

Lambda: the ultimate syntax-semantics interface

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Human concepts





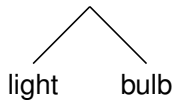
Line up representations and what they represent



Multiple compositional interpretations

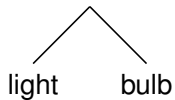


Multiple compositional interpretations

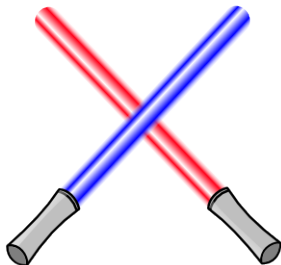


```
object {sphere ...  
  interior {media {emission <.4,.3,.2>}}}  
object {cylinder ...}
```

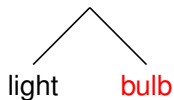
Multiple compositional interpretations



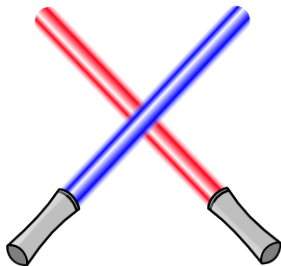
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  interior {media {emission <.4,.3,.2>}}}  
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Multiple compositional interpretations

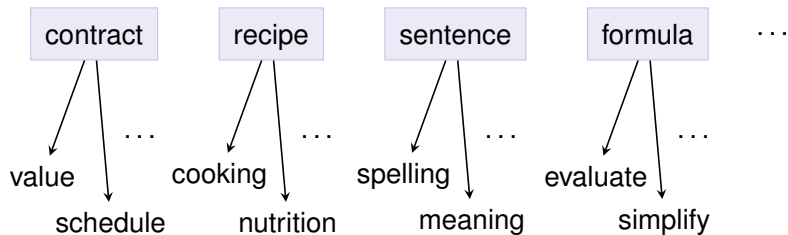


```
object {sphere ...
  interior {media {emission <.4,.3,.2>}}
object {cylinder ...}
```

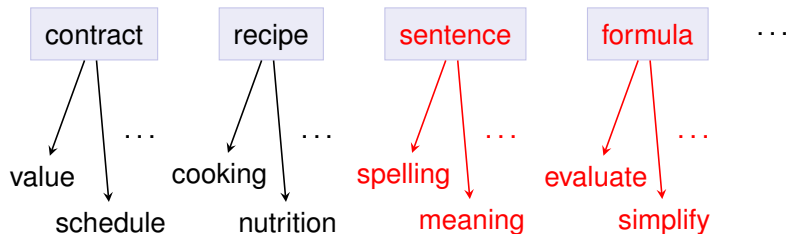


```
object {cone ...
  interior {media {emission <.4,.3,.2>}}
object {sphere ...
  interior {media {emission <.4,.3,.2>}}
object {cylinder ...}
```


Interpretations are everywhere



Interpretations are everywhere



We taught linguists and programmers at conferences and schools

The will Collaborative tasks for mutual acculturation

The way Modular, higher-order programming languages

Montague grammar fragments

“I reject the contention that an important theoretical difference exists between formal and natural languages . . .

I regard the construction of a theory of truth—or rather, of the more general notion of truth under an interpretation—as the basic goal of serious syntax and semantics.”

—Richard Montague, “English as a Formal Language” (1970)

Montague grammar fragments

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$S ::= NP VP \quad \llbracket S \rrbracket = \llbracket VP \rrbracket (\llbracket NP \rrbracket)$

$VP ::= TV NP \quad \llbracket VP \rrbracket = \llbracket TV \rrbracket (\llbracket NP \rrbracket)$

$NP ::= \text{John} \quad \llbracket NP \rrbracket = j$

$NP ::= \text{Mary} \quad \llbracket NP \rrbracket = m$

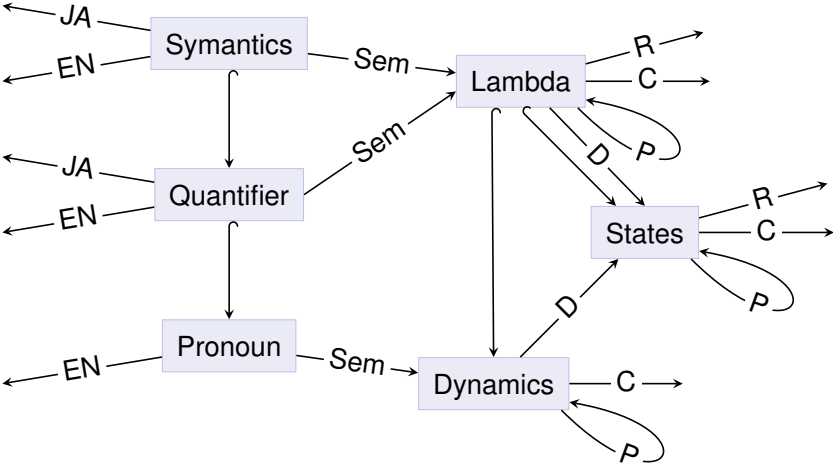
$TV ::= \text{likes} \quad \llbracket TV \rrbracket = (o \mapsto (s \mapsto (s, o) \in \{(j, m), (m, j), \dots\}))$

Calculus.

Understanding type classes

	class	instance
math	signature	model
linguistics	language	interpretation
computer science	interface	implementation

Map



Domain-specific languages for collaboration

Multiple communities. Multiple interpretations.

The will Calculemus: automation, application, understanding

The way Expressions abstract over interpretations,
rather than the other way around

Potential exchanges: quotation, types, pragmatics

Other domains:

- ▶ Probability distributions
- ▶ Braid drawings
- ▶ Context-free grammars
- ▶ Optimized code generators
- ▶ Geometric objects

Let's talk!