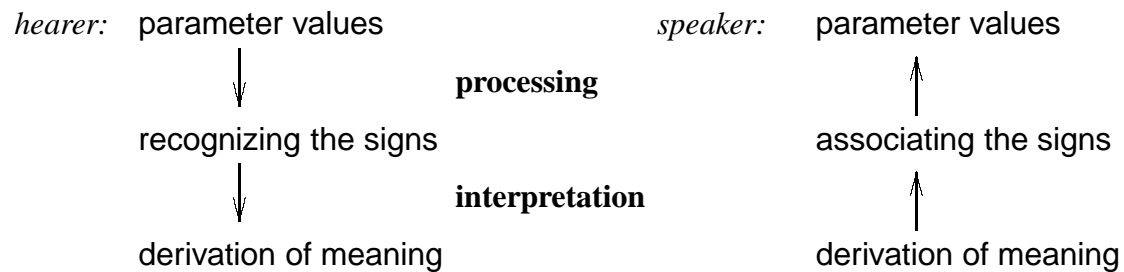


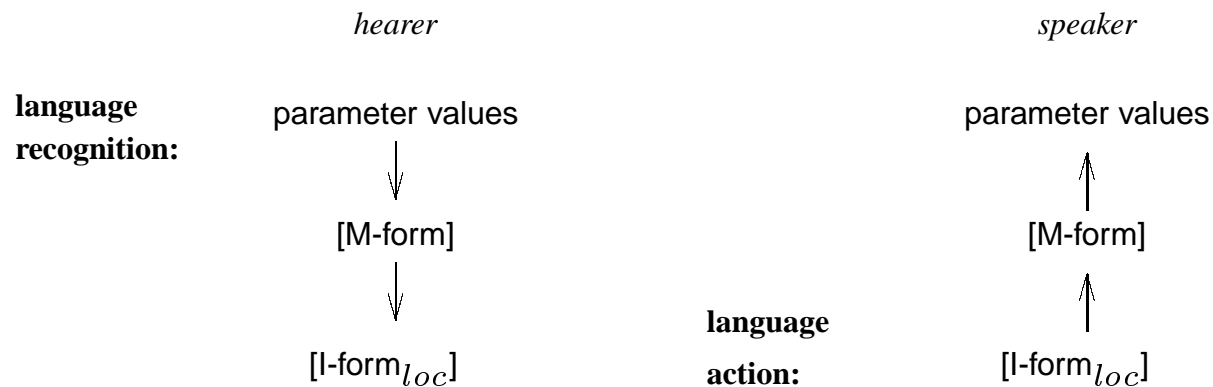
## 4. Language communication

