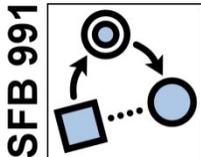


# Cascades

A fundamental structure of cognitive representations

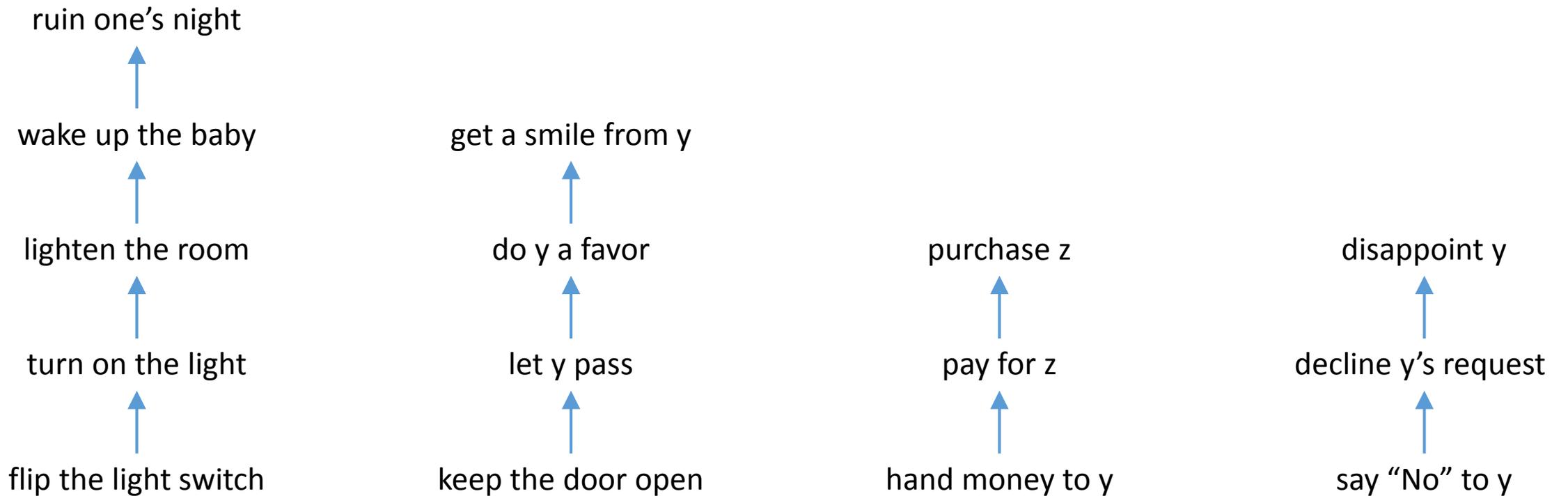
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Düsseldorf, 12 – 14 September 2018



# 1. Cascades

## 1.1 Multi-level categorization of action: examples



## 1.2 Act-tokens, act-types, act-TTs

An **act-token** is an instantiation of an **act-type**.

Example: Amy's opening the door at 2:03 p.m. is a token of the act-type 'open the door'.

An act-type can have an open number of act-tokens.

Act-tokens are located in time and space and have a particular agent.

An **act-TT** is a token  $a$  of an act-type  $A$ . Notation:  $a/A$ .

- **Act-TTs** are categorized act-tokens
- Whenever we verbally refer to an act, we refer to an act-TT:  
no reference without some kind of categorizing description
- Whenever we think of an act, we think of an act-TT.

In general 'x/Y' stands for : "entity-x-under-the-type-description-Y"

### 1.3 C-constitution

#### Definition (informal)\*

Let  $a_1/A_1$  and  $a_2/A_2$  be act-TTs with the same agent and the same action time.

Under circumstances  $C$ , an act-TT  $a_1/A_1$  **c-constitutes (“level-generates”)** an act-TT  $a_2/A_2$

$a_1/A_1$  c-const  $a_2/A_2$       or       $a_1/A_1 \hat{=} a_2/A_2$

iff under the circumstances  $C$ ,  $a_2/A_2$  is done *by* doing  $a_1/A_2$ , or *in* doing  $a_1/A_2$ .

