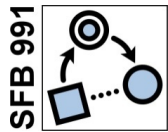


# Roles and the compositional semantics of role-denoting relational adjectives

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## 0. Introduction

### 0.1 The project

- Some nominals such as *president* show an ambiguity between readings related to an official or social role, or to readings on a personal level.

The president visited his mother. (personal visit preferred)

The president visited Netanyahu. (official visit preferred)

- These readings are driven in large part by our understanding of social roles in the world: heads of state are visited in the course of official duties of leading a country, while parents are not.
- **Puzzle:** these same nominals admit for **only** a role-related reading when used as adjectives.

The president visited his mother.

Does not entail: There was a presidential visit to the president's mother.

- Distinction arises not just with verbal predication, but also possessives.

the president's desk (may be a personal desk)

the presidential desk (must be an official desk)

## 0.1 The project

- *Presidential* in this example is a member of the class of relational adjectives (RAs).

Ukrainian crisis, technical architect, nuclear war, dental care, semantics conference

- We call *presidential* (and other like adjectives) role-denoting relational adjectives.

president  $\sim$  presidential    mayor  $\sim$  mayoral    senator  $\sim$  senatorial    pope  $\sim$  papal

- These role-denoting relational adjectives form a semi-productive subclass of RAs.
- Often derived from a noun, but in some cases this is only apparent diachronically (e.g., *royal* from Lat. *rex* 'king')

## 0.1 The project

### Questions addressed today

1. How are relational adjectives, especially those of the *presidential*-type, represented?
2. How are roles semantically represented and distinguished from ordinary individuals?

## 0.1 The project

### Our answer

- Enrich ontology with **levels of action** (official and personal).
- Lexical decomposition for role-denoting RAs. They encode an event at an official level of action.
- Role-denoting RAs relate meaning of nominal to the official actions encoded in the adjective.
- Roles are derived from thematic roles of events at an official level of action.

### Big picture

- How adjectives compose with the nouns that they modify
- How world knowledge and context interact with lexical meaning
- How our natural language ontology is organized, and what kinds of things we find in it (e.g. the project of natural language metaphysics)

## 0.2 Roadmap for this talk

- Section 1: Basic data on relational adjectives
- Section 2: Previous accounts of RAs and some critiques
- Section 3: Ontological background for roles
- Section 4: Analysis of *presidency*, *president*, *presidential*
- Section 5: Expanding on the analysis
- Section 6: Discussion and conclusion

### Note:

- We focus on *presidential* as the best and clearest example case in our analysis.
- But the basic analysis can be extended to other examples of these role-denoting RAs.

# 1. Relational adjectives

## 1.1 Variants of adnominal adjective use

### Non-relational: Property use

Semantics of A+N: The adjective defines a property of its argument;  
if combined with a noun, the property by composition is attributed to the noun referent.

- Many property adjectives (i.e. adjectives with adnominal property use) define a class in their own right ‘the A ones’.
- Property adjectives can be used predicatively.

- Subclasses:

(non-gradable) adjectives of color, shape, material: *green round wooden*

(gradable) one-dimensional adjectives that specify their argument with respect to a particular dimension / attribute: *big short expensive old hot*

(gradable) multidimensional adjectives (cf. Sassoon 2013), *good healthy intelligent*

## 1.1 Variants of adnominal adjective use

### Classificatory use

Semantics of A+N: Modifying a noun with a classificatory adjective yields an expression for a subclass of the class denoted by the noun alone.

- Examples *nuclear war musical instrument dental care pediatric conference public university*
- Most classificatory adjectives are denominal, or there is a semantically related noun  
*musical – music pediatric – pediatrics public – public dental – teeth*
- Classificatory adjectives are not gradable.
- Property adjectives can usually not be used predicatively, but exceptions are possible  
*#the care was dental*  
*#this instrument is musical*  
*??this conference is pediatric*  
*this university is public*
- Out of context, classificatory adjectives do not define a class in their own right.



## 1.1 Variants of adnominal adjective use

### Thematic use

The adjective is denominal or otherwise lexically corresponding to a noun  $N_A$ .

Semantics of A+N: Modifying a noun with a thematic adjective amounts to the characterization of an event argument of the head noun as a case of  $N_A$ .

- Examples *presidential visit* *French policy* *semantics workshop*
- Thematic adjectives are not gradable.
- Thematic adjectives can usually not be used predicatively  
#*this visit is presidential*  
#*this policy is French*  
??*this workshop is semantics*
- Out of context, thematic adjectives do not define a class in their own right.

