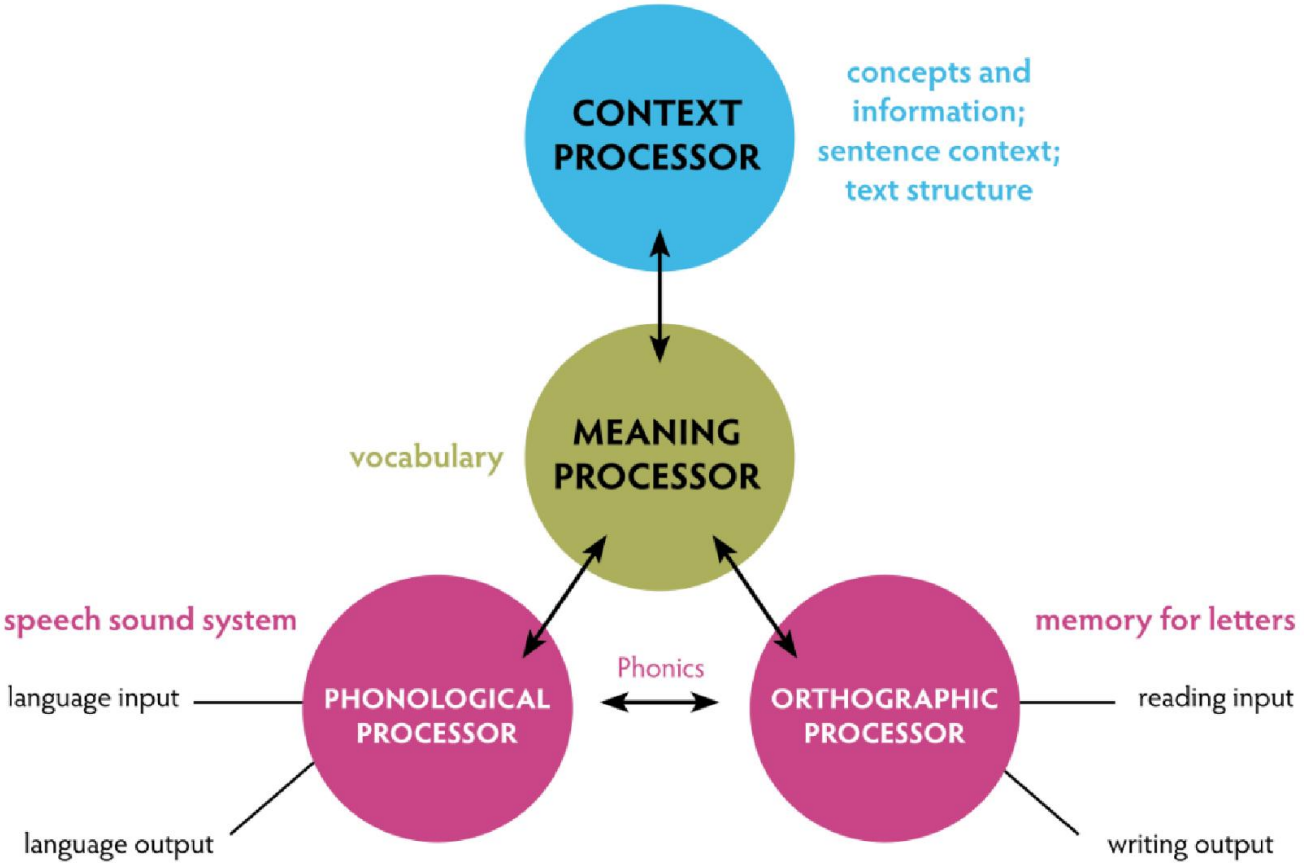
Week 6: Word recognition

- Word recognition
  - Word recognition refers to a component process of language. Word recognition transforms written and spoken forms of words into linguistic representations.



- Probing the lexicon
  - The mental lexicon is that component of the grammar that contains all the information – phonological, morphological, semantic, and syntactic – that speakers know about individual words and/or morphemes.

The process of retrieving words?

