Class 5
# Phonemes, Allophones, and Phonological Rules
9/26/19

Reading: Finish Campbell Ch. 2

1 But first! ...Superheroes and their alter-egos

- Many Superheroes have an alter-ego.
  - Their alter-ego is how they present themselves to the world in most cases.
  - But when danger is around, they turn into their superhero persona.
- The fact that they have two different personas doesn't mean they're actually two different people.
  - They still have a single true identity.
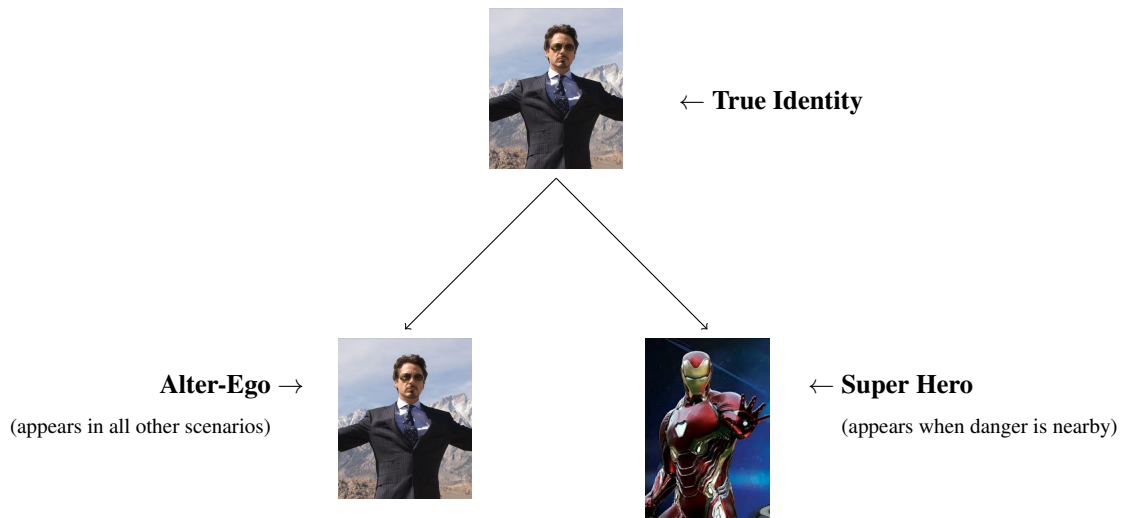 - There are just rules governing which persona appears when.

- Bruce Wayne keeps his Batman identity a secret.
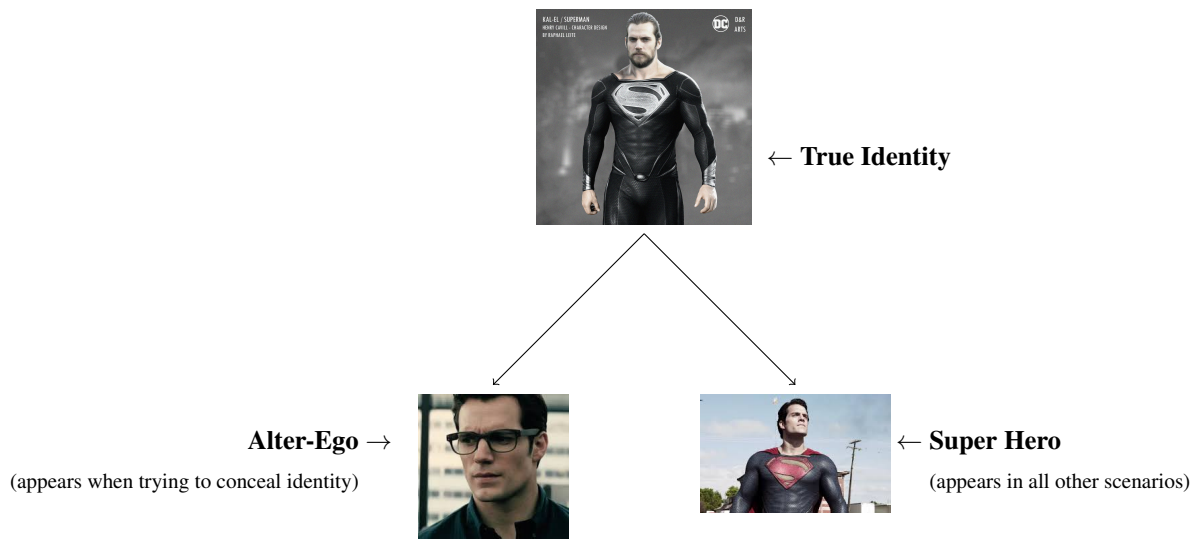
(1)   Bruce Wayne and Batman