## 1.2 Relational adjectives proper

Most relational adjectives are either derived from, or semantically related, to a noun **N<sub>A</sub>**

<i>motherly</i>	<i>mother</i>
<i>papal</i>	> <i>pope</i>
<i>senatorial</i>	<i>senator</i>
<i>royal</i>	> <i>king, queen</i>
<i>presidential</i>	<i>president</i>
<i>semantic</i>	<i>semantics</i>

German

<i>ärztlich</i>	<i>Arzt</i> ('[medical] doctor')
<i>studentisch</i>	<i>Student</i> ('college/university student')
<i>fachmännisch</i>	<i>Fachmann</i> ('specialist, expert')

1.2 Relational adjectives proper

Relational A+N compositionally result in a sense that relates the sense of N to N<sub>A</sub>.

There are three near-equivalent ways of semantically joining two N senses:

	English	German	Russian
deNA + N	<i>presidential visit</i>	—	<i>prezident<sub>N</sub>-skij<sub>A</sub> visit</i>
NN compound	—	<i>Präsidentenbesuch</i>	—
possessive N N	<i>president's visit</i>	<i>Besuch des Präsidenten</i>	<i>visit prezident<sub>N</sub>-a<sub>GEN</sub></i>
deNA + N	<i>Ukrainian crisis</i>	—	—
NN compound	—	<i>Ukraine<sub>N</sub>krise</i>	—
possessive N N	—	—	—

## 2. Previous accounts

### 2.1 Previous accounts I: Recoverable predicates, thematic and classificatory adjectives

- **Levi (1978)** analyses compounds and RAs as being transformationally derived from predications that make use of a set of abstract “Recoverably Deletable Predicates.”

**CAUSE, HAVE, MAKE, USE, BE, IN, FOR, FROM, ABOUT**

stress caused by heat -> heat stress -> thermal stress

- Raises questions of where these predicates come from, and why only these predicates.
- Previous syntactic accounts (Bosque and Picallo 1996, Alexiadou and Stavrou 2011, a.o.) assume a distinction between **thematic** and **classificatory** uses of RAs.
- In these accounts, thematic RAs **syntactically** saturate an argument position. Classificatory RAs are true adjectives (in many accounts) and not argument-saturating.
- **Arsenijevic et al. (2014)** provide arguments against this view and for a view that RAs are always true adjectives without syntactic argument-saturating behavior.
- Argument-saturating behavior is only apparent. Product of semantics.

## 2.2 Previous accounts II

**McNally and Boleda (2004)** argue that relational adjectives are properties of kinds and not individuals.

- Propose an intersective analysis of RAs, adapting Larson's (1998) analysis of certain event-related adjectives (e.g. *beautiful dancer*, *skillful surgeon*)
- Assume that common nouns have an argument for a Carlsonian kind  $x_k$  in addition to an argument for an ordinary individual  $y_o$ . Ordinary individual and kind related via Carlson's *R(ealization)* relation.

$$\llbracket \textit{architect} \rrbracket = \lambda x_k \lambda y_o [R(x_k, y_o) \wedge \mathbf{architect}(x_k)]$$

- RAs are properties of kinds.

$$\llbracket \textit{technical} \rrbracket = \lambda x_k [\mathbf{technical}(x_k)]$$

- Intersective modification via the kind argument.

$$\llbracket \textit{technical architect} \rrbracket = \lambda y_o \exists x_k [R(x_k, y_o) \wedge \mathbf{architect}(x_k) \wedge \mathbf{technical}(x_k)]$$

### 2.3 Objection: Paraphrases with *kind*

- Given a kind-based analyses, we might expect **paraphrases with *kind*** to be possible with role adjectives (e.g. *an A kind of N*).
- Generally, paraphrases of this sort are **not possible** with role adjectives or **don't capture the role-related meaning**.

<i>presidential election</i>	election of the president (THEME)	<i>#presidential kind of election</i>
<i>presidential office</i>	office [position] of being president	<i>#presidential kind of office</i>
<i>presidential office</i>	office [room] used by the president	<i>#presidential kind of office</i>
<i>presidential desk</i>	desk used by the president	<i>#presidential kind of desk</i>
<i>presidential advisor</i>	advisor of the president (GOAL)	<i>#presidential kind of advisor</i>
<i>presidential visit (1)</i>	visit by the president	<i>#presidential kind of visit</i>
<i>presidential visit (2)</i>	visit to the president	<i>#presidential kind of visit</i>
<i>presidential order</i>	order issued by the president (AGENT)	<i>#presidential kind of order</i>
<i>presidential motorcade</i>	motorcade escorting the president	<i>#presidential kind of motorcade</i>

- This suggests that kinds are not the ontological sort relevant for an analysis of adjectives like *presidential*.