1. The connected lexicon

- Are words interconnected?
  - Please list the first three words that come to mind when you see the following words:
    - paper

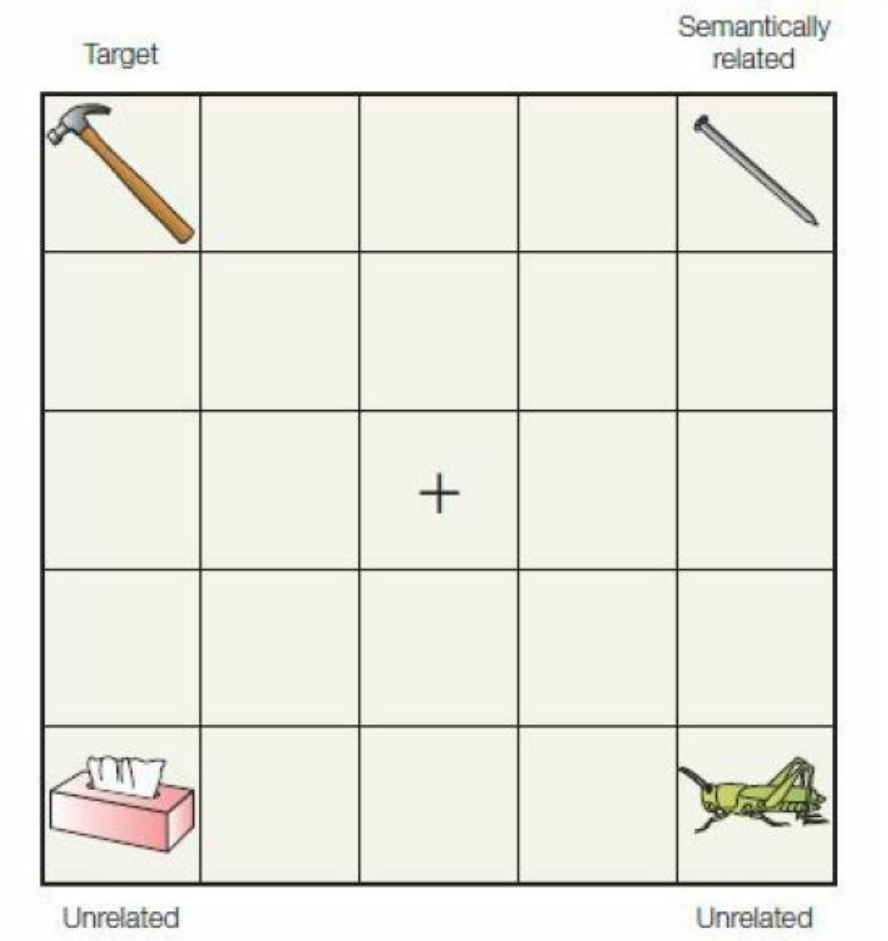
This is a *word association test (task).*

- Now collect the responses of some of your classmates and compare them to your own. How much overlap is there in the words you thought of? Are there certain kinds of semantic relationships that you see coming up with some regularity in the word association test?

- Part–whole relationships, such as *paper–book*
- Objects that fall in the same conceptual category, such as *paper-pencil*
- Relationships between objects and typical actions, such as *paper–write*
- Relationships between objects and typical agents, such as *paper-writer*
- Relationships between objects and typical materials, such as *paper-tree*
- Objects that tend to be part of the same situation, such as *paper-test*
- Objects that bear a strong physical resemblance to each other, such as *paper-whiteboard*
- Antonyms, such as *black–white*
- Synonyms, such as *black–dark*
- Any cultural difference? (breakfast)