For example: Under circumstances

$a_1/$ ‘keep the door open’  $\hat{=}$   $a_2/$ ‘let  $y$  pass’  $\hat{=}$   $a_3/$ ‘do  $y$  a favor’  $\hat{=}$   $a_4/$ ‘get a smile from  $y$ ’

$a_1/$ ‘say “No” to  $y$ ’  $\hat{=}$   $a_2/$ ‘decline  $y$ ’s request’  $\hat{=}$   $a_3/$ ‘disappoint  $y$ ’

\* Based on the notion of “level-generation” in Goldman (1970)

## 1.4 Cascades

- The relation c-const is **irreflexive**: If  $a_1/A_1 \hat{=} a_2/A_2$ , then  $a_1/A_1$  and  $a_2/A_2$  are different.
  - The relation c-const is **transitive**: If  $a_1/A_1 \hat{=} a_2/A_2$  and  $a_2/A_2 \hat{=} a_3/A_3$ , then  $a_1/A_1 \hat{=} a_3/A_3$ 
    - > *c-constitution forms chains*
    - > *several steps of c-constitution form one (larger) step*
    - > *c-constitution may be broken down into finer steps*
  - The relation c-const is **asymmetric**: If  $a_1/A_1 \hat{=} a_2/A_2$ , then *not*  $a_2/A_2 \hat{=} a_1/A_1$ .
- The relation of c-const gives rise to **tree structures**.

### Definition

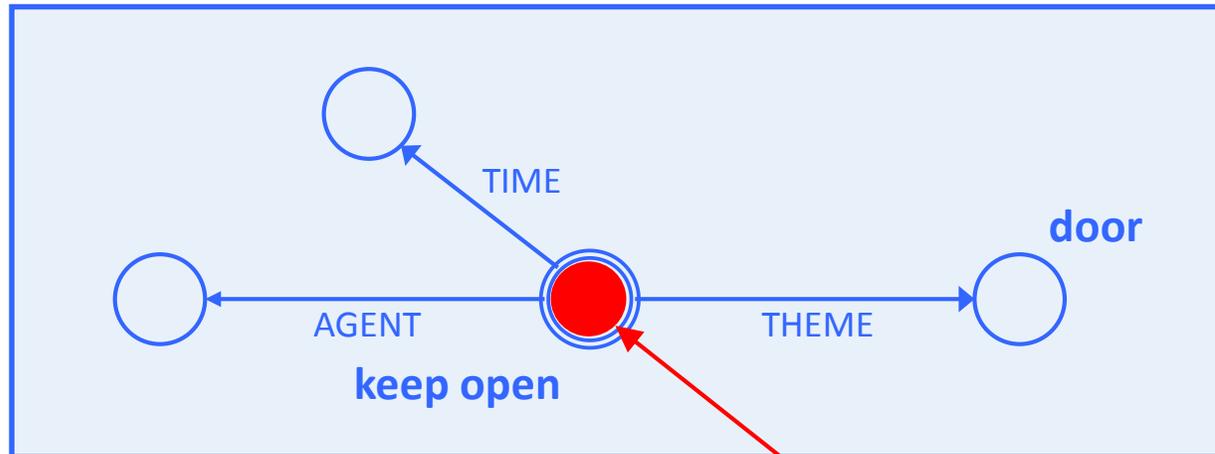
A **cascade** is an act-tree generated by c-constitution.

## 1.5 Frames

We represent act-types as frames.

- Düsseldorf Barsalou frames are representations of TTs: representations of a type (= a category) by description of a token (= a member of the category)

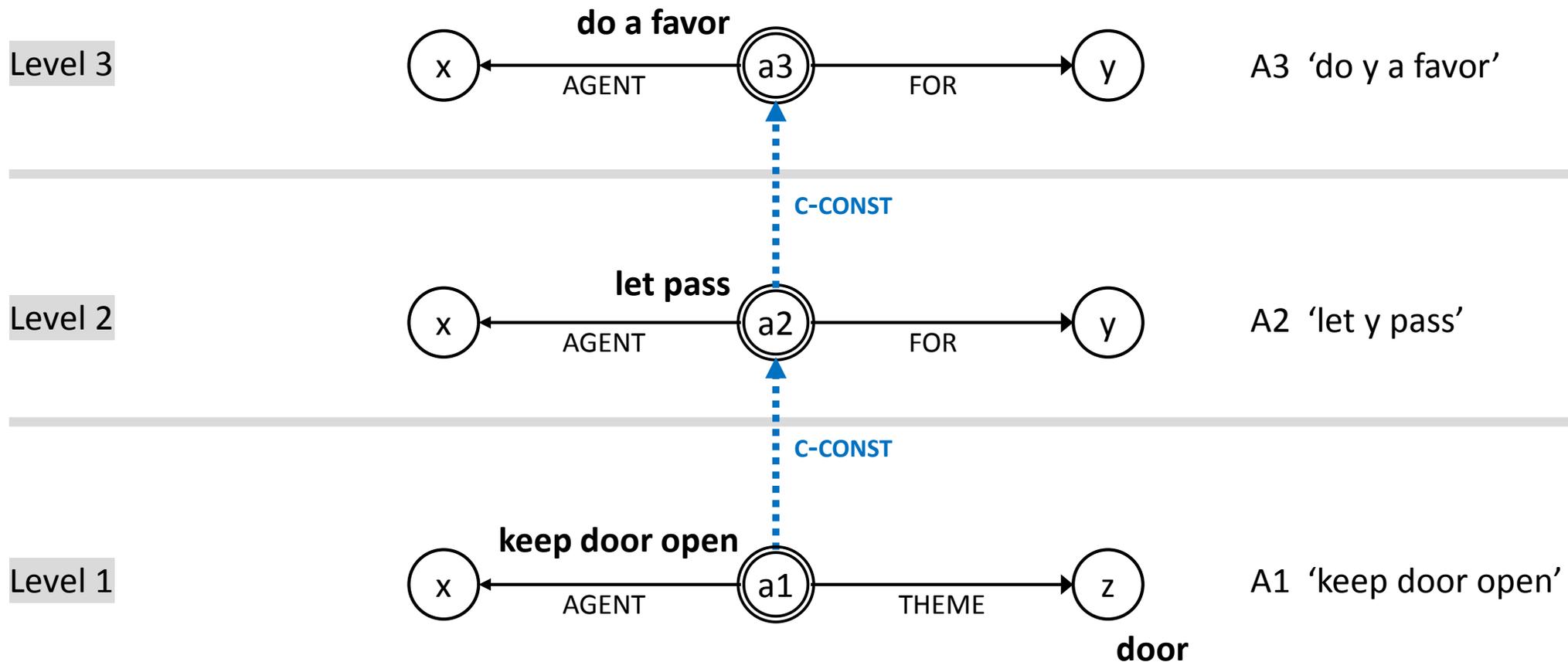
frame for the act-type 'keep a door open'