## 2.4 Objection: Relations encoded in the adjective

- Arsenijević et al. (2014) propose that certain adjectives (*French, Danish*) do more than simple intersective modification, but also encode an **Origin** relation, relating a kind and a location. There are, however, many possible relations involved with *presidential*.

<i>presidential election</i>	election <b>with the aim of determining the next</b> president <sub>incumbent</sub>	("thematic")
<i>presidential office (1)</i>	the office <b>of</b> president <sub>role</sub>	
<i>presidential office (2)</i>	office <b>for certain types of official action by</b> the president	
<i>presidential advisor</i>	advisor <b>to the president for official action</b>	
<i>presidential visit (1)</i>	visit <b>by</b> the president as the president	("thematic")
<i>presidential visit (2)</i>	visit <b>to</b> the president as the president	("thematic")
<i>presidential order</i>	order <b>by</b> the president as part of executing presidential rights	("thematic")
<i>presidential motorcade</i>	motorcade <b>[for] escorting</b> the president on official travel	

- Encoding the relation within the adjective is too strong. Not a general strategy for role-denoting RAs.
- The relation must come from the modified noun and/or a bridging relation provided by context.

## 2.5 Objection: Predications with relational adjectives

- The account of relational adjectives as properties of kinds predicts that they should be able to take kind-denoting DPs as arguments (such as BPs or kind-denoting indefinites) when used predicatively.

This is possible, though not always so.

*For women concerned about their future fertility for **reasons that are medical, social or financial...***

*\*Doctors/\*A doctor can be **medical**.*

- Additionally, RAs used predicatively can sometimes predicate of non-kind-denoting DPs, which should result in a type mismatch.

*This university is **public**, but private universities and colleges are also on the island.*

*An early goal of diagnosis is to determine whether the condition is **viral or bacterial**.*

- This distribution isn't straightforwardly predicted by RAs as predicates of kinds; other pragmatic and semantic properties must be involved.



## 3. Ontological background

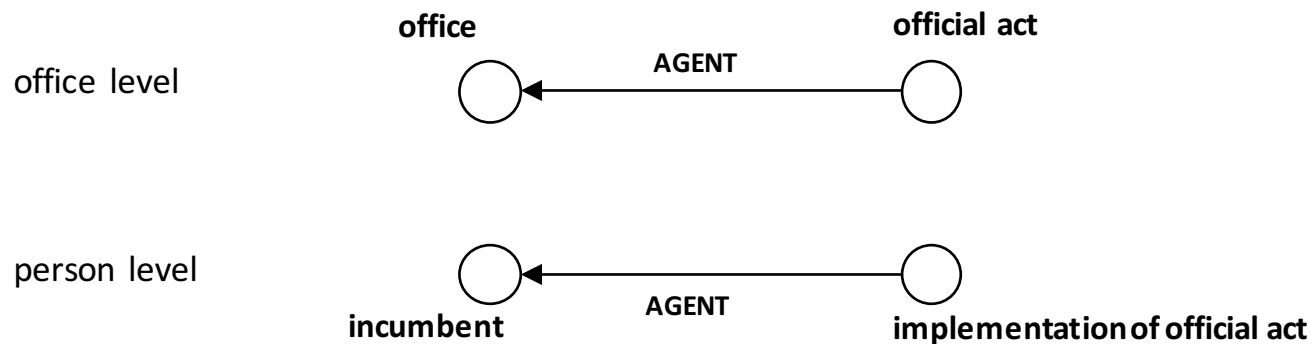
### 3.1 Social ontology

- A social ontology provides for social entities such as persons and institutions, roles, offices, functions, and actions by social agents (e.g. voters, politicians, police, parents, spouses, teachers, etc.).
- Essential to the social ontology are social acts performed by social agents that produce social facts by acting, implement social roles etc.
- Entities in the social ontology are (ultimately) implemented by entities in a physical ontology: persons are implemented by human animals, and social acts are implemented by doings that under appropriate circumstances **count as** particular social acts (Searle 1995).
- The social ontology of our world is in itself multi-level.  
For example, persons are social entities that may take in social roles (a higher level).
- The social ontology is grounded by and dependent on the physical ontology.

### 3.2 Office and person levels of action

- A social office, like ‘president of the US’, is defined at a non-basic, abstract level of social ontology. There is an incumbent of the office, a person.
- Certain types of acts are considered acts by the office (rather than the individual).
- Being an abstract institution, the office cannot execute the act.
- Official acts have to be implemented by the person in office.
- What office-holders do when they *implement* an official act is *not* the official act because the official act is an act by the office, not by its incumbent.