1.1 Evidence for partial retrieval of related words

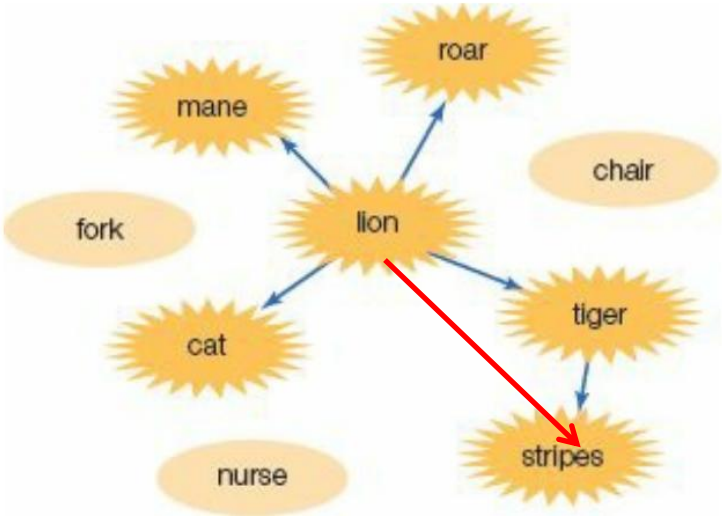
- Evidence for the interconnections among words has come from semantic priming, which suggests that when you hear or read a word, you also partially activate other words that are related in meaning.
  - prime: tree, target: wood, fish, mirror
  - lexical decision task: participants read strings of letters on a screen that might either be actual words (doctor) or nonsense words (domter). (ACC & RT)



Yee and Sedivy (2006): Shortly after hearing the word *hammer*, subjects were more likely to look briefly at the nail than at unrelated items such as the cricket. This suggests that hearing a word results in the activation of semantically related words as well as the target words.

Try to build a model

- lion, cat, mane, roar, stripes, tiger, folk, nurse



Mediated semantic priming: the process by which a prime word speeds up responses to a target word not because of a direct connection, but due to an indirect connection via some other intervening word

Figure 8.2 A simple spreading-activation network. Hearing the word *lion* activates the mental representation of that word and, in turn, the representations of related words such as *mane*, *cat*, *tiger*, and eventually *stripes* (via *tiger*).

- Spreading activation model:
  - lion → tiger → stripes → paisley → shirt → tie → neck → head → hair, and so on.
  - The model needs to have a way to prevent such overwhelming activation within the lexical network.

- **Decay function**: The rate at which information fades in memory, such that information that has become activated gradually returns to a baseline level of activation

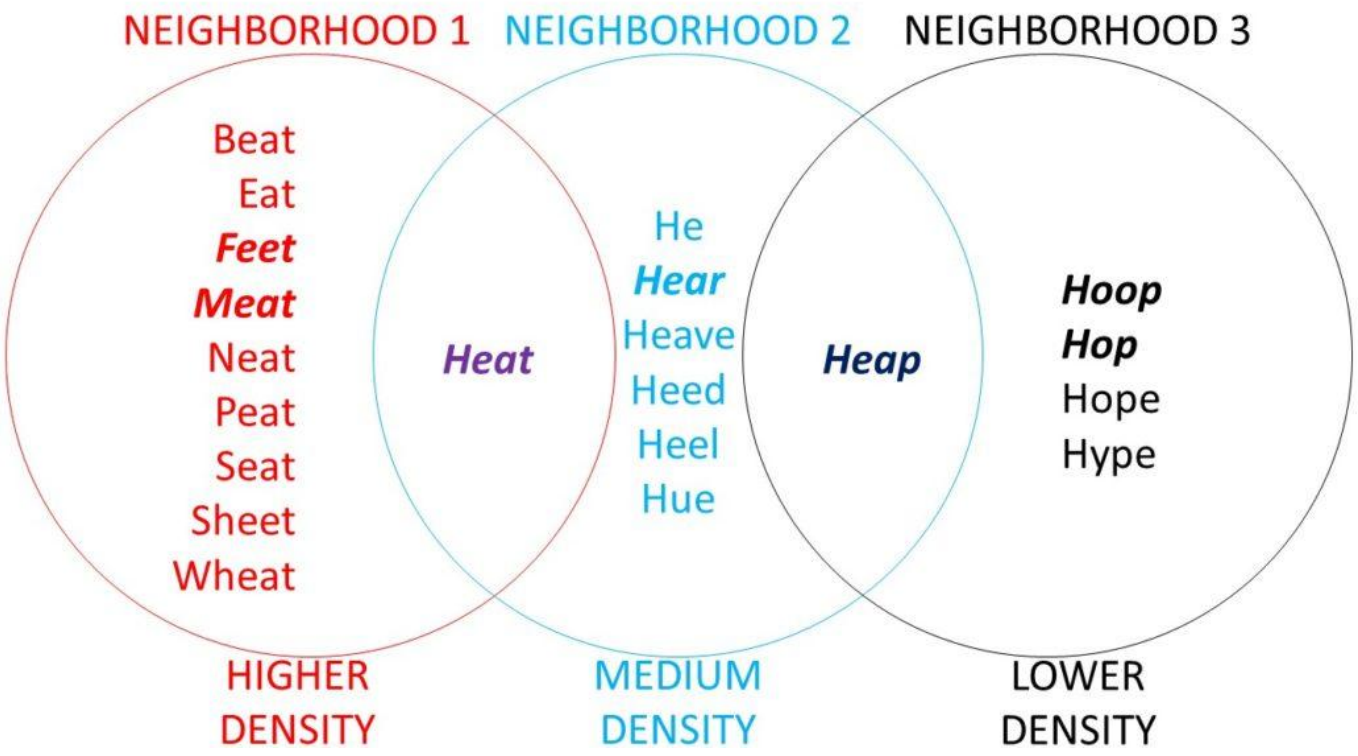
1.2 Competition from partially activated words

