Irregular past tense inflection

- *give - gave, teach - taught*

- The meaning of *give* is contained in *gave* since *gave* describes giving in the past. But the sound of *give* is not contained in *gave*.

- Are *give* and *gave* two lexical entries that are similar to each other or is there some morpheme that they both contain?
Inflection

- Tense marking: walk-ed, walk-s
- Number marking: boy-s

Hallmarks of inflection:

- **Morphological realization of features that are obligatory parts of linguistic expressions.**
  - Sentences must carry tense; tense morphemes are the overt realization of this.
  - Nouns need to be specified for either plural or singular; number marking is the overt realization of this.

- **Inflection is completely productive; there are no verbs that resist tense marking.**

- **Inflection never changes the category of the word.** Verbs stay verbs, nouns stay nouns.
Derivation

- modern-ize, destruct-ion, teach-er, re-open

Hallmarks of derivation:

- Does not have the same kind of obligatory nature as inflection.
  - E.g., verbs do not in general have to be marked for whether they describe an event that has already occurred before. Thus the re- prefix is not part of the inflectional system of English.

- Has the potential to change the category of a word.

- Derivational affixes may have limited productivity.
  - E.g., not all adjectives combine with -ize.
    - *lawfulize
### Morphology and phonological transparency

<table>
<thead>
<tr>
<th></th>
<th><strong>Transparent</strong></th>
<th><strong>Opaque</strong></th>
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<td>dance - danced</td>
<td>go-went (“suppletion”)</td>
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<tr>
<td><strong>Derivation</strong></td>
<td>sad - sadness</td>
<td>assert - assertion</td>
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<td>realize - realization</td>
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<td>allude - allusion</td>
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# The past tense debate

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"regular"  
"irregular"
The past tense debate

- Are regulars and irregulars represented similarly or differently in the mind/brain?
- This question was popularized in the late nineties by Steven Pinker.
A necessary concept: allomorphy

- Two sound representations are linked to the same meaning and context decides which sound representation is used.
- The two allomorphs of the indefinite article in English:
  - Before a consonant:  *a* car
  - Before a vowel:  *an* idea
Three theories

- Dual mechanism theory (Pinker’s “Words and Rules” theory)
  - Regular (transparent) forms are generated by rule, irregulars are stored.

- Single mechanism storage theory
  - Both regulars and irregulars are stored.

- Single mechanism composition theory
  - All forms involve composition.
  - How could that work???
    - Irregulars involve root allomorphy combined with either a null or a overt past tense morpheme.

\[
\begin{align*}
\text{sang} & \quad \text{Ø} \\
\text{kep} & \quad -t
\end{align*}
\]
Relationship between the stem and the past tense form in the three theories

- **Dual mechanism theory:**
  
  \[
  \text{walk - walked} \quad \rightarrow \quad \text{stem identity}
  \]
  
  \[
  \text{sing - sang} \quad \rightarrow \quad \text{neighbors}
  \]

- **Single mechanism storage theory:**
  
  \[
  \text{walk - walked} \quad \rightarrow \quad \text{neighbors}
  \]
  
  \[
  \text{sing - sang} \quad \rightarrow \quad \text{neighbors}
  \]

- **Single mechanism composition theory:**
  
  \[
  \text{walk - walked} \quad \rightarrow \quad \text{stem identity}
  \]
  
  \[
  \text{sing - sang}^{(\emptyset)} \quad \rightarrow \quad \text{stem identity}
  \]
Differences between regulars and irregulars

1. Brain damage affects regulars and irregulars differently.
Aphasic data

Inferior frontal damage
--> problems with
regulatrs

Temporal lobe damage
--> problems with
irregulars
Explaining the aphaic data

Dual mechanism theories

- Left inferior frontal lobe supports rules.
  Regulars are derived by rule.
- Temporal lobe houses the lexicon.
  Irregulars are stored in the lexicon.
Explaining the aphasic data
Single mechanism storage theories

In this theory, the aphasic data would somehow need to follow from the distinct levels of phonological relatedness between irregulars and their stems, on the one hand, and regulars and their stems on the other.
Explaining the aphasic data

Single mechanism composition theories

- Difference would need to lie in a problem with allomorphy.
- Tyler et al. (2004):
  - Processing regulars involves phonological parsing of a stem and an affix. This is supported by inferior frontal regions.
  - Irregulars involve listing of the irregular form (although it is linked to the same stem morpheme as the present tense form). Problems with irregulars arise from lexical access problems.
Aphasic upshot

- Dual mechanism theories tell the neatest story.
Differences between regulars and irregulars

1. Brain damage affects regulars and irregulars differently.
   - Easiest to explain with a dual mechanism theory.
   - But regulars and irregulars must be somehow different in every theory and therefore every theory can tell some story about the aphasic data.