← **True Identity**

Alter-Ego →

(appears in all other scenarios)

← **Super Hero**

(appears when danger is nearby)
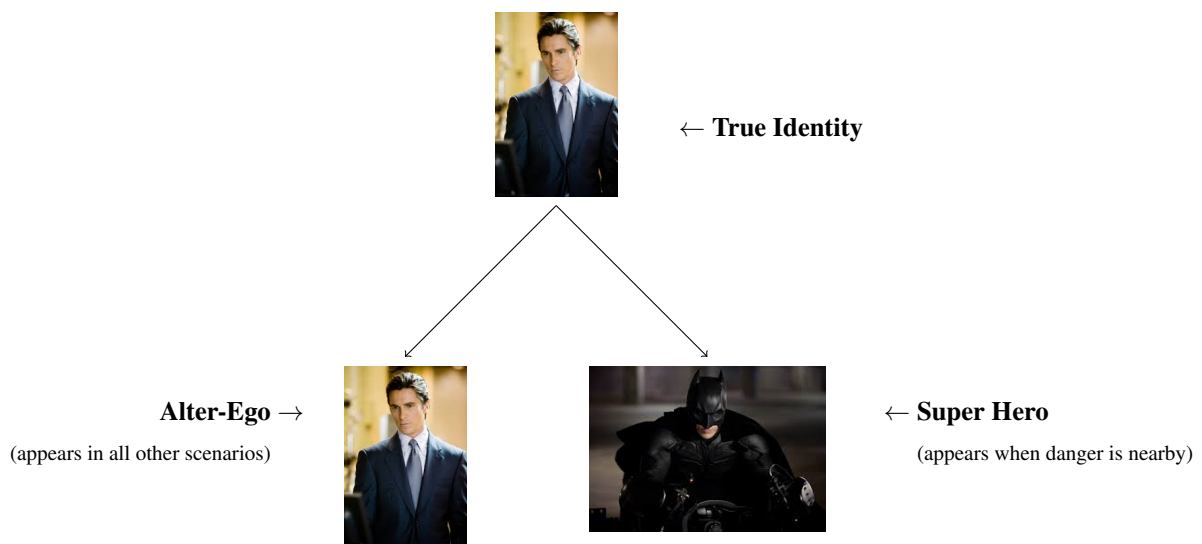
- Tony Stark doesn't hide the fact that he's Iron Man

(2)   Tony Stark and Iron Man

$\leftarrow$ **True Identity**

Alter-Ego $\rightarrow$

(appears in all other scenarios)

$\leftarrow$ **Super Hero**

(appears when danger is nearby)
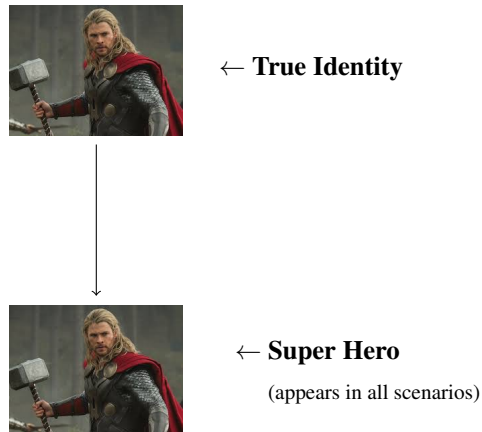
- Superman and Clark Kent are personas of Kal-El (people don't usually get to see the Kal-El persona)

(3)   Kal-El, Superman, and Clark Kent

$\leftarrow$ **True Identity**

Alter-Ego $\rightarrow$

(appears when trying to conceal identity)

$\leftarrow$ **Super Hero**

(appears in all other scenarios)

- Some superheroes are just inherently superheroes, and don't hide it.