- facilitation: processes that make it easier for word recognition to be completed
- inhibition: processes that result in word recognition becoming more difficult

  --- stench: stanch

  --- sling: sting, fling, bling, cling, slung, slang, slim, slit, slip, slid, slick

- **Neighborhood density effects**: it is more difficult and time-consuming to retrieve a word from memory if the word bears a strong phonological resemblance to many other words in the vocabulary than if resembles only a few other words



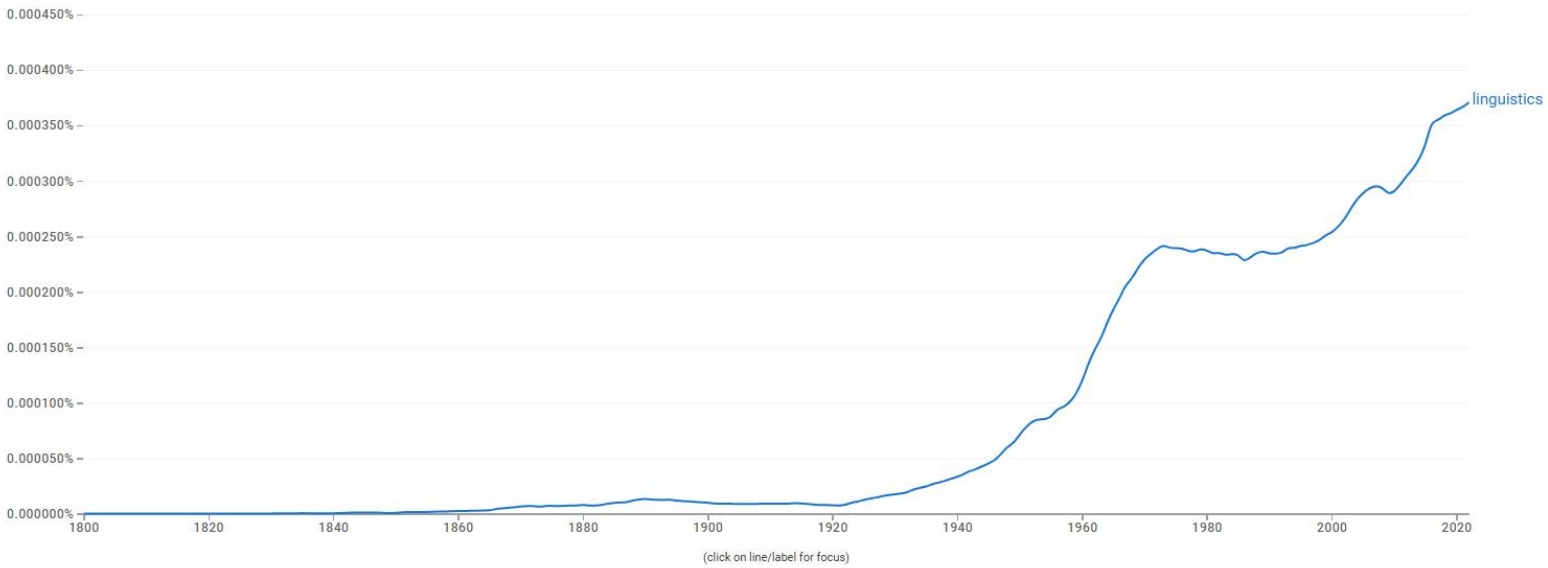
- Some other factors?
  - For example, the word *scourge* has a small number of sound-alike neighbors while thing has many; but the word *thing* is far more common than scourge.
  - However, subjects take less time to recognize thing than scourge
    - frequency
    - word length
    - regularity
    - age of acquisition
    - ...