Figure 1: Office and role level



### 3.3 Connections between levels

- There is a function **INC** that returns the incumbent for the office.
- There is a function **IMPL** that returns the implementing act  $A\downarrow$  for the official act  $A$ .  
 $A$  and  $A\downarrow$  have the same temporal extension  $\tau$ .
- There is a (partial function) **CONST** that returns the implemented act  $A\uparrow$  for the implementary act.  
This relation is Goldman's (1970) "level-generation".

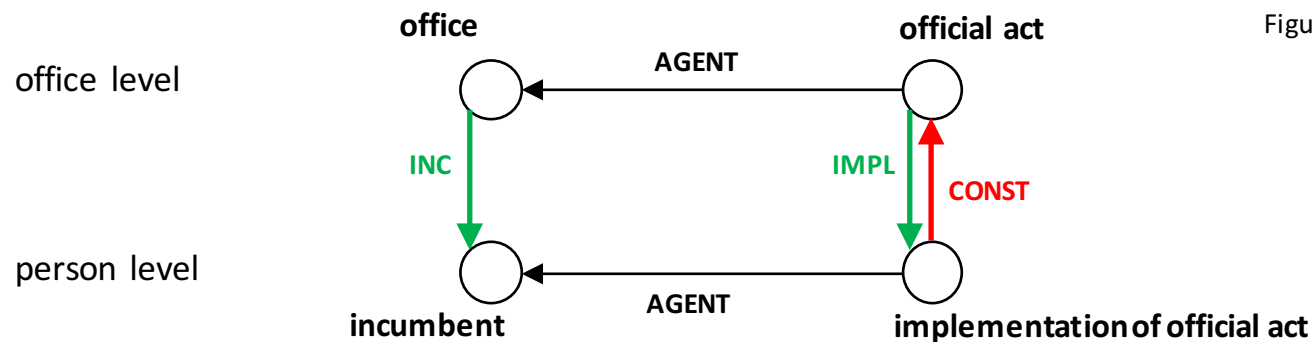


Figure 2: Office and role level relations

### 3.3 Connections between levels

- Goldman (1970) asks the question of when two acts (events) are identical.
- Are spatiotemporally coextensive acts identical?
- Example: John did the following things all at the same time: (i) moved his hand, (ii) scared away a fly, (iii) flipped the switch, (iv) turned on the light, (v) woke Mary up.

John scared away a fly by moving his hand.

John flipped by the switch by moving his hand.

John woke Mary up by turning on the light.

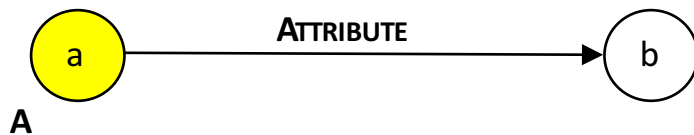
#John woke Mary up by moving his hand.

#John scared away a fly by turning on the light.

- **Not** identical acts. Different causal properties.
- But, some pairs of acts have a relationship to each other (e.g., causal (i & ii), constitutive (i, iii)), while others don't (e.g., (i, v)).
- When relationships such as these hold, one act is said to level generate the second. Second act is dependent on the first.

### 3.3 A note on notation

- Analysis uses a version of frame semantics formalized by Petersen (2007) and Löbner (2014).
- Frame is a recursive attribute–value structure.
- Model lexical and world-knowledge within the same representation.
- Attributes in this theory are functions.
- We move back and forth between using first-order formalizations of frames and graph-theoretic frame diagrams. But, nothing crucial is gained or lost with either formalization.
- Arcs represent attributes, nodes represent values.
- Distinguished node (in yellow) represents the referential argument of the frame.



$$\lambda a. \mathbf{A}(a) \wedge \text{ATTRIBUTE}(a) = b$$

## 4. *Presidency – president – presidential*

### 4.1 *\*Preside and presidency*

- The notions of ‘president’ and ‘presidency’ are defined (by social regulation) at the office level.
- We assume that the basic notion is the one of ‘presidency’.
- A presidency is an event with two arguments, an ORG[ANIZATION] and a HEAD. We introduce a hypothetical verb *\*preside* for this type of event.
- Like for any event, there is a temporal extension  $\tau$  for every presidency. We assume that presidencies are temporally uninterrupted.

