek beat the rascal badly.'

zbić: `subj{np(str)} + obj{np(str)} +`

`{lex(preppp(na,acc),sg,'jabłko',`

`ratr1({lex(adjp(agr),agr,agr,pos,'kwaśny',natr))})}`

- ( $\wedge$  OBL PFORM)=c na ( $\wedge$  OBL CASE)=c acc

- ( $\wedge$  OBL NUM)=c sg

- ( $\wedge$  OBL PRED FN)=c jabłko

- ( $\wedge$  OBL ADJUNCT \$)=%DEP

(%DEP PRED FN)=c kwaśny (%DEP CAT)=c adj

~[(PATH ADJUNCT \$) <h %DEP] "nothing before"

~[%DEP <h (PATH ADJUNCT \$)] "nothing after"



## Problem with `ratr1` in conversion



Janek zbił łobuza **na** \*(kwaśne) jabłko.

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zbić: `subj{np(str)} + obj{np(str)} +`

`{lex(prepp(na,acc),sg,'jabłko'),`

`ratr1({lex(adjp(agr),agr,agr,pos,'kwaśny',natr))})}`

- ( $\wedge$  OBL PFORM)=c na ( $\wedge$  OBL CASE)=c acc
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## Problem with `ratr1` in conversion



Janek zbił łobuza **na** \*(kwaśne) **jabłko**.

Janek.NOM beat rascal.ACC to sour apple

'Janek beat the rascal badly.'

zbić: `subj{np(str)} + obj{np(str)} +`

`{lex(pre,np(na,acc),sg,'jabłko'),`

`ratr1({lex(adj(agr),agr,agr,pos,'kwaśny',natr))})`

- `(^ OBL PFORM)=c na (^ OBL CASE)=c acc`
- `(^ OBL NUM)=c sg`
- `(^ OBL PRED FN)=c jabłko`
- `(^ OBL ADJUNCT $)=%DEP`  
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Janek zbił łobuza na \*(kwaśne) jabłko.  
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`{lex(preppp(na,acc),sg,'jabłko',`  
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Janek zbił łobuza na \*(kwaśne) jabłko.  
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 'Janek beat the rascal badly.'

zbić: `subj{np(str)} + obj{np(str)} +`  
`{lex(preppn(na,acc),sg,'jabłko',`  
`ratr1({lex(adjp(agr),agr,agr,pos,'kwaśny',natr)}))}`

- `(^ OBL PFORM)=c na (^ OBL CASE)=c acc`
- `(^ OBL NUM)=c sg`
- `(^ OBL PRED FN)=c jabłko`
- `(^ OBL ADJUNCT $)=%DEP`  
`(%DEP PRED FN)=c kwaśny (%DEP CAT)=c adj`  
`~[(PATH ADJUNCT $) <h %DEP] "nothing before"`  
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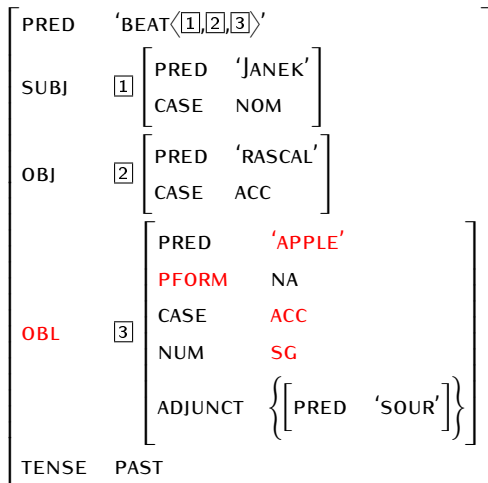


# F-structure for ZBIĆ NA KWAŚNE JABŁKO

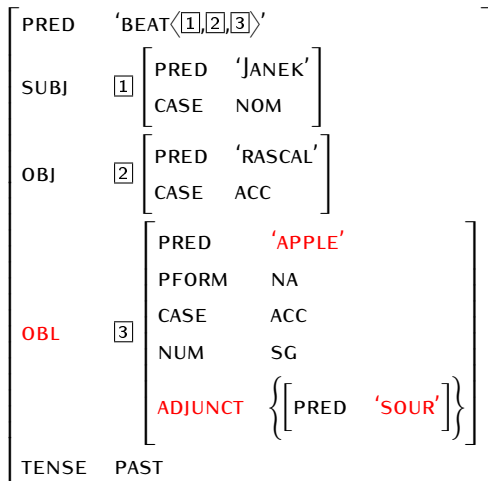


PRED	‘BEAT<1,2,3>’															
SUBJ	<table style="border-collapse: collapse;"> <tr> <td style="border: 1px solid black; padding: 2px 5px; text-align: center;">1</td> <td style="padding: 10px;"> <table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">‘JANEK’</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">NOM</td> </tr> </table> </td> </tr> </table>	1	<table style="border-collapse: collapse;"> <tr> <td style="padding: 2px 5px;">PRED</td> <td style="padding: 2px 5px;">‘JANEK’</td> </tr> <tr> <td style="padding: 2px 5px;">CASE</td> <td style="padding: 2px 5px;">NOM</td> </tr> </table>	PRED	‘JANEK’	CASE	NOM									
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TENSE	PAST															