### 4.1 Adding language

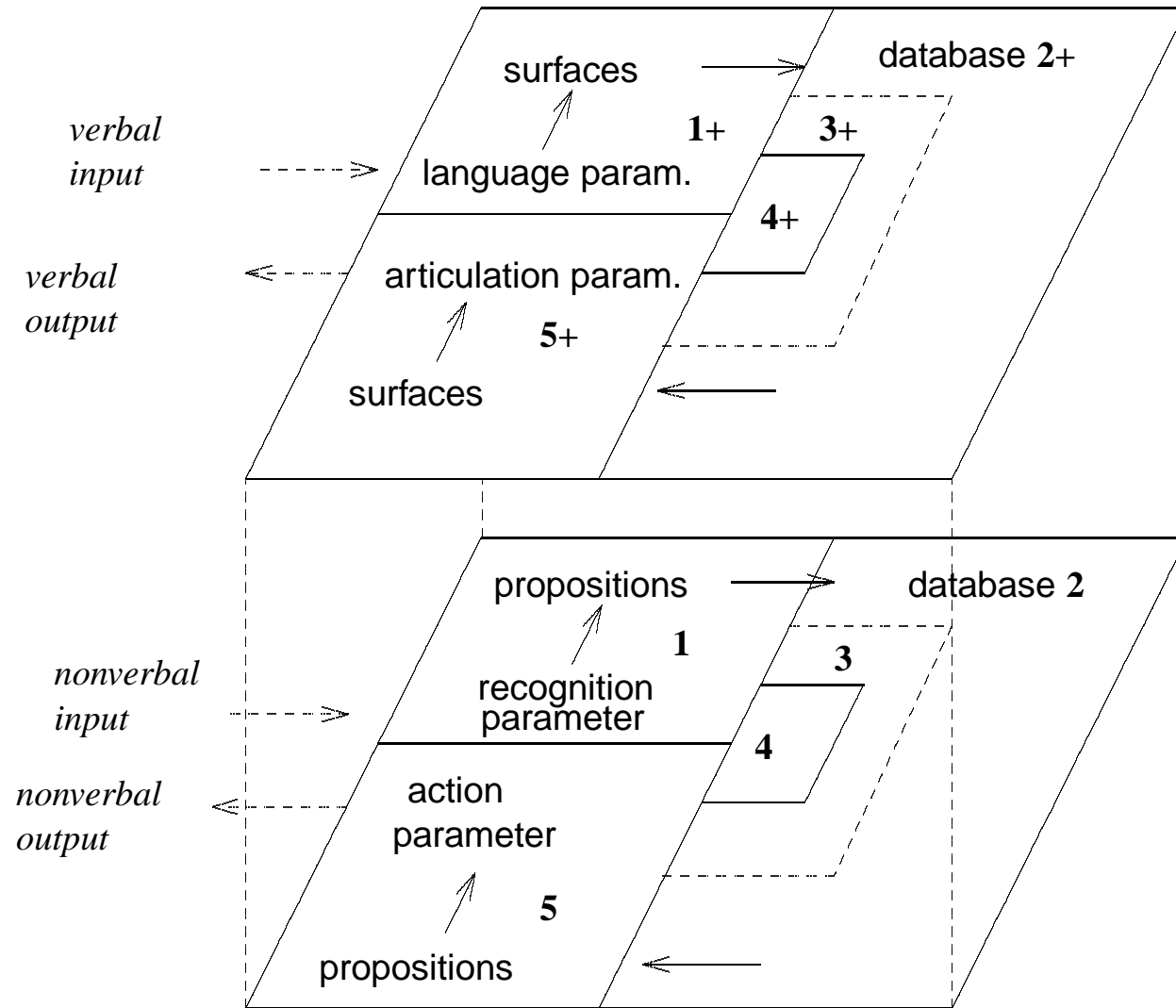
#### 4.1.1 Two subprocedures of language use