- Frequency effect
  - The more frequent, the faster to be recognized (Forster & Chambers, 1973; Monsell, 1991)
  - So one's experience with words is somehow encoded in (local) orthographic representations of known words and thus influence the ease with which those words are recognized.

TABLE 8.1 Some examples of words and their frequency by percentage of Google Ngram database[a]

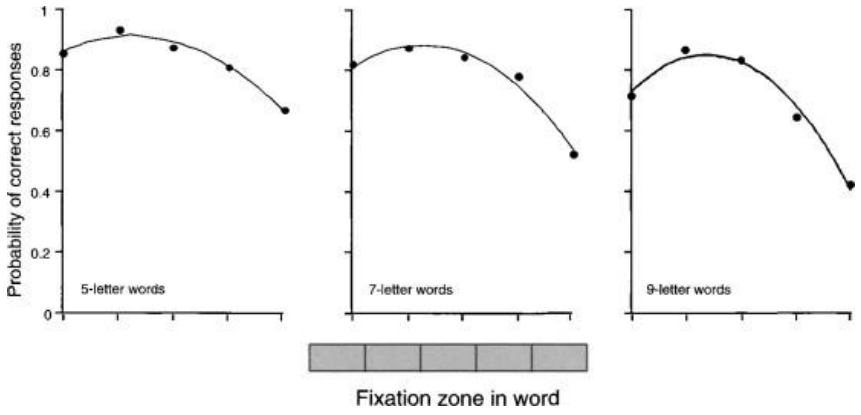
High frequency (>0.005%)	Medium frequency (0.001–0.003%)	Low frequency (<0.0001%)
stand	trend	stork
bed	gap	pug
desire	genius	gyrate

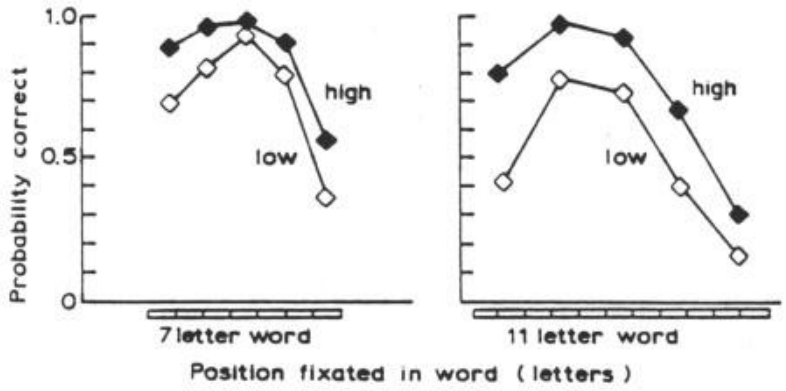
[a] While Google Ngram is a quick and accessible tool, you should bear in mind that Google's collection of text is not necessarily a representative sample of language use. Researchers tend to use other databases that have been more carefully designed to reflect the frequencies of spoken and written words.