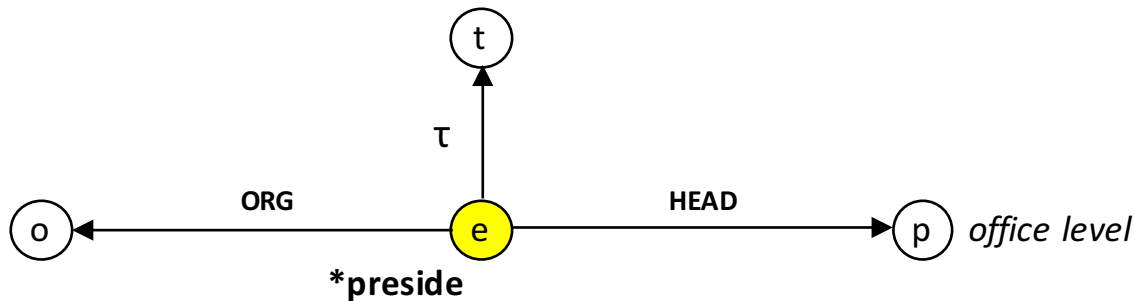


Figure 3: *presidency* and *\*preside*

$$\lambda e (*preside(e) \wedge HEAD(e)=p \wedge ORG(e)=o \wedge \tau(e)=t)$$

#### 4.1 \**Preside* and *presidency*

- Evidence for an event \***preside** from derivational morphology.
- View of derivational morphology within frame semantics is that it involves shifting the referential index in the frame to a different node (Kawaletz and Plag 2015).
- *president* -> *presidency*. Shift from president individual at the office or personal level to the \***preside** event at the office level.

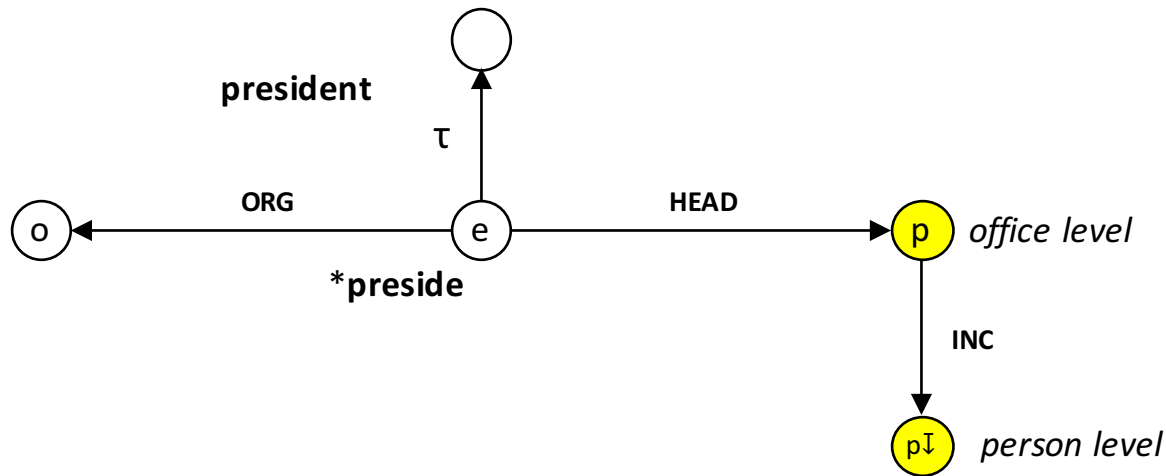
Barack Obama's presidency lasted eight years.

Because his presidency occurred between those of Grover Cleveland and Theodore Roosevelt, McKinley's accomplishments have often been overlooked.

- Note: Not crucial for our analysis that *presidency* itself denote an event.
- But, we do need an event incorporated into the meaning of *president*.
- Similar move made by Larson (1998) for nouns like *king* that also do not obviously have an event.

## 4.2 *President*

- The noun *president* is indiscriminately used at the office and the person level.
- We derive its meaning from the *\*preside* concept / frame / meaning.
- Assumption: For every time *t*, every organization *o*, there is at most one presidency obtaining.

Figure 4: *president*

$\text{president}_{\text{off}}(t, o) =_{\text{def}} \text{HEAD} (\text{le } (*\text{preside}(e) \wedge t \text{ in } \tau(e) \wedge \text{ORG}(e)=o)$

$\text{president}_{\text{pers}}(t, o) =_{\text{def}} \text{INC} (\text{HEAD} (\text{le } (*\text{preside}(e) \wedge t \text{ in } \tau(e) \wedge \text{ORG}(e)=o)$



### 4.3 *Presidential*

- The adjective *presidential*, in the meaning underlying its RA use, relates to the office level. It is based on the concept \**preside*;
- It appears to lack the ORG and the  $\tau$  argument.