(4)   Thor

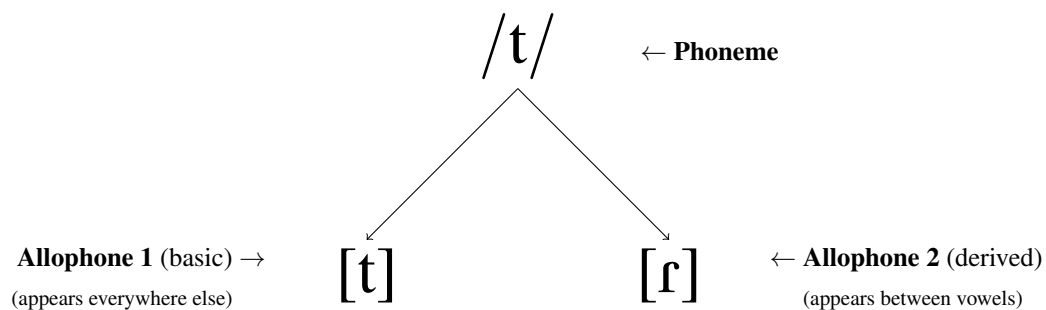 ← **True Identity**

 ← **Super Hero**

(appears in all scenarios)

2   Sounds are superheroes! Phonemes and allophones

- We can observe the output of language as a set of sounds: "**phones**".
  ↪ These are equivalent to the various personas a superhero has.
- Each phone has a *true identity* that is stored in the speaker's mind: "**phoneme**".
  ○ We call this the "underlying {form/representation/level}" (UR).
- When a single phoneme has multiple *personas* (phones), those different personas are called "**allophones**".
  ⋆ (Strictly speaking, we can/should refer to all phones as *allophones of a particular phoneme*.)

(5)   **[t]'s and [ɾ]'s (flaps) in English**

$$/t/$$ ← **Phoneme**

Allophone 1 (basic) → $[t]$ $[ɾ]$ ← **Allophone 2** (derived)

(appears everywhere else)   (appears between vowels)

- Why should we think that /t/ sometimes comes out as [ɾ]? There are "**alternations**".

(6)   a.   *write* [ɹaɪt]
        b.   *writer* [ɹaɪɾɹ]

- We assume that speakers store the root for WRITE with a single representation.
  ○ So, in order to relate the two different "**surface {forms/representations}**" (SR), one must be **derived** by phonological rule.

3   Phonological rules and notations

- Each allophone is **derived** from its phonemes by a "**phonological rule**".

- Each rule has three components:

(7)   Components of a phonological rule
   a.   The phoneme(s) it applies to   *Bruce Wayne*
   b.   The allophone it creates   *becomes Batman*
   c.   The specific environment/context in which it applies   *when danger is nearby*

- There are a number of important notations that go into a phonological rule:

(8)   Notations for a phonological rule
   a.   The phoneme is marked off by slashes   **/t/**
   ⋆   The derivation from phoneme to allophone is indicated by a right arrow   **→**
   b.   The allophone is marked off by square brackets   **[ɾ]**
   ⋆   The fact that there is a specific context is indicated by a slash   **/**
   c.   The context is spelled out either
        - Formally: use an underscore to indicate the position of the allophone in question   **V_V**
        - Informally: using words or some combination of words and symbols   **between two vowels**

- Putting all this together, our flapping rule would look like this:

(9)   The English flapping rule (version 1): **/t/ → [ɾ] / V_V**

- In many cases, we'll want to describe the entire set of allophones that derive from a particular phoneme.
- Many phonemes will have one allophone that is derived and one that is default/basic.
   ○ [ɾ] is a *derived allophone* of /t/ because it changes features of the phoneme (in a definable context).
   ○ [t] is the *default allophone* of /t/ because it retains all the features of the phoneme and applies in the "**elsewhere**" context.