central node: act-token of the type 'keep a door open'

## 1.6 Cascades of frames

We represent cascades as trees of frames, built up by c-constitution – *a relation between frames*.



## 2. Verbs

### 2.1 Basic and non-basic act-types

#### Informal definition

An act-type  $B$  is **basic** if, under normal circumstances for the agent, for act-TTs  $b/B$ , there is no act-TT  $a/A$  such that  $a/A$  c-const  $b/B$ .

#### Remark

For all act-TTs  $a/A$ , either  $A$  is a basic act-type or there is some act-TT  $b/B$  such that  $b/B$  c-const  $a/A$  in one or more steps.

#### Examples of basic act-types (quoted from Goldman 1970)

extend one's arm  
shrug one's shoulder  
pucker one's lips

move one's finger  
open one's eyes  
wrinkle one's nose

bend one's knee  
turn one's head

## 2.2 Verb meanings, frames and cascades

- Action verbs denote act-types.
- The meaning of verbs denoting *basic act-types* are single frames representing that type of act.
- The meanings of verbs denoting *non-basic act-types* are cascade-format act concepts.

## 2.3 Basic and non-basic verbs

100 most frequent English act verbs (according to the online British National Corpus).

say go make take come give look use tell put work leave show ask try call provide keep  
hold turn bring begin follow help write run set move play pay meet lead allow carry produce  
talk offer consider suggest let sit continue add change buy speak send decide win describe  
agree build read reach open spend return draw create sell cause walk accept wait pass lie apply  
base raise increase report watch learn cover explain claim break support  
form cut reduce establish join bear achieve seek deal choose fail serve face rise kill drive  
discuss place prove argue introduce

basic, non-basic, social (according to the definitions in the Online Dictionary of English)

- Social (inter)action is necessarily level-generated by some physical behavior; the level-generation involves one or more applications of convention (Searle 1995).
- Types of social acts are what they are by virtue of social rules, i.e. by social construal. They count as what they are. Lower level acts mean that the higher acts are done.

## 2.4 Groups of non-basic verbs

- **Verbs of social interaction**

- **Verbs of causing an emotional reaction**

*shock delight surprise disappoint frustrate ....*

Shocking etc. is done *by* doing something more concrete to the experiencer of the emotion (more generally: accomplishment verbs in Dowty 1979)

- **Verbs of evaluated action**

*break the law help lie make a mistake*

There is an underlying more concrete action that c-constitutes the evaluated action (Sæbø 2008, 2016 on “criterion predicates”).