- length effect
  - In word recognition, the finding that longer words tend to be recognized more slowly than shorter words (linear effect).
  - A re-examination of the word length effect on lexical decision reaction times in a large-scale study, revealed a more curvilinear fashion (New et al. 2006).
    - Specifically, medium-length words (i.e., 5–8 letters) elicited the shortest response times while short (i.e., <5 letters) and long words (i.e., 8–13 letters) elicited comparatively prolonged response times.

- Word length influences activation in various brain regions in such a similar fashion. The visual word form area (VWFA) exhibited a U-shaped modulation by eliciting the least activation to medium-length words, suggesting that this region preferentially responds to words with an “optimal” length (Yarkoni et al., 2008b)
- Fixation issue
  - the word is recognized best when fixated slightly left of center and performance is better with the eyes fixating on the first compared to the last letter in the word





- Regularity & consistency: grapheme-phoneme correspondence (GPC,音形对应) regularity vs. rime consistency
  - grapheme: a grapheme is the smallest functional unit of a writing system or symbol
  - phoneme: a phoneme is the smallest sound units in a language that can change meaning
  - rime: rime refers to the part of the word that follows the initial phoneme

- A word is considered regular when the GPC pronunciation given to it would be the same as the rime pronunciation
  - Naming irregular words are slower than regular words
- Consistency is determined by the amount of words with the same rime ending that are vocalized the same way
- Which is more important?
  - Rime consistency has a larger influence than GPC regularity (Treiman etc.)

- Subjective frequency
  - individual differences: often obtained by collecting subjective frequency or familiarity ratings from a group of participants
    - Firstly, the accuracy of corpus frequencies is largely subject to corpus sampling biases.
    - Secondly, even with good corpus sampling, corpus frequencies tend to have less reliable and accurate estimates for words in the lower frequency range

- Two ways of subjective F
  - Familiarity ratings (Toglia & Battig, 1978)

Some examples of "Likert- Type" Scales

	Never	Sometimes	Often	Always
I order at least one meal from an online food delivery app.	1	2	3	4

	Never	Sometimes	Often	Always
I use the product on a monthly basis.	1	2	3	4

	Never	Sometimes	Often	Always
I drink coffee from cafés at least once a day.	1	2	3	4

  - Subjective F (Balota et al, 1999)

- Age of acquisition
  - How about the AofA (age of acquisition)? Might this information also be encoded in representations of orthographic form?
  - YES! Early acquired words are processed faster than later acquired words in lexical and semantic tasks.
  - And maybe independent of F (Morrison & Ellis, 1995; Gerhand

water (2.37)	*shrink* (7.06)
chicken (3.26)	*diet* (9.25)
picture (4.05)	*justice* (9.47)
woman (4.95)	*feud* (10.33)
neighbor (5.06)	*inbox* (12.84)
clerk (6.74)	*linguist* (13.82)

Estimates of AoA drawn from a database of more than 30,000 English words (Kuperman et al., 2012)

- A methodological difficulty:
  1. These two factors are both estimates
  2. They are highly related (r=-.68), how can we test the independent effects?

  – Another possibility: F and AofA are actually two dimensions of a single variable: cumulative F.
    – Cumulative F: the frequency with which an individual is exposed to a particular word over their lifetime (Lewis et al., 2001; Zevin & Seidenberg, 2002)
    – Cumulative F provides a better description of our experience with words than F (Brysbaert and Ghyselink, 2006)
    – Cumulative F ?? AofA (further research)

- Semantic influences
  - Words with *rich* semantic representations are recognized faster
    - Imageability
    - Number of semantic features
    - Semantic neighborhood density
    - Number of meanings
    - Number of related meanings

- Imageability (形象性)
  - Imageability is a psycholinguistic variable that indicates how well a word gives rise to a mental image or sensory experience
    - words such as “apple” or “house,” for example, are typically rated as high in imageability
    - words such as “fact” or “hope” are rated as low in imageability
  - higher imageability faster and more accurately than words with lower imageability, which is termed the imageability effect

- Effects that you might want to take into account
  - frequency
  - orthographic length
  - regularity in naming
  - orthographic neighborhood
  - imageability
  - ...

- semantic priming
- morpheme
- word
- L2