Lexical representations in theories of word reading

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Overview

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   a. The mental lexicon
   b. The naive reader
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4. The BIA+ model

Color legend

- ENGLISH
- DUTCH
- FRENCH

Word reading

Some effects

Most word reading is studied through *priming studies*

Words which are preceded with something related are read faster.

- **Orthographic :** Bear – Beer
- **Phonological :** Fine – Wine   (Rhyme)
- **Semantics   :** Chair – Couch

Some effects

Also works across languages

- **Orthographic** : Poison – Poisson
- **Phonological** : Feats - Fiets   (Homophony)
- **Semantics**   : Desk   - Bureau
- **Cognates**   : Wolf   - Wolf   (Superfacilitation)

The cognate effect is unique for bilinguals

Opposite effects

Ambiguity causes inhibition:

- **Room :** English or Dutch?
- **Lead :** Verb or Noun?
- **Spin :** Animal or action?

Word reading

Common sense definition: The translation of groups of letters into meaning.

Word reading

Common sense definition: The translation of groups of letters into meaning.

D+O+G   -> **Dog**   -> Animal, Four legs, Loud

The Dictionary Metaphor

Mental Lexicon

"The **mental lexicon** is defined as a **mental** dictionary that contains information regarding a word's meaning, pronunciation, syntactic characteristics, and so on."

- Words are looked up in the "dictionary", which "releases" the information in the entry.
- The orthography is the "key", all other information is part of the entry.

Mental Lexicon

The mental lexicon is often used as a theoretical construct in psycholinguistic experiments

- Words are often described as being retrieved and stored.
- The orthography of the word is often implicitly construed as the *key* of a dictionary -> **Primacy of Orthography**
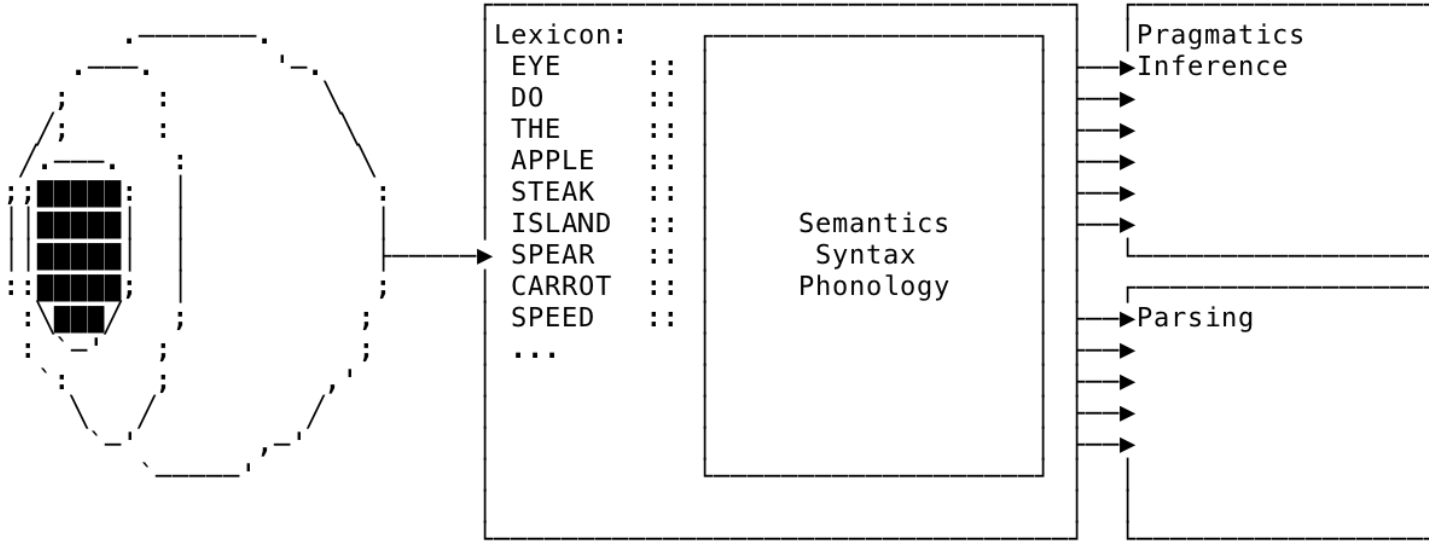

- **The orthography of a word *is* the word**

Computers and dictionaries

The dictionary metaphor naturally leads to a computer
metaphor, with a memory bank, and key-value pairs.

