# Irregularity/opacity

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<th>Transparent (regular)</th>
<th>Opaque (irregular)</th>
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<td>sing - sang, bring - brought, go-went (suppletion)</td>
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<td>sad - sadness</td>
<td>assert - assertion, realize - realization, allude - allusion</td>
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<td>Semantic, Derivation</td>
<td>stupid - stupidity</td>
<td>universe - university</td>
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# The past tense debate

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Suppletion occurs in the past tense of verbs like "go" and "bring".
Possibilities

- Regular (transparent) forms are generated by rule, irregulars are stored. (dual mechanism)
- Both regulars and irregulars are stored. (single mechanism)
- All forms involve composition. (single mechanism)
  - How could that work???
    - Irregulars involve root allomorphy combined with either a null or a overt past tense morpheme.

\[
\begin{align*}
\text{sang} & \quad \emptyset \\
\text{kep} & \quad -t
\end{align*}
\]
Core predictions

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

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

- Single mechanism composition accounts:
  
  \[ \text{walk} - \text{walked} \quad \rightarrow \quad \text{stem identity} \]
  
  \[ \text{sing} - \text{sang}(\emptyset) \quad \rightarrow \quad \text{stem identity} \]
Aphasic data

Inferior frontal damage
  --> problems with
    regulars

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

Dual mechanism theories

- Broca’s area 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

- Regulars and their stems relate to each other primarily via phonology (transparent phonological relationship).
- Regulars and their stems relate to each other primarily via semantics (opaque phonological relationship).
Explaining the aphasic data

Single mechanism composition theories

- Difference would need to lie in a problem with allomorphy.
- Tyler et al.:
  - 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.
Trouble for dual mechanism and single mechanism storage theories

- Irregulars and their stems don’t behave as lexical neighbors in processing.
Long-lag priming (Marslen-Wilson & Tyler, 1998)

**PRIME**
called

gave

**TARGET**
call
give

white

black

**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.
Inflectional Regularity: Probing the Nature of Lexical Representation in a Cross-Modal Priming Task

Mark Allen and William Badecker

Johns Hopkins University
TABLE 1
Cross-Modal Priming Effects Previously Observed for Regular and Irregular English Verbs in Identity and Inflected Prime Conditions (Marslen-Wilson et al., 1993)

<table>
<thead>
<tr>
<th>Prime (auditory)</th>
<th>Target (visual)</th>
<th>Facilitation (in comparison to unrelated control)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regular verbs</td>
<td>walk</td>
<td>walk</td>
</tr>
<tr>
<td></td>
<td>walked</td>
<td>walk</td>
</tr>
<tr>
<td>Irregular verbs</td>
<td>give</td>
<td>give</td>
</tr>
<tr>
<td></td>
<td>gave</td>
<td>give</td>
</tr>
<tr>
<td>Condition</td>
<td>Prime type</td>
<td>Example</td>
</tr>
<tr>
<td>-------------</td>
<td>------------</td>
<td>-------------</td>
</tr>
<tr>
<td>Similar</td>
<td>Noise</td>
<td>[noise]-give</td>
</tr>
<tr>
<td></td>
<td>Unrelated</td>
<td>look-give</td>
</tr>
<tr>
<td></td>
<td>Inflected</td>
<td>gave-give</td>
</tr>
<tr>
<td>Dissimilar</td>
<td>Noise</td>
<td>[noise]-teach</td>
</tr>
<tr>
<td></td>
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<td>look-teach</td>
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Cross-modal priming in ERPs
(Marslen-Wilson & Tyler, 1998)

- Left anterior negativity for regulars and irregulars but not for semantic prime-target pairs.
Problems with irregulars often accompanied by semantic deficits.

Makes sense if irregulars and their stems are semantic relatives.

Do semantic deficits cause problems with irregulars?
Four patients with semantic dementia
(All anomic)

Figure 1. (A) Result of a conjunction analysis showing regions of significant difference between patients and controls. The regions are superimposed on a normal T1 image displayed in neurological convention (R is right) and the values on the coronal slices represent Talairach y coordinates. (B) Regions of significant difference between individual patients and controls. Sagittal slices are shown at Talairach $x = -32$ (L) and $x = 32$ (R) for each patient.
<table>
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<tr>
<th>CSL Past Tense Elicitation Task</th>
<th>B. S.</th>
<th>E. K. (Time 1)</th>
<th>E. K. (Time 2)</th>
<th>J. T.</th>
<th>K. B.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Regulars</td>
<td>95</td>
<td>86</td>
<td>86</td>
<td>100</td>
<td>95</td>
</tr>
<tr>
<td>Irregulars</td>
<td>100</td>
<td>82</td>
<td>86</td>
<td>55</td>
<td>100</td>
</tr>
</tbody>
</table>
Auditory–auditory priming study

**Figure 2.** Auditory–auditory priming study: Mean RTs and standard errors for 12 control volunteers.

**Figure 3.** Auditory–auditory priming study: Mean RTs and standard errors for the patients (group data for J. T., E. K., and B. S.).
Auditory–auditory priming study

**Figure 4.** Auditory–auditory priming study: Priming effects across groups for the irregular and semantic conditions.
**Wug testing.** 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
Wug testing. What’s the past tense of:

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- **chool**
  - chooled or chole

- **fleep**
  - flepeed or flept

- **dape**
  - daped or dapt

Albright (2002):

Island of reliability: a phonological context in which a particular morphological change works especially well. For example, every English verb that ends in a voiceless fricative is regular (wished, laughed, etc.).
Albright & Hayes (*Cognition*, 2003)

Figure 2. Effect of Islands of Reliability (IOR) for Irregulars and Regulars

(a) IOR Effect on Ratings (adjusted)  (b) IOR Effect on Production Probabilities
Speakers do not just apply the default rule but rather have knowledge about specific environments that differentiate the degrees of confidence for a regular outcome.

Both regular and irregular inflection are characterized by significant generalizations that are best characterized by rules (rather than memorization + analogy).