2. Irregulars and regulars prime their stems differently.
Crossmodal priming data (Marslen-Wilson, 1993)

<table>
<thead>
<tr>
<th>Prime (auditory)</th>
<th>Target (visual)</th>
<th>Facilitation (in comparison to unrelated control)</th>
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<td>Regular verbs</td>
<td>walk</td>
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</tr>
<tr>
<td></td>
<td>walked</td>
<td>walk</td>
</tr>
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</tr>
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Explaining the priming data
(priming for *walked - walk* but not for *gave - give*)

- Dual mechanism theory
  - Walked contains *walk* but *gave* does not contain *give*. Repetition priming expected only for *walked - walk*.

- Single mechanism storage theory
  - ?
  - [If the lack of priming for *gave - give* is due to phonological interference, there should be more such interference for *walked - walk*, which have more sound similarity.]

- Single mechanism composition theory
  - The morpheme *GIVE* has two allomorphs that sound similar. The reason why *gave* does not behaviorally prime *give* is due to an interference effect between the two allomorphs. This interference counteracts the effect of repeating the same morpheme.
Differences between regulars and irregulars

1. Brain damage affects regulars and irregulars differently.
   - Easiest to explain with a dual mechanism theory.
   - But regulars and irregulars must be somehow different in every theory and therefore every theory can tell some story about the aphasic data.

2. Irregulars and regulars prime their stems differently
   (In crossmodal priming, priming for walked - walk but not for gave - give.)
   - Problem for single mechanisms storage theories.
Similarities between regulars and irregulars

1. Long lag priming.
Long lag priming

When prime and target are separated by intervening words, only repetition priming effects are observed.
**REPETITION**

Prime: teach, spin, ocean, hand

Target: teach

Priming?: Yes

---

**PHONOLOGICAL**

Prime: teach, spin, ocean, hand

Target: tea

Priming?: No

---

**SEMANTIC**

Prime: teach, spin, ocean, hand

Target: learn

Priming?: No
Regulars and irregulars in long lag priming
(Marslen-Wilson & Tyler, 1998)

- Repetition effect both for regulars and irregulars!

**Fig. 4 Delayed repetition priming.** Listeners made lexical decisions to primed and unprimed targets, and the difference (in ms) is plotted for each condition. No priming was found at these long lags for purely semantically related targets, but significant and equally strong priming was found for targets preceded by both regular and irregular morphologically related primes.
Similarities between regulars and irregulars

1. Long lag priming.
   - Both regulars and irregulars pattern with repetition priming.
   - This can only be explained by the single mechanism composition theory.

2. Productivity.
**Wug testing** (Albright and Hayes, 2003)

What’s the past tense of:

- **blafe**
  - blafed or bleft
- **blig**
  - bligged or blug
- **bredge**
  - bredged or broge
- **chake**
  - chaked or chook
- **chool**
  - chooled or chole
- **fleep**
  - fleeped or flept
- **dape**
  - daped or dapt

Under the dual mechanism theory, you should always prefer regular inflection for novel words as there is no generative way to create irregulars.

But, in fact, irregular inflection is productive too.
Similarities between regulars and irregulars

1. Long lag priming.
   - Both regulars and irregulars pattern with repetition priming.
   - This can only be explained by the single mechanism composition theory.

2. Productivity.
   - Contra the predictions of the dual mechanism theory:
     Novel words are regularly inflected when they resemble existing regularly inflected words and irregularly inflected when they resemble existing irregularly inflected words.
   - Both regulars and irregulars behave in a rule-like way, as predicted by the single mechanism composition theory (Albright and Hayes, 2003).
M350 priming (Stockall & Marantz, 2006)

- If the M350 reflects access to morphological roots,
  - The dual mechanism theory predicts cumulative similarity effects for irregulars (give - gave) and repetition priming for regulars (walk - walked)
  - The single mechanism storage theory predicts cumulative similarity effects for both for irregulars and regulars.
  - The single mechanism composition theory predicts repetition priming for both for irregulars and regulars.

- Result:
  - jump - jumped (positive priming in M350 latency)
  - give - gave (positive priming in M350 latency)
  - teach - taught (positive priming in M350 latency)
  - boil - broil (no priming)
Three theories

- Dual mechanism theory (Pinker’s “Words and Rules” theory)
  - Cannot explain the long lag priming, M350 priming, or wug test data.

- Single mechanism storage theory
  - Cannot explain long lag priming or M350 data, or why crossmodal priming is obtained for walked - walk but not for gave - give.

- Single mechanism composition theory
  - The winner (at least for now...).