#### 4.1.2 Processing signs of language

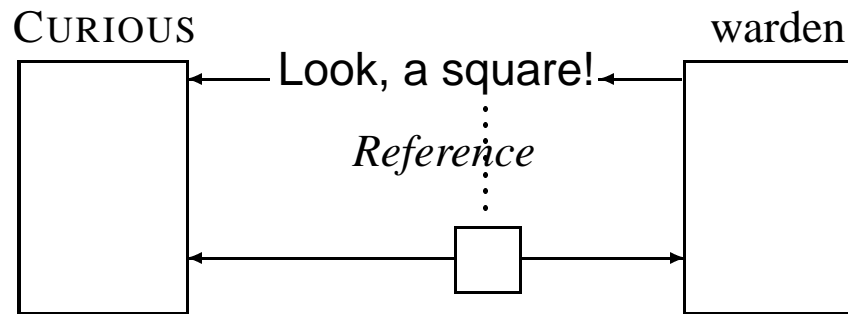


### 4.1.3 Expanded structure of CURIOUS

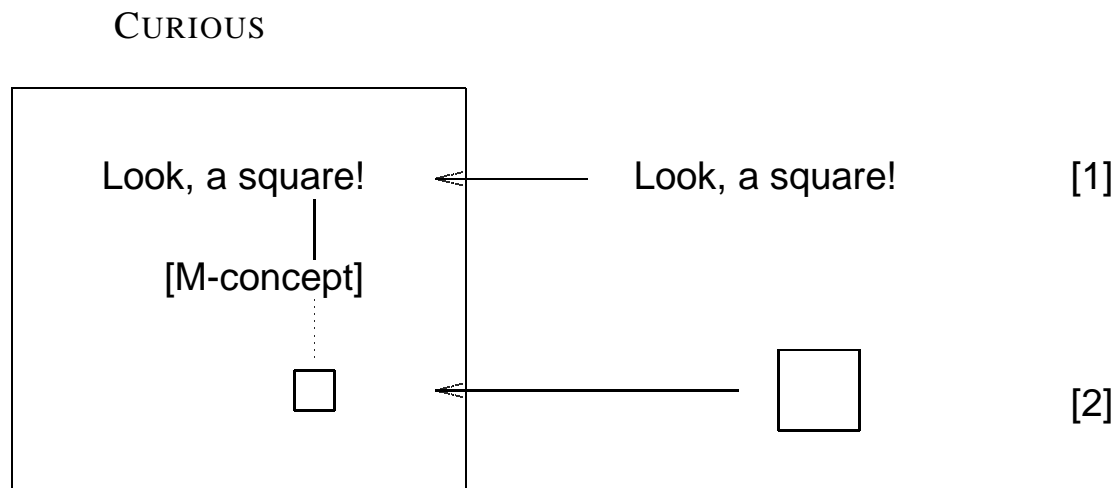


## 4.2 Modeling reference

### 4.2.1 An external view of reference



### 4.2.2 Internal and external aspects of reference





## 4.3 Using literal meaning

### 4.3.1 Immediate and mediated reference

- *Immediate reference* is the speaker's or the hearer's reference to objects in the current task environment.
- *Mediated reference* is the speaker's or hearer's reference to objects which are not in the current task environment.

### 4.3.2 Two notions of meaning

- $\text{meaning}_1$  = property of signs, also called literal meaning
- $\text{meaning}_2$  = property of utterances, also called speaker meaning

### 4.3.3 First principle of pragmatics (PoP-1)

The speaker's utterance  $\text{meaning}_2$  is the use of the sign's literal  $\text{meaning}_1$  relative to an internal context.

## 4.4 Frege's principle

### 4.4.1 Frege's principle

The meaning of a complex expression is a function of the meaning of the parts and their mode of composition.

### 4.4.2 Different parts

- a. The dog bites the *man*
- b. The dog bites the *bone*

### 4.4.3 Different composition

- a. The *dog* bites the *man*
- a'. The *man* bites the *dog*

#### 4.4.4 Standard interpretation of Frege's principle

surface:	<b>a</b>	=	<b>a</b>		<b>a</b>	≠	<b>b</b>
	⋮		⋮		⋮		⋮
meaning <sub>1</sub> :	<b>A</b>	=	<b>A</b>		<b>A</b>	≠	<b>B</b>

#### 4.4.5 Syntactic ambiguity

They don't know how good meat tastes

#### 4.4.6 Paraphrase

The dog bit the man (active)

The man was bitten by the dog (passive)

### 4.4.7 Apparent exceptions (incorrect analysis)

	ambiguity	paraphrase
surface:	$a = a$	$a \neq b$
	⋮            ⋮	⋮            ⋮
meaning <sub>1</sub> :	$A \neq A'$	$A = B$

### 4.4.8 Syntactic ambiguity (correct analysis)

unanalyzed surface:	$a = a$	
analyzed surface:	$a \neq a'$	} scope of the Fregean principle
	⋮            ⋮	
meaning <sub>1</sub> :	$A \neq A'$	

### 4.4.9 Syntactic paraphrase

	<i>incorrect</i>	<i>correct</i>
surface:	$2 + 4 \neq 3 + 3$	$2 + 4 \neq 3 + 3$
	⋮            ⋮	⋮            ⋮
meaning <sub>1</sub> :	$6 = 6$	$2' + 4' \sim 3' + 3'$
	<b>identity</b>	<b>equivalence</b>



## 4.5 Surface compositionality

In its standard interpretation, Frege's principle corresponds to the principle of surface compositionality.

### 4.5.1 Surface compositionality I (SC-I principle)

An analysis of natural language is surface compositional if it uses only concrete word forms as the building blocks such that all syntactic and semantic properties of complex expression derive systematically from the syntactic category and the meaning<sub>1</sub> of their building blocks.