# F-structure for ZBIĆ NA KWAŚNE JABŁKO



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## An example of coordination and embedding



My również witamy Cię serdecznie i z (szeroko)  
 we.NOM also welcome you.ACC cordially and with widely  
 \*(otwartymi) ramionami.  
 open.INST arms.INST

'We are also welcoming you cordially and with (widely) open arms.'

```
witać: subj{np(str)} + obj{np(str)} +
{xp(mod); lex(preppnp(z, inst), pl, XOR('ramię', 'ręka'),
ratr1({lex(adjp(agr), agr, agr, pos, 'otwarty',
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```

- coordinate position: plain xp(mod) and lexicalised preppnp
- XOR (either... or...) lemma specification
- lexicalised preppnp must be modified by a lexicalised adjp
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# Formalisation of WITAĆ Z (SZEROKO) OTWARTYMI RAMIONAMI



```
(^ OBL-MOD PRED FN)=c z (^ OBL-MOD OBJ CASE)=c inst
```

```
(^ OBL-MOD OBJ NUM)=c pl
```

```
(^ OBL-MOD OBJ PRED FN)$c {ramię ręka}
```

```
(^ OBL-MOD ADJUNCT $)=%DEP
```

```
(%DEP PRED FN)=c otwarty (%DEP CAT)=c adj
```

```
~[(^ OBL-MOD ADJUNCT $) <h %DEP]
```

```
~[%DEP <h (^ OBL-MOD ADJUNCT $)]
```

```
~(^ OBL-MOD GF-ADJUNCT)
```

```
{(%DEP ADJUNCT $)=%DEPEMB
```

```
(%DEPEMB PRED FN)=c szeroko (%DEPEMB CAT)=c adv
```

```
~[(%DEP ADJUNCT $) <h %DEPEMB]
```

```
~[%DEPEMB <h (%DEP ADJUNCT $)]
```

```
~(%DEPEMB GF)
```

```
| ~(%DEP GF)}
```

# Formalisation of WITAĆ Z (SZEROKO) OTWARTYMI RAMIONAMI



(^ OBL-MOD PRED FN)=c **z** (^ OBL-MOD OBJ CASE)=c **inst**

(^ OBL-MOD OBJ NUM)=c pl

(^ OBL-MOD OBJ PRED FN)\$c {ramię ręka}

(^ OBL-MOD ADJUNCT \$)=%DEP

(%DEP PRED FN)=c otwarty (%DEP CAT)=c adj

~[(^ OBL-MOD ADJUNCT \$) <h %DEP]

~[%DEP <h (^ OBL-MOD ADJUNCT \$)]

~(^ OBL-MOD GF-ADJUNCT)

{(%DEP ADJUNCT \$)=%DEPEMB

(%DEPEMB PRED FN)=c szeroko (%DEPEMB CAT)=c adv

~[(%DEP ADJUNCT \$) <h %DEPEMB]