The naive reader

In the naive reader, word reading is feed-forward computation


```
Lexicon:
 EYE     ::
 DO      ::
 THE     ::
 APPLE   ::
 STEAK   ::
 ISLAND  ::         Semantics
 SPEAR   ::          Syntax
 CARROT  ::         Phonology
 SPEED   ::
 ...
```
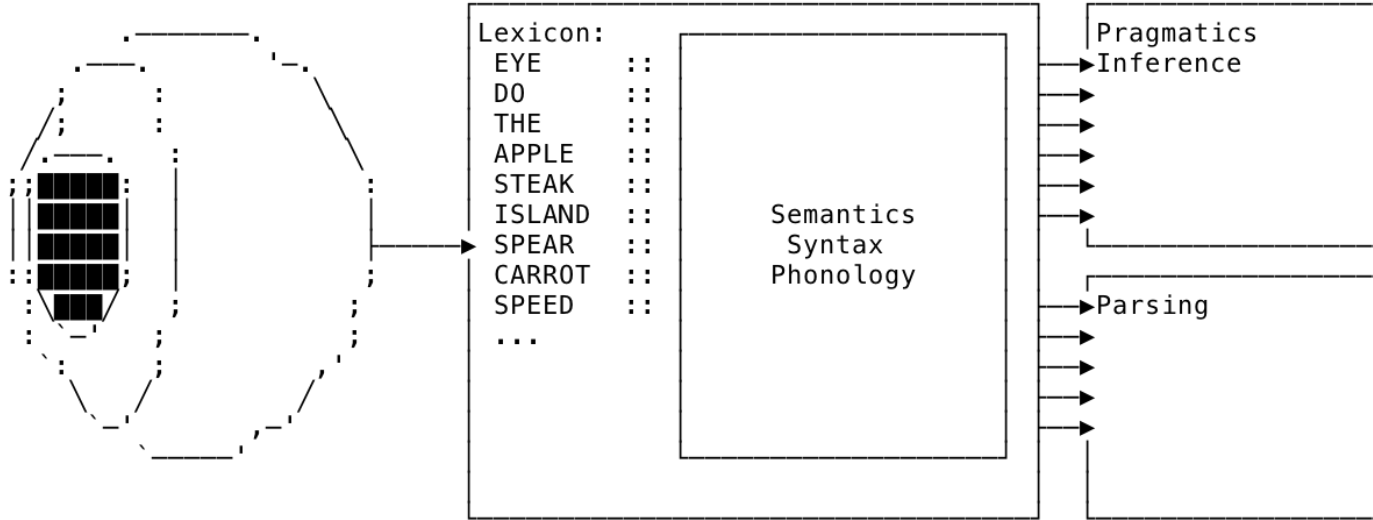
Pragmatics
Inference

Parsing

I took the lead

The naive reader

The naive reader is a computational theory of mind (CTM) implementation of word reading

- It involves sequential processing between isolated modules
- It only involves feed-forward activation between modules

The naive reader

Semantics, syntax, pragmatics don't affect reading
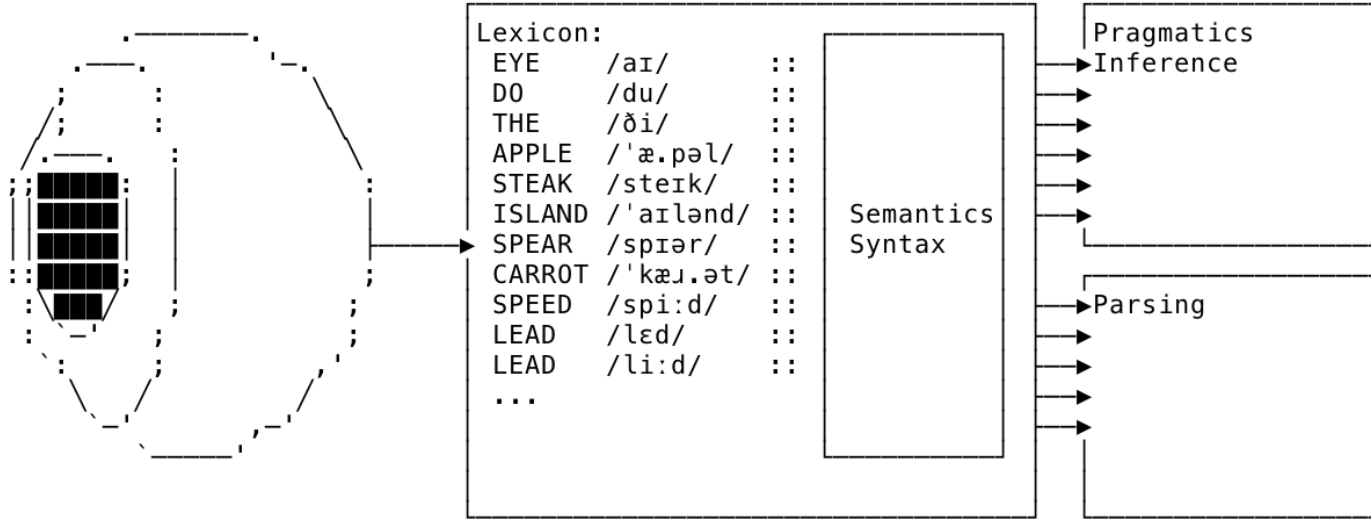
The Dictionary metaphor Revisited

Phonology

The way a word *sounds* influences its access.

