Summary: Reading

Unlike speech, which is acquired with relatively little formal input, reading is something that must be formally taught. The ability to read offers a person an alternative route to language – one that takes **orthographic** (written) symbols as input instead of speech or manual/facial signs. While reading therefore relies more heavily on visual processing than does speech perception, higher-level language processes are largely the same regardless of the sort of input we receive. (We'll talk more about the brain regions that underlie language processing in a few weeks, but for now, it may be exciting to know that the neural systems underlying speech and reading are largely shared.)

Notably, different language communities have adopted different writing systems, and different systems may emphasize different aspects of language. **Logographic** languages, for instance, emphasize concepts/meaning over pronunciation/sound, whereas **alphabetic** languages involve letters (**graphemes**) that correspond to phonemes. Within alphabetic languages, however, there is variability in how consistently graphemes correspond to particular phonemes, with some languages having relatively direct correspondences between graphemes and phonemes (known as **orthographically shallow**/**transparent** languages), whereas others languages have relatively complex correspondences between graphemes and phonemes (**orthographically deep**/**opaque** languages, like English).

Many cognitive models of reading emphasize that there are two routes to reading – a **direct** route that maps directly from written input to meaning as well as an **indirect** route where print maps to meaning via phonology. Support for this sort of architecture comes from individuals with different forms of developmental dyslexia, as these individuals show different patterns of reading impairment that can be explained by selective damage to one of these routes. We also see evidence for an influence of phonology on orthography in behavioral studies; for instance, readers are more likely to falsely categorize a word like *rows* as a member of the category *flower* because of its phonological similarity to the word *rose*.

Importantly, these two routes need not be mutually exclusive. Readers may vary in their reliance on each route depending on their stage of reading development as well as based on the particular language they are reading. A very practical question is the extent to which childhood reading instruction should emphasize direct mapping from words to meaning (the "whole word" approach) as compared to phonological processing (the "phonics" approach).

Much of our knowledge of the cognitive basis of reading comes from eyetracking studies. Such studies demonstrate that eye movements are choppy rather than smooth – that is, we make **saccades** (rapid eye movements) from one fixation location to another, extracting information at each fixation point. From these studies, we have also been able to gain information about how much information readers obtain on each fixation. Notably, the **perceptual span** (the window of text from which we can get information) is asymmetric, as we attend more to upcoming information than information we have already encountered. While we may not be consciously aware of all the letters in our perceptual span, eyetracking studies show that we may be able to extract some information about them.