- **Speech act verbs**

*ask reply beg promise warn announce*

(Austin 1962)

## 2.5 Lexical and grammatical cases of level-generation in verb semantics

### Adding a level of social interaction

(1) basic: 'wink' ↑ social: 'wink at'

(2) Japanese

*dōa o ake-ru*  
 door ACC open-PRES  
 "open the door"  
 'open' ↑ 'do a favor'

social: *dōa o ake- te age- ru*  
 door ACC open give ↗ PRES  
 "open the door as a favor"

(3) French

*ouvre ta porte*  
 open your door  
 "open your door"  
 'open' ↑ 'do a favor'

social: *ouvre- moi ta porte*  
 open 1s your door  
 "open your door for me"

## 2.5 Lexical and grammatical cases of level-generation in verb semantics

### Adding a level of achieving a result

(4) German verbs of killing

'er-würgen' = 'würgen' ↑ 'töten'  
"choke to death" "choke" "kill"

(5) English resultative constructions

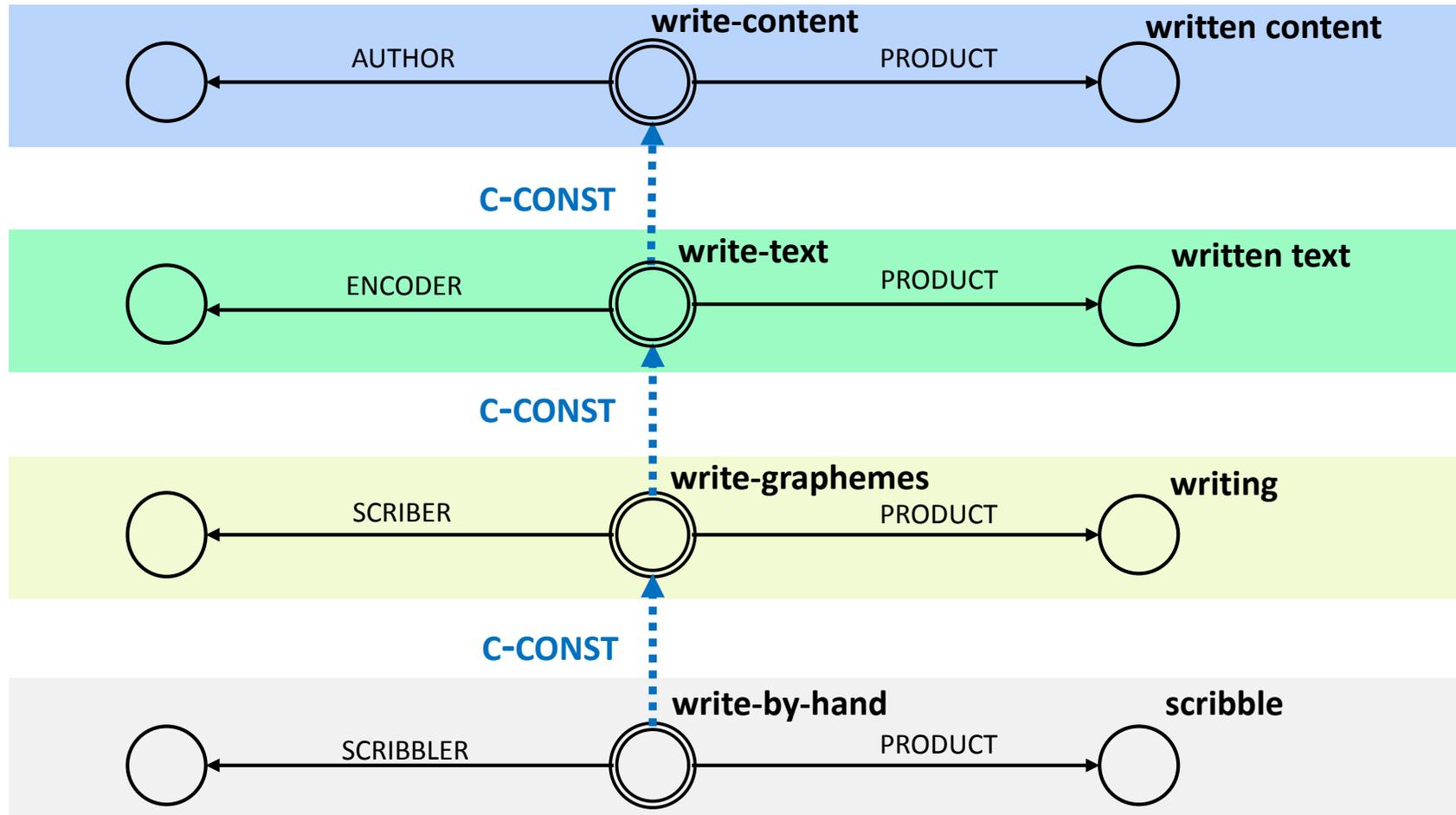
'hammer flat' = 'hammer' ↑ 'flatten'