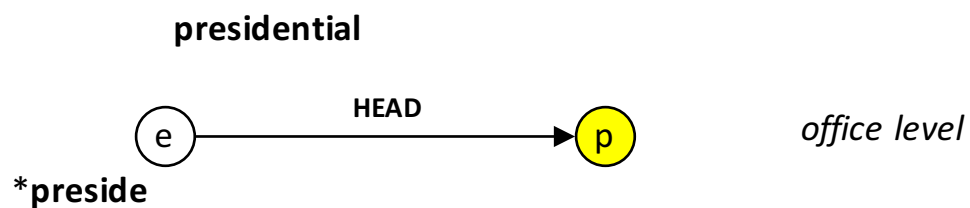


Figure 5: *presidential*

## 5. Compositional analysis

### 5.1 Possible readings for visiting-president constructions

	official reading	personal reading
(1) <i>The US president visits the Russian president.</i>	available*	available
(2) <i>Trump visits Putin.</i>	world knowledge: available	available
(3) <i>Trump visits his son.</i>	world knowledge: not available	available
(4) <i>presidential visit</i>	available	<b>not available</b>
(5) <i>the president's visit</i>	available	available
(6) <i>Präsidentenbesuch</i>	available	<b>not available</b>

#### Note

The “official” reading is also possible with arbitrary denotations of the office-holders *if supported by world knowledge* (cf. (2) and (3)).

### 5.1 Possible readings for vising-presidents constructions

### Note

- **DP internally: only the  $N_{\text{poss}}$  N variant allows for both the person reading and the office reading.**
- The  $N_{\text{poss}}$  N variant is the only one where the first **N refers**.  
N roots of denominal words do not refer.

- Compare

*presidential advisor*

**VS.**

*president's advisor*

regular advisor for official presidential matters

advisor of the president in arbitrary matters,  
including such unrelated to president's office

*presidential desk*

VS.

*president's desk*

desk for the president for his official use

desk used by the president for any purpose,  
possibly unrelated to president's office

## 5.2 General assumptions on composition

### We assume that...

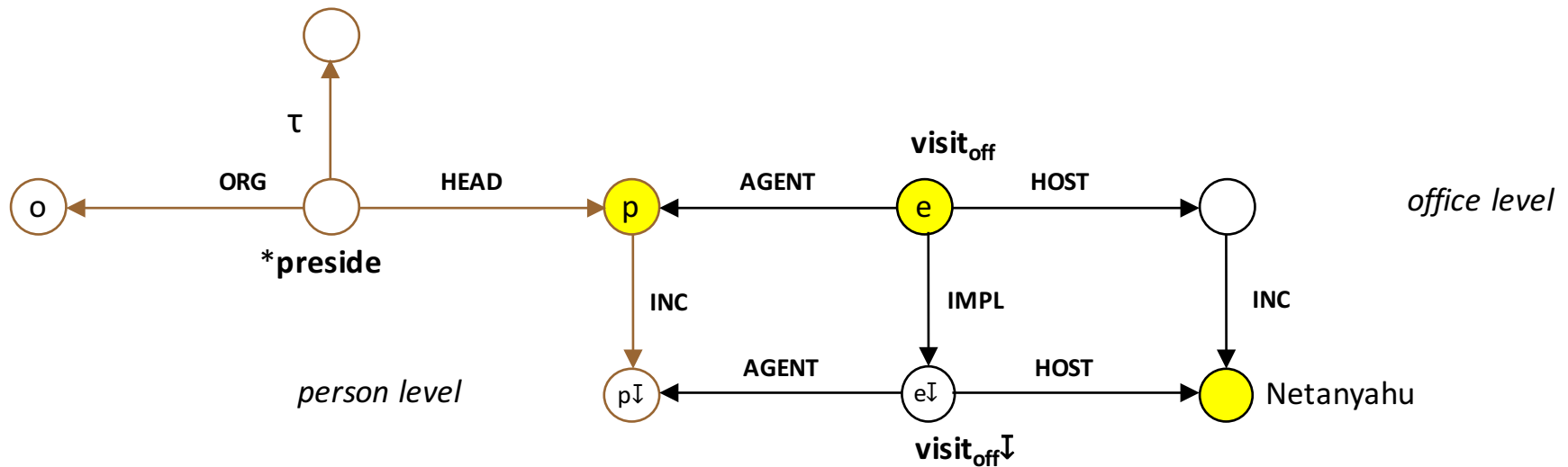
- The basic mechanism of composition is **unification**, rather than function application.
- When two meanings are unified, there may be more than one possibility for unification.  
*Composition is not necessarily deterministic.*
- Expressions with multi-level denotation lend themselves for unification at all levels involved.
- Semantic concepts are based on, and embedded in, our general ontology.
- Context knowledge may enable or prevent particular choices for unification.

### 5.3 Official visit

*The president visited Netanyahu.*

Reading 1: Official visit<sub>off</sub> by visitor in office to host in some office.