- **Homographs are read more slowly** : *Lead*, *Wind*
- **Homophones are easily confused** : *Their* and *There*
- **Cross-lingual evidence** : Room and Roem
- **Phonology plays a role in access**

Solution

Add phonology to the key of the dictionary


```
Lexicon:
 EYE    /aɪ/        ::
 DO     /du/        ::
 THE    /ði/        ::          Semantics
 APPLE  /ˈæ.pəl/    ::          Syntax
 STEAK  /steɪk/     ::
 ISLAND /ˈaɪlənd/   ::
 SPEAR  /spɪər/     ::
 CARROT /ˈkæɹ.ət/   ::
 SPEED  /spiːd/     ::
 LEAD   /lɛd/       ::
 LEAD   /liːd/      ::
 ...
```

Pragmatics
Inference

Parsing

Solution

By adding phonology to the key of the dictionary, we're saying that both readings of *lead* are different words

Phonology has been transferred from *Entry* to *Key.*

Semantics

Similarly, semantics plays an important role in bilingual access.

- **Wolf** is read quickly for Dutch – English bilinguals
- **Spin** is read more slowly

The difference between these words is their shared semantics.
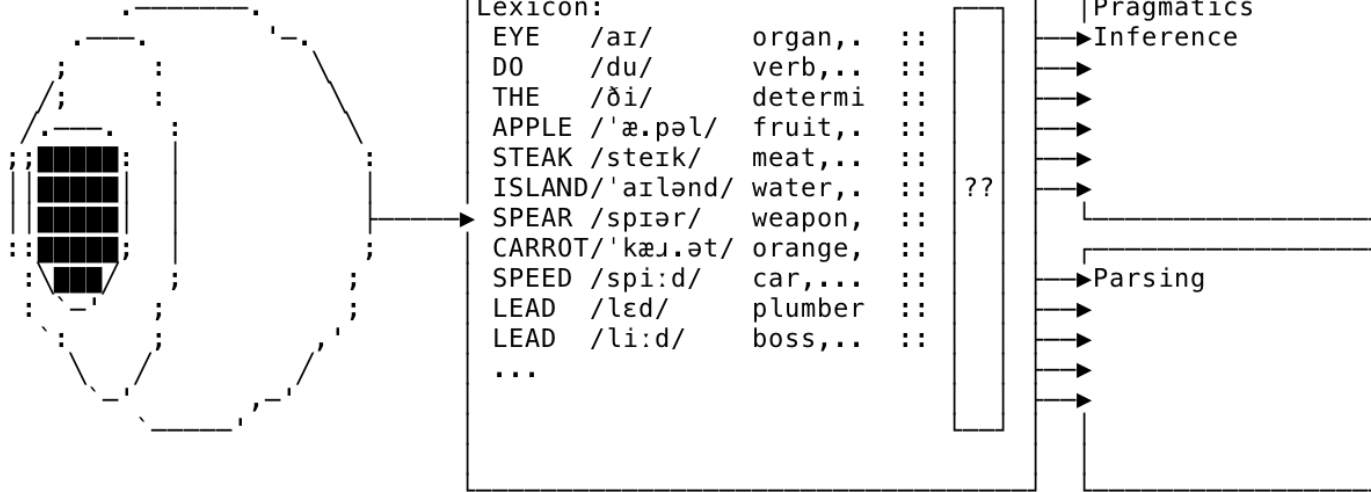
Semantics

These effects are too quick to be post-access.

Furthermore, semantic expectancies directly influence word access, also for monolinguals (Elman, 2009)

Solution

Add semantics to the key


```
Lexicon:
 EYE   /aɪ/      organ,.  ::
 DO    /du/      verb,..  ::
 THE   /ði/      determi  ::
 APPLE /ˈæ.pəl/  fruit,.  ::
 STEAK /steɪk/   meat,..  ::
 ISLAND/ˈaɪlənd/ water,.  ::
 SPEAR /spɪər/   weapon,  ::
 CARROT/ˈkæɹ.ət/ orange,  ::
 SPEED /spiːd/   car,...  ::
 LEAD  /lɛd/     plumber  ::
 LEAD  /liːd/    boss,..  ::
 ...
```

??

Pragmatics
Inference

Parsing

Solution (?)