~[%DEPEMB <h (%DEP ADJUNCT \$)]

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| ~(%DEP GF)}

# Formalisation of WITAĆ Z (SZEROKO) OTWARTYMI RAMIONAMI



(^ OBL-MOD PRED FN)=c z (^ OBL-MOD OBJ CASE)=c inst  
 (^ OBL-MOD OBJ NUM)=c **pl**  
 (^ OBL-MOD OBJ PRED FN)\$c {ramię ręka}

(^ OBL-MOD ADJUNCT \$)=%DEP  
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# Formalisation of WITAĆ Z (SZEROKO) OTWARTYMI RAMIONAMI



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(^ OBL-MOD OBJ NUM)=c pl

(^ OBL-MOD OBJ PRED FN)\$c {ramię ręka}

(^ OBL-MOD ADJUNCT \$)=%DEP

(%DEP PRED FN)=c otwarty (%DEP CAT)=c adj

~[(^ OBL-MOD ADJUNCT \$) <h %DEP]

~[%DEP <h (^ OBL-MOD ADJUNCT \$)]

~(^ OBL-MOD GF-ADJUNCT)

{(%DEP ADJUNCT \$)=%DEPEMB

(%DEPEMB PRED FN)=c szeroko (%DEPEMB CAT)=c adv

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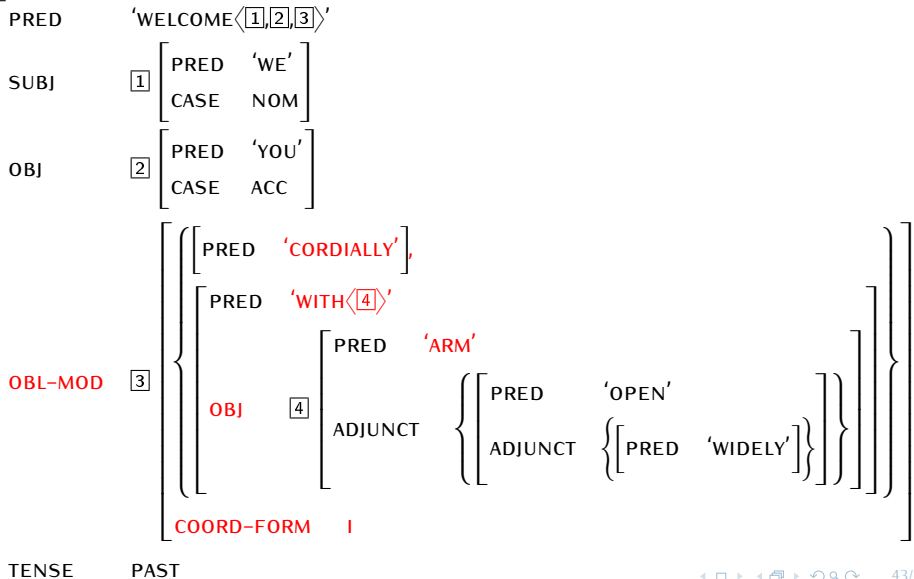
```
(^ OBL-MOD PRED FN)=c z (^ OBL-MOD OBJ CASE)=c inst
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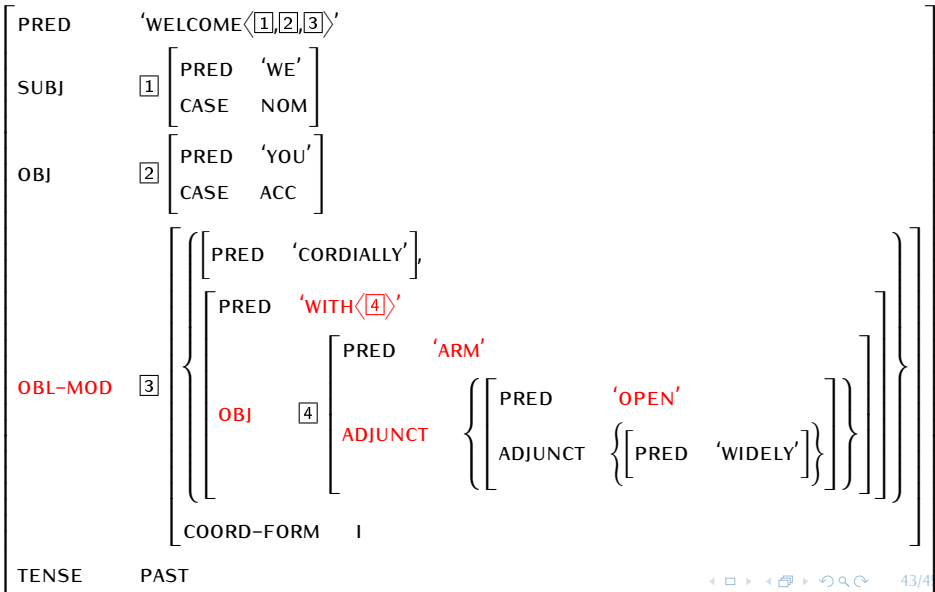
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# F-structure for WITAĆ z (SZEROKO) OTWARTYMI RAMIONAMI



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# Representing MWEs in LFG?



- LEX attribute inside relevant dependents
- extra MWE PRED attribute
- pointer to Walenty schemata (idea: Agata Savary)
- pointer to XML identifiers of dependents
- pointer to WordNet sense of the MWE
- more?...



# Conclusion



- how Walenty can be used with an LFG grammar
- issues:
  - GF assignment (unlikes)
  - imposing basic constraints (unlikes)
  - passive voice formation
  - argument reduction
  - imposing lexicalised constraints

## POLFIE

<http://zil.ipipan.waw.pl/LFG/>

## POLFIE in XLE-Web

<http://iness.mozart.ipipan.waw.pl/iness/xle-web>

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