- 'visit<sub>off</sub>' requires agent and host at the office level
- **The agent node unifies with the office-level node of the 'president' frame.**
- The office of Netanyahu is left to world knowledge.
- Reference to the person of Netanyahu necessitates elaboration of the personal level.

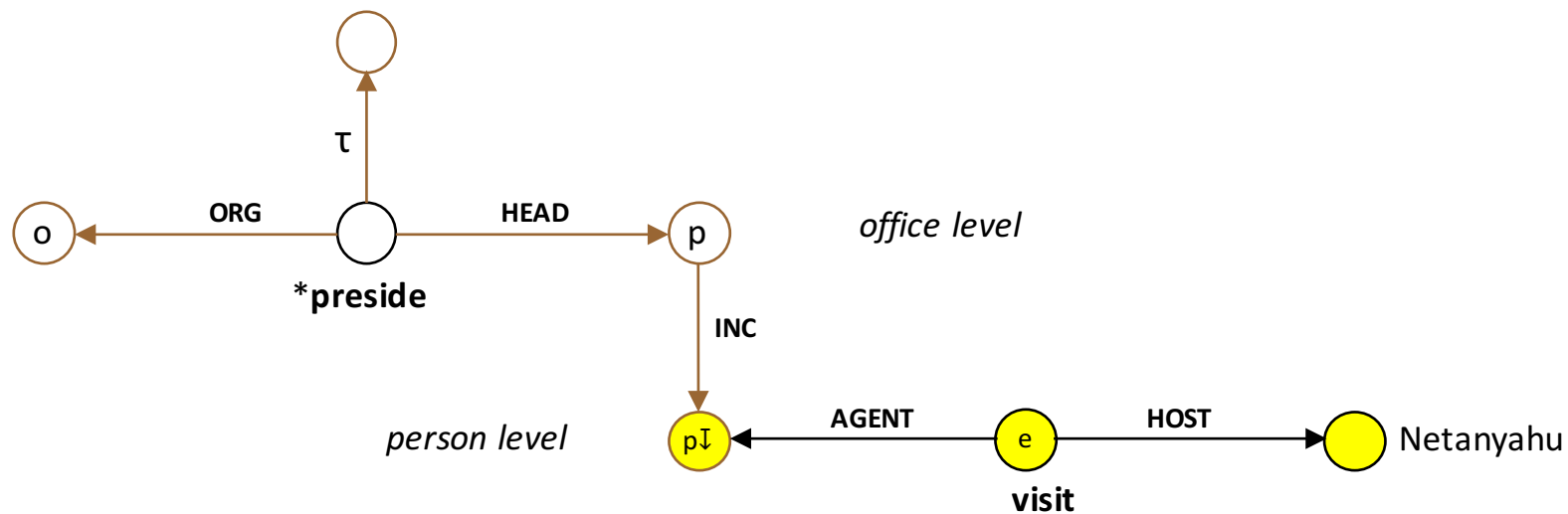


## 5.4 Personal visit

*The president visits Netanyahu.*

Reading 2: Personal visit.

- 'visit' as a verb of non-institutional personal action requires agent and host at the personal level :
- **The agent node unifies with the incumbent node of the 'president' frame.**

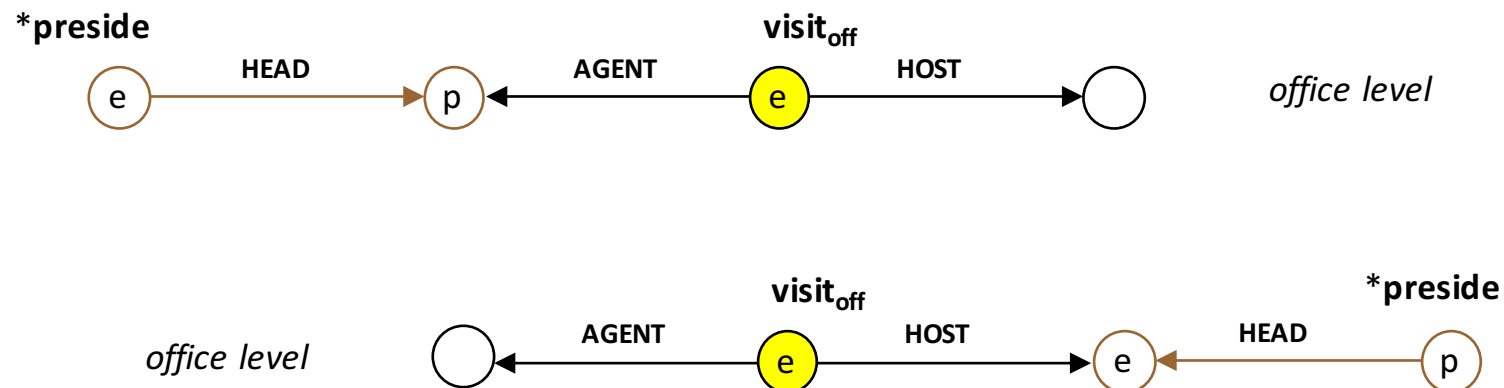


## 5.5 Presidential visit

### *presidential visit*

- The frame for *presidential* does not provide nodes at the person level.
- The only target for unification is the office-level president node.