If we add semantics to the key of the dictionary, what is left in the entry?
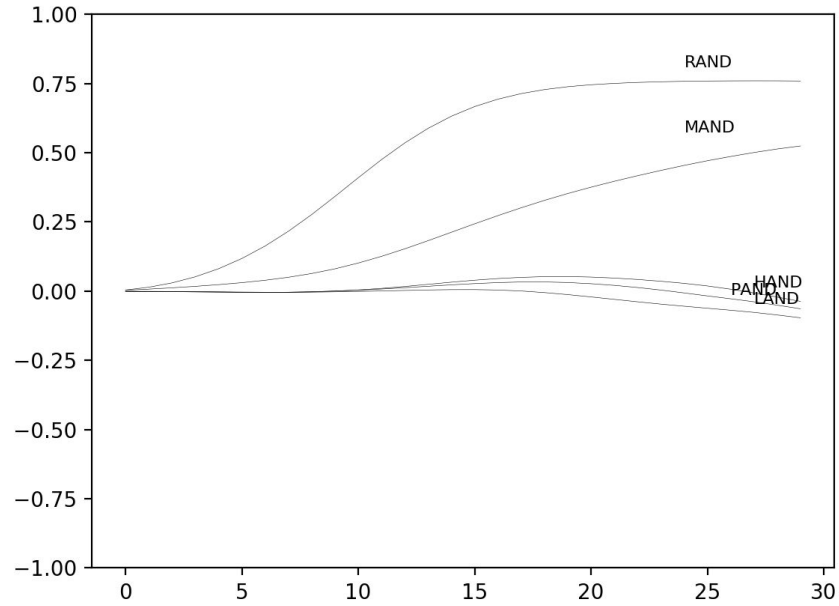
A Real example

Bia Plus

A bilingual model of word reading (Dijkstra & Van Heuven, 2002)

- Contains separate representations for Orthography, Phonology, and Semantics.
- Representations inhibit and facilitate each other
  - **Glass** and **Grass** look alike, so inhibit each other
  - **Beat** *sounds* like **Neat**, so *seeing* **Beat** causes activation of **Neat**
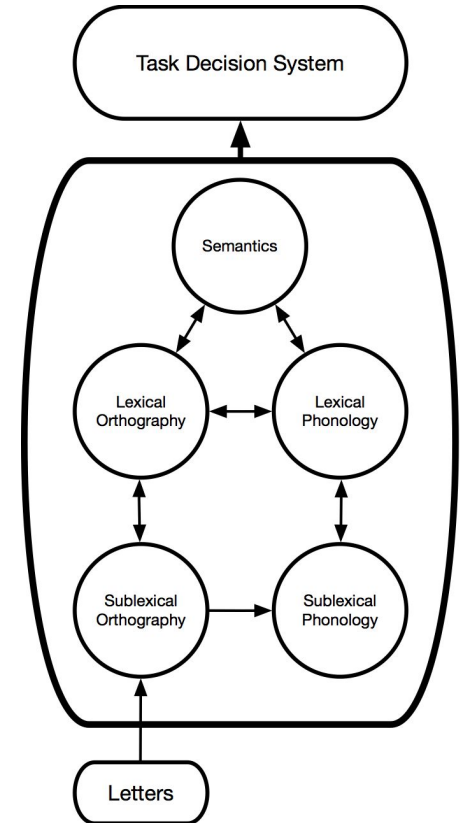
BIA Plus

Representations

Example:

O -> Room
P -> /rum/   : /rom/
S -> Space   : Cooking

So, the key to the representation is **Room-/rum/-Space** for English, **Room-/rom/-Cooking**

Representations

However: authors maintain separate representations for languages -> **Language is part of the key**

O -> Room-en : Room-nl
P -> /rum/   : /rom/
S -> Space   : Substance for cooking

Keys become: **Room-en-/rum/-Space** and **Room-nl-/rom/-Cooking**

According to authors: no inhibition without 2 orthographic representations.

Homographs

If **Room** needs two separate representations to achieve inhibition, then what about **lead?**

O -> Lead-en
P -> /led/   : /lid/
S -> ...

The observed inhibition for monolingual homographs is very similar to the one for bilingual homographs.

Homographs

Two options:

1. Admit that phonology provides enough information
   a. Implies language no longer needed in the key
2. Do not account for interlingual evidence
   a. Leads to a weak theory

Similar arguments can be made for **spin**, but with extensions to semantics.

- Monolinguals can differentiate between **bank**, so how does **spin** differ?

The take-away

Once one assumes the existence of representations with a static structure, problems arise in defining the difference between the **key** of a word and its **content.**

Even if the problem of the **key-content** distinction is removed, we saw that a real model of word reading uses a definition of word related primarily based on **orthography**