Interactive Activation Models

Evidence for interactive activation: **word superiority effect**

- Wheeler ’70: phoneme recognition is facilitated in real words
- Warren&Sherman’74: phon. restoration in noise/cough-manip. speech
- Foss&Blank ’80: frequent words facilitate phoneme recognition

Interactive Activation Model (James McClelland & David Rumelhart ’81):

- actually a precursor to TRACE
- introduced the idea of interactive activation:
  - word level: ABLE, TRAP, TRIP, TAKE, TIME, CART
  - letter level: A, N, T, G, S
  - feature level: ‘|’, ‘/’, ‘–’ (line segments of LED-style ‘asterisk’ letters)
  - constraints propagate in both directions between successive levels
  - can use word info to fill in segments ‘WOR{K vs. R}’ (word superiority)
- TRACE (McClelland&Elman’86) is defined on speech features
Evidence for Incremental Lexical Access

William Marslen-Wilson ’84: non-words recognized before end of word

- **stimuli:** spoken words/non-words: ‘trenkitude’, ‘cathedruke’
- **measure:** response time of lexical decision (is it a word?)
- **results:** non-word latencies constant $\sim .450s$ from ‘discrimination point’ (recognition point) where target diverges from all other words e.g.: /k/ in ‘trenkitude’, /u/ in ‘cathedruke’ also, time not dependent on num. competitors (contra FOBS)

William Marslen-Wilson & Pienie Zwitserlood ’89: parallel activation

- **stimuli:** hear ‘captain/captive’, see (non-)word query: SHIP/GUARD visual query presented during (at /t/) / after spoken word
- **measure:** reaction time in lexical decision task
- **results:** probe w/in word $\rightarrow$ any rel. to prefix, proportional to frequency probe after word $\rightarrow$ priming only for actual word

Shows parallel competition (up to semantic level) early in recognition. This is trouble for serial models (FOBS), not modeled in TRACE precursors.
Incremental Lexical Access Model

Pienie Zwitserlood ’89: lack of context effects for probe within word

- **stimuli:** carrier: ‘The next word is kapiti’ + visual: SHIP/MONEY
  neutral: ‘They mourned the loss of their kapiti’ + ...
  biasing: ‘With damp spirits the men stood around the grave.’
  ‘They mourned the loss of their kapiti’ + ...

- **measure:** reaction time in lexical decision task

- **results:** no diff. betw. carrier/neutral/biasing at early probe .130s/.199s

 Shows initial stages of lexical access are purely phonetic, no context yet

COHORT (Marslen-Wilson ’87,’89): three phases of lexical access

- **activation/contact:** autonomous, parallel, no context
- **selection:** at recognition/uniqueness point, bottom-up, dep. on context
- **integration:** features and syntactic category evaluated in utterance
More recent models of lexical access:

- James McClelland & Jeffrey Elman ’86: TRACE
  - incremental (like COHORT), but fully interactive
- Dennis Norris ’94: SHORTLIST
  - incremental, like COHORT, but more so
  - models competition across word boundaries (segmentation problem)
    e.g.: find a catalog / find a cat a log
  - modular, no top-down propagation
- Martin Gaskell & Marslen-Wilson ’97: Distributed COHORT
  - incremental (like COHORT)
  - distributed (like SRN)
- Dennis Norris & James McQueen ’08: SHORTLIST-B
  - probabilistic version (works like modern speech recognizer, e.g. Siri)

Not lexical access:

- Jeffrey Elman ’91: SRN
  - distributed
  - incremental
  - model of sentence processing
For next time...

Read:
- Traxler ch 3, pp. 116–128

Study:
- list of review topics (review session in next class)