## 2.5 Lexical and grammatical cases of level-generation in verb semantics

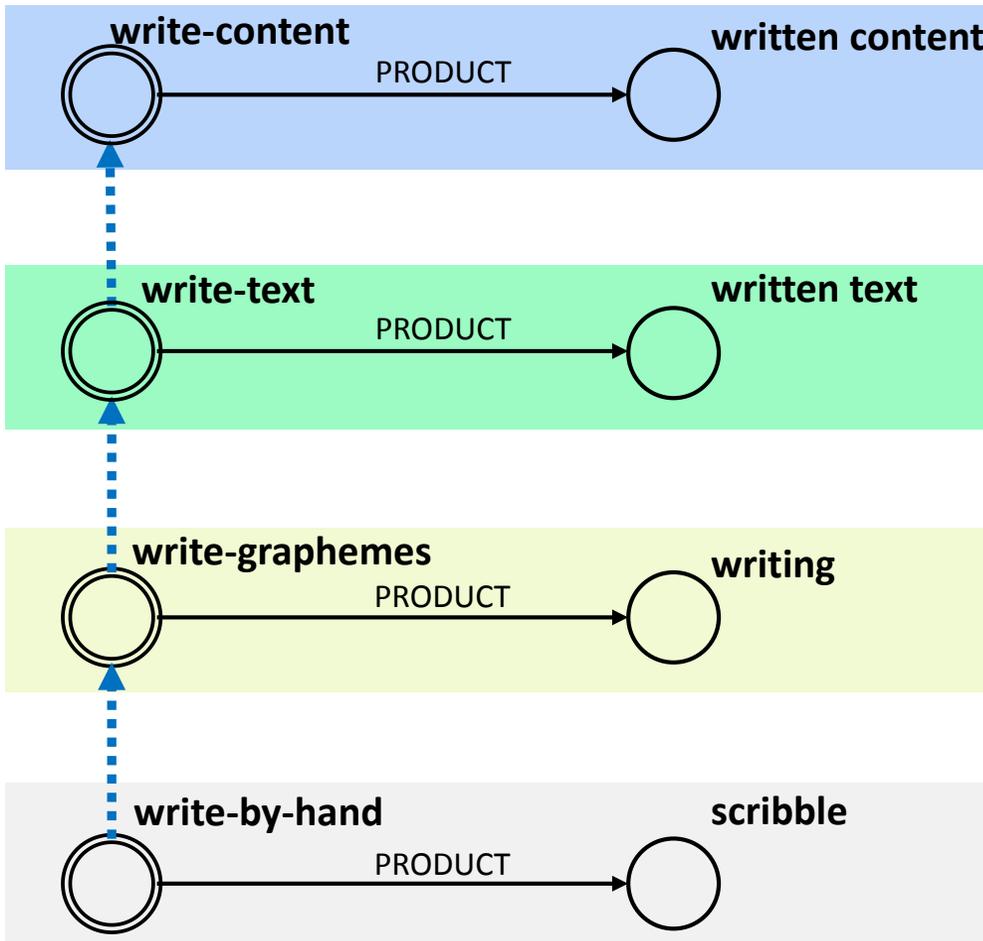
### Adding a level of evaluation or appraisal

- (6) German “erratic” verbs of doing something with the wrong outcome  
 ‘**sich ver-wählen**’ = ‘wählen’ ↑ ‘**fail**’  
 “dial wrong”                      “dial”
- (7) Mandarin *wán* 玩 “play” constructions for doing something for pleasure  
 ‘*Wǒ xiàwǔ chūqù hé péngyǒu guàngjiē wán ne*’  
 I      afternoon go.out with friend go.shopping play PRT  
 “I go out shopping with my friend for fun.”  
 ‘go shopping’ ↑ ‘**have fun**’
- (8) German adverbs of the form ADJ-*erweise* : add ‘do sth. ADJ’  
 for example ‘*dumm-erweise*’ (from *dumm* = ‘stupid’)  
 ‘**dummerweise antworten**’ = ‘reply’ ↑ ‘**do something stupid**’