(10)   Allophones of /t/ in English
   a.   Rule 1: **/t/ → [ɾ] / V_V**
   b.   Rule 2: **/t/ → [t] elsewhere**

- Heuristic: when we find an "elsewhere" allophone, we automatically select that as the value of the phoneme.
→ This is why we know the phoneme is /t/ not /ɾ/.

4   Phonological rules and features

- While sometimes we get rules that simply change one sound (at the phoneme level) into another, largely unrelated sound (at the allophone level), the two sounds are usually closely related in terms of **phonological features**.
- Also, the *context* is often definable in terms of **phonological features**.

(11)   Umlaut in Old English

	mouse	*mouse*-PL	*foot*	*foot*-PL
Underlying Representation	/muːs/	/muːs-i/	/foːt/	/foːt-i/
Surface Representation	[muːs]	[myːsi]	[foːt]	[føːti]

Note: [y] = high, front, rounded, tense vowel; [ø] = mid, front, rounded, tense vowel

- We could write rules that just transform each phoneme into each allophone:

(12)   Phonological rules in Old English (by segment)
   a.   Phonological rules for /u/ and its allophones
        i.   Rule 1: **/u/ → [y] / _Ci**
        ii.   Rule 2: **/u/ → [u] elsewhere**

   b.   Phonological rules for /o/ and its allophones
        i.   Rule 1: **/o/ → [ø] / _Ci**
        ii.   Rule 2: **/o/ → [o] elsewhere**

- Or we could write them in terms of the features involved:

(13)   Phonological rules in Old English (by feature)
   a.   Phonological rules for /u/ and its allophones
        i.   Rule 1: $/V_{[+high,-low,\mathbf{+back},+round,+tense]}/ \rightarrow [V_{[+high,-low,\mathbf{-back},+round,+tense]}] / \_CV_{[+high,\mathbf{-back}]}$
        ii.   Rule 2: (abbreviated) /u/ → [u] elsewhere

   b.   Phonological rules for /o/ and its allophones
        i.   Rule 1: $/V_{[-high,-low,\mathbf{+back},+round,+tense]}/ \rightarrow [V_{[-high,-low,\mathbf{+back},+round,+tense]}] / \_CV_{[+high,\mathbf{-back}]}$
        ii.   Rule 2: (abbreviated) /o/ → [o] elsewhere

- This lets us see what's changing and why:
   → In both cases, a [+back] vowel is changing to a [-back] vowel, in the context of a following [-back] vowel.

- This also lets us see that we have a unified **phonological process** occurring:

(14)   The *umlaut* rule in Old English
        $/V_{[+back]}/ \rightarrow [V_{[-back]}] / \_CV_{[+high,-back]}$

- We can do something similar with the flapping rule in (Modern) English.
   ○ It applies to both /t/ and /d/.
   ○ These are both coronal stops.

(15)   Flapping in Modern English

	write	*writer*	*ride*	*rider*
Underlying Representation	/ɹaɪt/	/ɹaɪt-ɹ/	/ɹaɪd/	/ɹaɪd-ɹ/
FLAPPING RULE	n/a	ɹaɪɾ-ɹ	n/a	ɹaɪɾ-ɹ
Surface Representation	[ɹaɪt]	[ɹaɪɾɹ̩]	[ɹaɪd]	[ɹaɪɾɹ̩]

(16)   The English flapping rule (version 2):
        [Coronal,-cont,-son] → [+flap,(+cont,+son,+voice)] / V_V