### 4.5.2 Consequences of surface compositionality

- Methodologically:  
Syntactic analyses are *concrete* because no kind of zero surface or underlying form may be used,
- Mathematically:  
Syntactic and semantic analyses may be of *low complexity*
- Functionally:  
The internal matching between meaning<sub>1</sub> and context may be extended from single words to the systematic syntactic-semantic *combination* of expressions.

## *Violating surface compositionality:* EXAMPLE I

### 4.5.3 Linguistic generalizations with transformational grammar

Transformations are supposed to be innate, yet have no function in communication.

### 4.5.4 Examples of ‘classical’ transformations

DEEP STRUCTURE:

SURFACE STRUCTURE:

*Passive:*

Peter closed the door

⇒ The door was closed by Peter

*Do-support:*

Peter not open the door

⇒ Peter didn't open the door

*Reflexivization*

Peter<sub>i</sub> shaves Peter<sub>i</sub>

⇒ Peter shaves himself

*There-insertion*

A hedgehog is in the garden

⇒ There is a hedgehog in the garden

*Pronominalization*

Peter<sub>i</sub> said that Peter<sub>i</sub> was tired      ⇒ Peter said that he was tired

*Relative clause formation*

Peter [Peter was tired]      ⇒ Peter, who was tired

*Main clause order in German*

Peter die Tür geschlossen hat      ⇒ Peter hat die Tür geschlossen

*Object raising*

Peter persuaded Jim [Jim sleeps]      ⇒ Peter persuaded Jim to sleep

*Subject-raising*

Peter promised Jim [Peter sleeps]      ⇒ Peter promised Jim to sleep

**4.5.5 Transformations and the standard interpretation of Frege's Principle**

For a while, transformational grammar assumed the equivalence of

*active*    Everyone in this room speaks at least two languages

*passive*    At least two languages are spoken by everyone in this room

### **4.5.6 Transformations and Darwin's law: Form follows function**

The structure of, e.g., a duck foot is innate. Good science should explain its form in terms of its function. The same holds for innate cognitive structures, e.g., the language ability.

### **4.5.7 Cognitive variant of Occam's razor**

Entities or components of grammar should not be postulated as innate if they have no clearly defined function within natural communication.

### **4.5.8 Applications of the cognitive razor**

The cognitive razor applies to transformational grammar as well as all later variants of nativism including LFG, GPSG, and HPSG. Like transformational grammar, their linguistic generalizations are nonfunctional with respect to communication and inherently in violation of surface compositionality.

## *Violating surface compositionality:* EXAMPLE II

### **4.5.9 Definition of meaning by Grice**

Definiendum: U meant something by uttering x.

Definiens: For some audience A, U intends his utterance of x to produce in A some effect (response) E, by means of A's recognition of the intention.

### **4.5.10 Explaining the evolution of language**

Grice defines sentence meaning as an utterance type and utterance meaning as a token of this utterance type.

Problem:

How can a type evolve if it is already presupposed by the first utterance meaning?

### **4.5.11 Conflicting uses of convention**

Literal use: Conveying intentions by obeying conventions

Metaphoric use: Conveying intentions by violating conventions

### 4.5.12 Elementary notions suitable for computational implementation?

Recognition of an intention, producing some effect, intending for some audience...

### 4.5.13 Successful man-machine communication

L = a natural language, SH = a human speaker-hearer of L, CA = a cognitive agent.

- *Successful natural language interpretation*

CA communicates successfully in the hearer mode, if CA understands the L-utterance in the way intended by SH. In technical terms this means that CA correctly recreates the speaker meaning of the L-utterance in its database. The developers of CA can verify the procedure because (i) they themselves can understand the utterance in L and (ii) they can view the interpretation directly in the database of CA.

- *Successful natural language production*

CA communicates successfully in the speaker mode, if CA formulates its intentions in L in a way that SH can understand. This requires technically that CA maps a certain structure in its database into an L-utterance which SH can correctly reconstruct. The developers of CA can verify the procedure because (i) they have direct access to the database structure to be communicated and (ii) they themselves can understand the utterance in L.