## 2.6 The cascade for 'write'



### 3. Semantics: consequences of the multi-level approach



write a reply

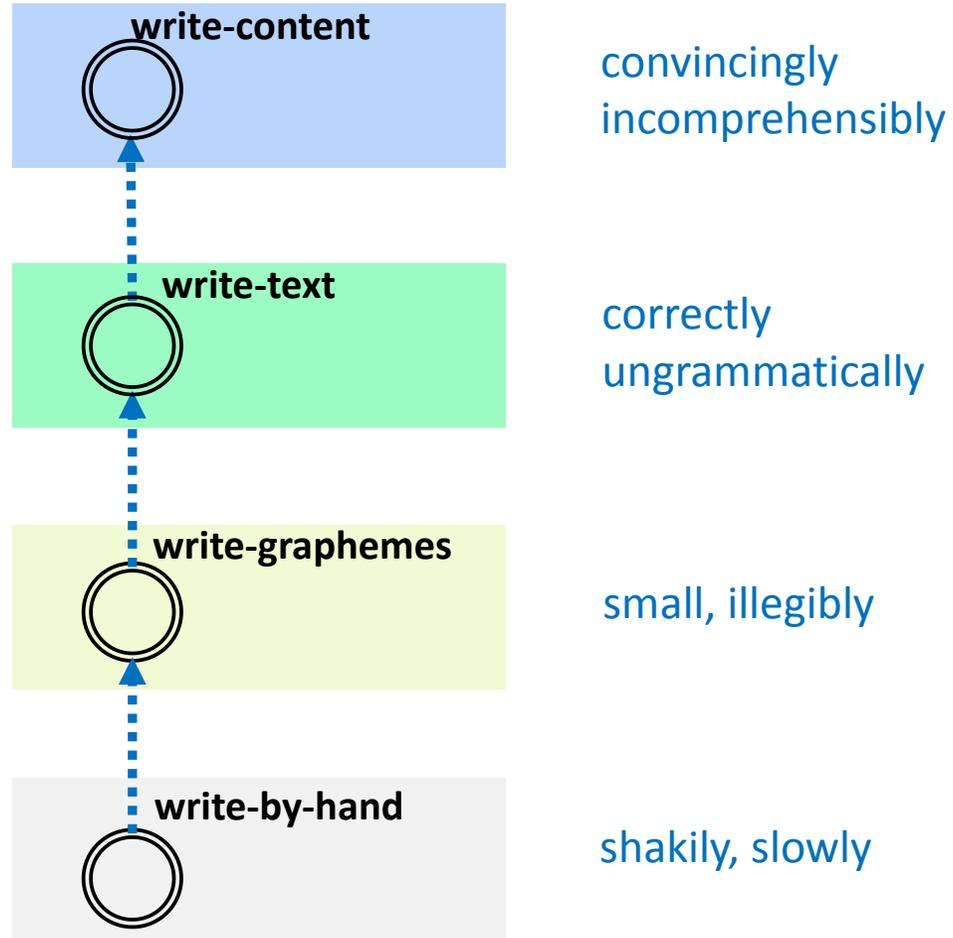
write a paragraph

write 'mama'

write whorls

#### 3.1 Argument specification

- Argument specification **selects the level** where it saturates an argument of the verb.  
*Note that at different levels, arguments may be of different ontological type.*
- Saturation at a higher level constrains the argument types at the lower levels.
- Most object specifications are level-selective.



### 3.2 Modification

- Modifiers **select a level** of the cascade as the target of modification.
- Most modifiers are level-selective.
- Some modifiers are not selective. For example, for a verb of incremental production, like *write*, *slowly* and *quickly* may apply at any level.

### 3.3 Agent specification

Deviating from Goldman's notion of act-trees, we may observe:  
The agents involved in writing are not necessarily the same person.

We may assume that the agent roles in a cascade can be **delegated** down from the content level agent. (Cf. the notion of "footing" in Goffman 1979)

	script	text	content		role
D T writes a letter to Putin	–	–	+		principal
X writes a letter to Putin	–	+	–	ghostwriter	encoder
Y writes a letter to Putin	+	–	–	typist	scriber

### 3.4 Reference

- The levels selected by the argument specifications, modifiers, and other adjuncts may not be the same.
- Statements about the writing of somebody may relate to several levels simultaneously.