Possible unifications: The 'president' node can unify with **either** the agent or the host node of 'visit'.

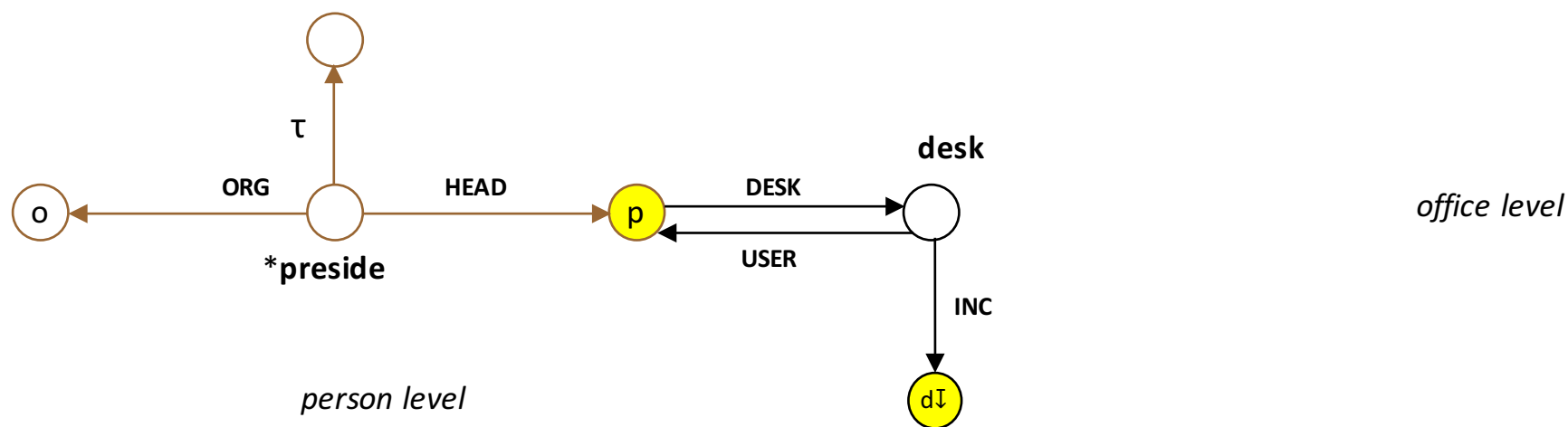


### 5.3 Presidential desk

*This is the presidential desk.*

Individuals in a role are uniquely associated with desks. **desk** node part of frame.

- Adjective only provides office level.
- Office level for *desk* must be generated.
- Unification of office level *desk* with **desk** node from *presidential*.





## 6. Conclusions

### 6.1 Social ontology

- The analysis of role-denoting adnominal adjectives requires a **rich ontology** that includes a social ontology and is able to distinguish between levels that constitute, or implement each others.
- Roles, at least some, can be derived from **events of role-incumbency** at an appropriate level in the social ontology. They are thematic roles in this type of event.
- Roles as abstract entities in the social ontology are linked by the **incumbent** relation to entities at the level of persons in the social ontology.
- The ontology level of roles and offices provides for role and **office acts** by agents at this level. These acts are level-generated (Goldman 1970) by doings of agents at lower levels.
- Reference to acts at office level necessarily requires lower level **implementary action** by the incumbent of the office.
- There is no commitment to 'kinds' or 'roles' as primitive ontological types. Kinds are not involved. Roles are thematic roles of incumbency events.

## 6.2 Compositional analysis

- A frame-based lexical semantics allows the application of **unification** as the basic mechanism of composition.
- Composition allows for **multiple readings** from the same lexical input, if unification is possible in more than one way. Thus composition is not necessarily deterministic.
- The ontology connects lexical concepts to world knowledge.
- Some lexical concepts involve more than one ontological level.
- Composition requires **level-selection** for unification.

## Thank you!

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CRC 991 Project C10

<http://www.sfb991.uni-duesseldorf.de/en/c10/>

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