*My grandmother used to write her personal letters on her typewriter.*

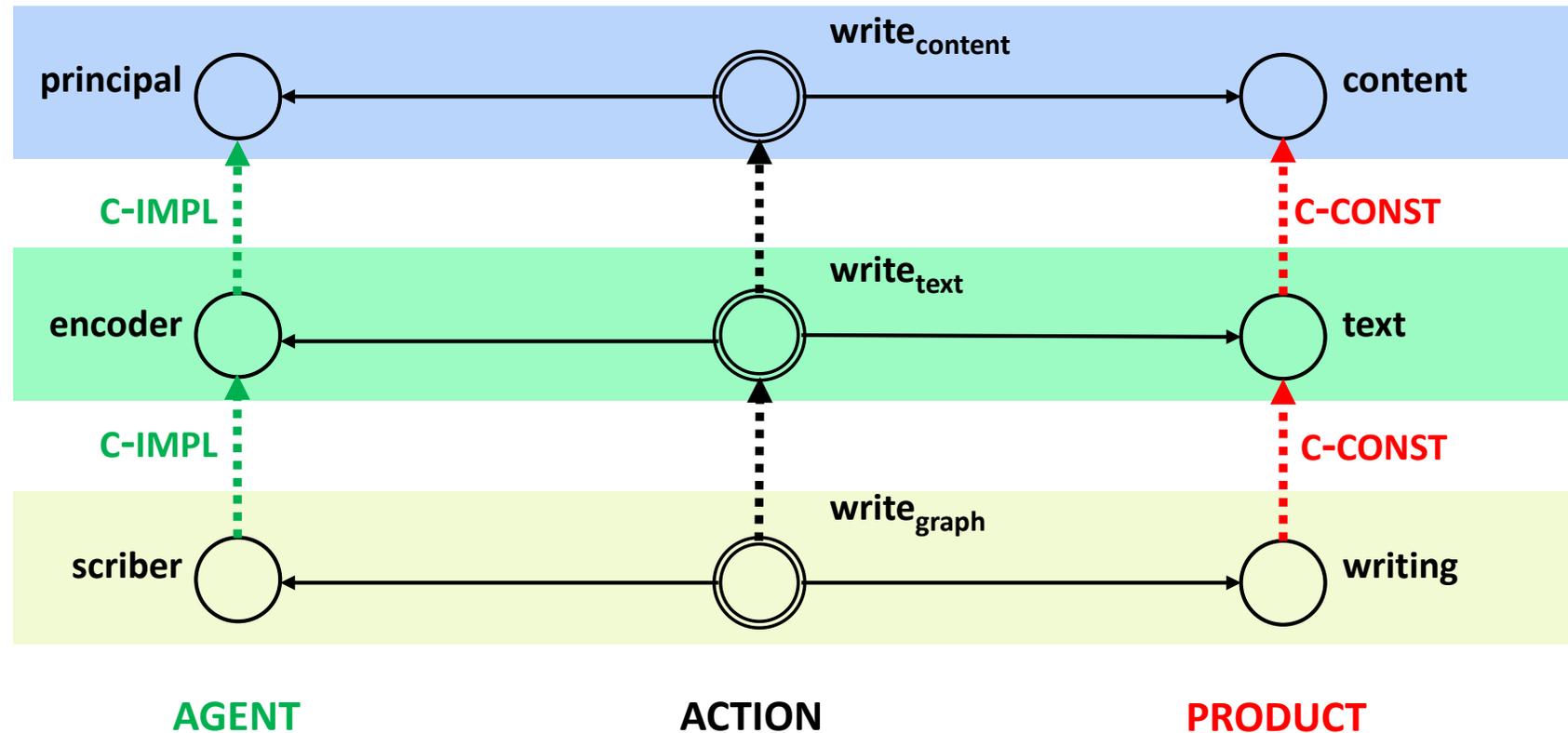
- **Reference is to all cascade levels simultaneously because all that happens in one.**  
The lower levels are conceptually necessary for the higher levels referred to to exist.

### **3.5 Semantic composition**

- The level selected is not determined by grammar, possibly not even constrained. Level selection appears to be a purely semantic/conceptual affair.
- Composition is not deterministic; there may be more than one level available for selection.
- A verb cascade may be enriched from context if levels are addressed in composition that are not specified in the lexical entry.

## 4. Beyond acts

### 4.1 C-constitution as a multi-track relation between act frames



## 4.2 Roles of agents and c-implementation

If  $a1/A1$  c-constitutes  $a2/A2$ , then  
the agent of  $a1/A1$  **c-implements** the agent of  $a2/A2$ .

**Roles** are argument roles in event types, such as AGENT, PATIENT, BENEFICIARY.

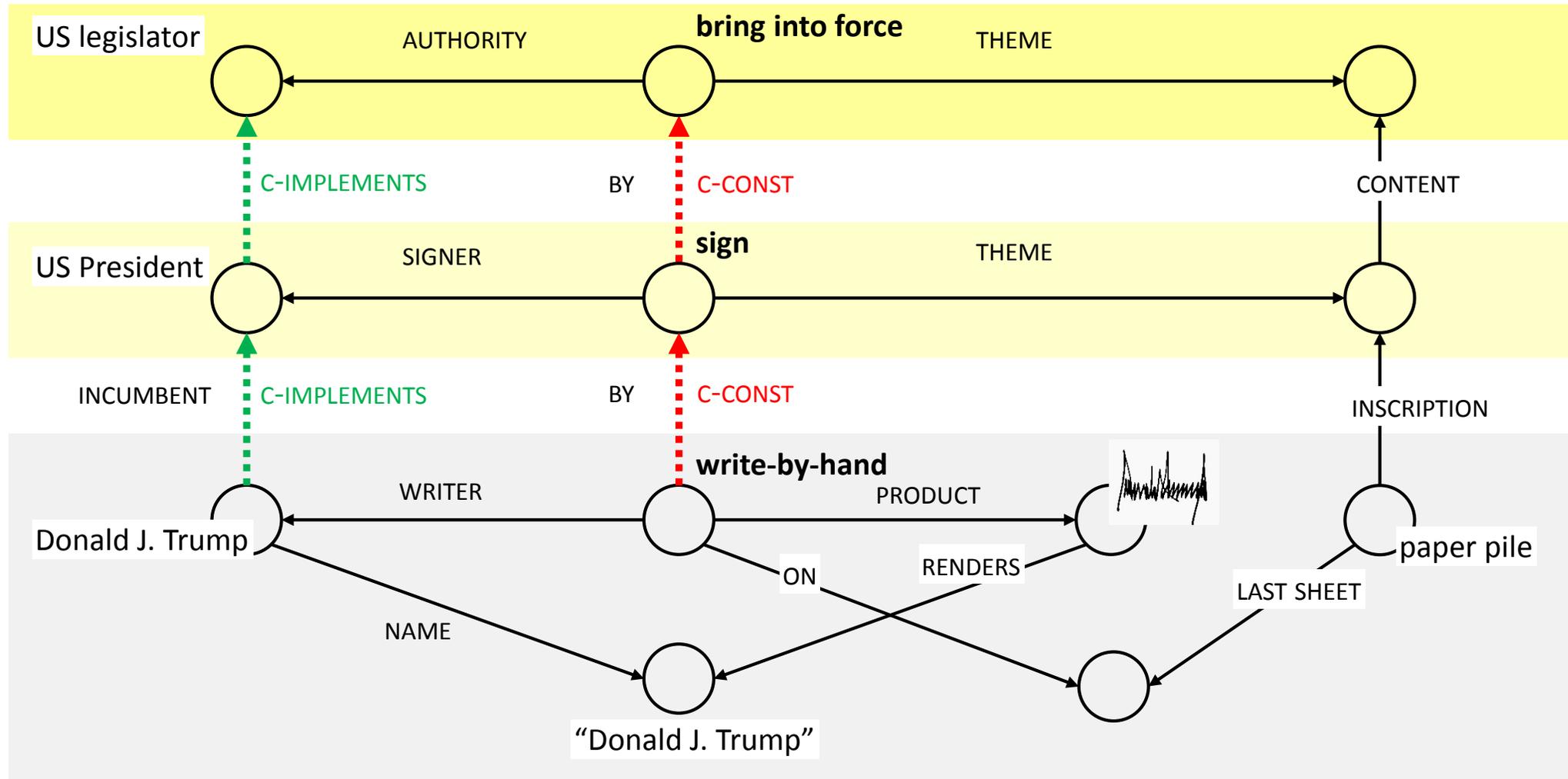
For example: Carl = AGENT( $a3/'write_{\text{text}}$  the speech')

Joey = AGENT( $a4/'wake up the baby'$ )

Sam = BENEFICIARY( $a3/'do y a favour'$ )

A person in a role is a “slash” entity like act-TTs: Carl/AGENT(a/A) etc.  
The component following the slash is a type description of the person.

### 4.3 Example: D.T. signs an executive order



#### 4.4 Roles of objects and (extended) c-implementation

Let  $a_1/A_1$  c-constitutes  $a_2/A_2$ . Let  $x_1$  and  $x_2$  are arguments in the same general role, of  $a_1$  and  $a_2$ , respectively, then  $x_1$  in  $a_1/A_1$  **c-constitutes**  $x_2$  in  $a_2/A_2$ .

For example: The graphemes produced at Level 2 of writing under circumstances constitute text.

The text produced at Level 3 of writing under circumstances constitutes content.

“ $x$  in semantic role  $R$  in  $e/E$ ” is an object-under-description:  $x/R(e/E)$

## 4.5 Why cascades matters

For action categorization

- Level-generation takes the act categorization into a **different context**
  - without that step, the act wouldn't play a role in that context.  
The higher-level contexts are the really relevant ones.
- Level-generation invests the act with additional **meaning** (for us) in that context, including social meaning and personal or social appraisal
  - without that step, the act wouldn't matter for us.
- Level-generation takes the act categorization to a level of “**abstractness**” that is necessary for reasoning and understanding of our world.

The analogue holds for the categorization of persons and objects in their varying roles.

## 4.6 Cascades in cognition and ontology

### ➤ **Hypothesis**

Whatever we categorize **we categorize at potentially more than one cascade level.**

- The bits and pieces of what is **reality to us** as human cognitive individuals always matter in many different contexts.
- There may be **macro-levels** across action and role concepts, such as
  - the personal level of individual appraisal;
  - levels of social interactions, relationships, and institutions;
  - levels of abstract reasoning

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## More talks relating to cascades

Ekaterina Gabrovskaja & Wilhelm Geuder

[Acting intentionally in Frames](#)

today, 10:30 here

Wilhelm Geuder

[The inside and outside of event concepts:  
“Mental” adverbs and “agentive” adverbs](#)

today, 11:15 here

Tobias Kalenscher, S. Löbner, Lisa-Maria Schönfeld

[Rat ultrasonic vocalizations as social reinforcers –  
implications for a multilevel model of the cognitive  
representation of action and the social world of rats](#)

today: 12:00 Lecture Hall 5H