Two lectures focused on Language:

- Today ask big question.
  - Is language a learned skill or an instinct?
    - Reading is a learned skill, verbal language may be more of an instinct (but controversial!).
- Tomorrow focus on a specific issue.
  - Describe a classic model of reading aloud single words (Dual-route model of reading).

Language: How does it develop?

- Learned skill? Like playing chess? In which case, general learning mechanisms may mediate language learning.
- Instinct, like perceiving in 3D? Or a spider spinning its web? In which case, specific and special purpose brain systems may support language acquisition.
  - That is, a language organ designed through evolution.
    - Pinker, S. (1994). *The Language Instinct.* William Morrow, New York

Reading appears to be a learned skill

- Reading is a recent invention
  - No time for evolution
- Many people around the world are illiterate
- Rarely acquired without explicit instruction

Verbal language may be an instinct:

(which minimizes but does not eliminate the role of learning):

- Universal across cultures.
- Brain damage can specifically impair language. e.g., Broca's aphasia.
  - Rarely a selective disorder of a general skills, e.g., chess.
- Critical period for language learning.
  - Genie
  - Sign-language.
  - Phonology (the sounds of language).

An example of a critical period for phonology:

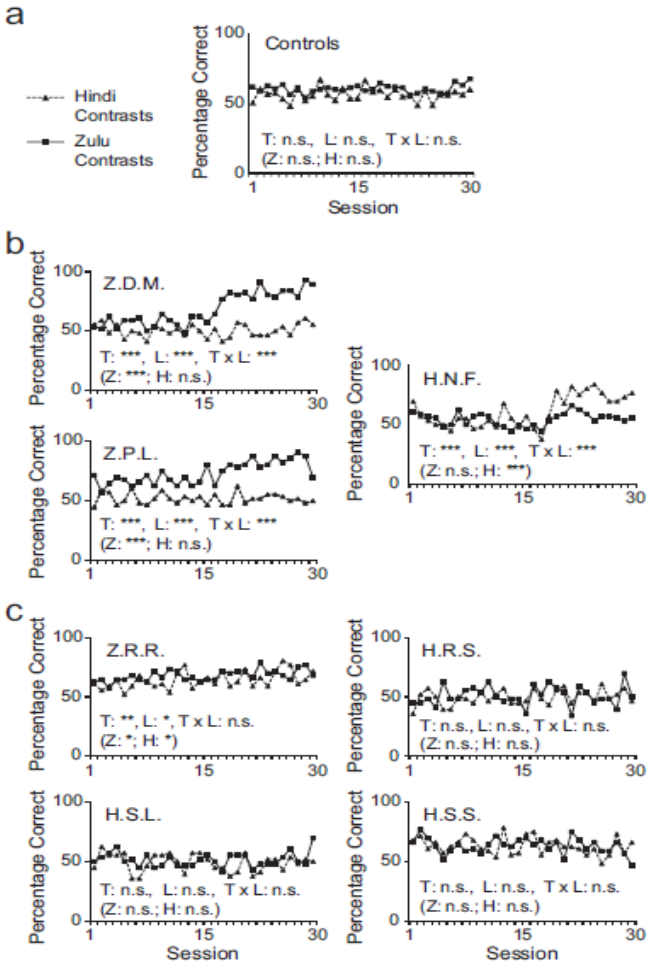


Fig. 1. Percentage of correct discrimination of the Hindi contrasts and Zulu contrasts over 30 sessions. The figure shows (a) the average performance of the 4 control native-English speakers, (b) the performance of the 3 Zulu and Hindi individuals under 40 years of age (2 with Zulu background: Z.D.M. and Z.P.L.; 1 with Hindi background: H.N.F.), and (c) the performance of the 4 Zulu and Hindi individuals over 40 years of age (1 with Zulu background: Z.R.R.; 3 with Hindi background: H.S.L., H.R.S., H.S.S.). Significance levels for statistical tests (n.s.: $p > .10$; $^{*}p \leq .05$; $^{**}p < .01$; $^{***}p < .001$) are shown in each graph. For the control group, results are collapsed across the 4 participants. Significance levels are reported individually for each participant with a Hindi or Zulu background. Results are shown for the main effect of time for the Hindi and Zulu contrasts combined (T; first 15 sessions vs. last 15 sessions), the main effect of language (L; Hindi contrasts vs. Zulu contrasts), the interaction between time and language (T × L; i.e., differential learning), the effect of time for the Zulu contrasts (Z), and the effect of time for the Hindi contrasts (H).

Bowers, J.S., Mattys, S.L., & Gage, S.H. (2009). Preserved implicit knowledge of a forgotten childhood language. *Psychological Science, 20,* 1064-1069

Furthermore, advocates of a language instinct often claim that language is unique to humans.

- Yes, animals can learn a small vocabulary.
- Yes, dolphins show some knowledge that word order matters, i.e., they have some (primitive) syntax.
- BUT, human language seem to be learned differently than the way animals learn language.

However, these points are controversial:

- The fact that something is universal doesn't make it an instinct.
  - Everyone claps with their hands, washes their hair.
- Specific deficits occur for cognitive skills that are not an instinct: Dyslexia.

Some authors question the existence of critical periods for language:

Data from 2.3 million immigrants to the US

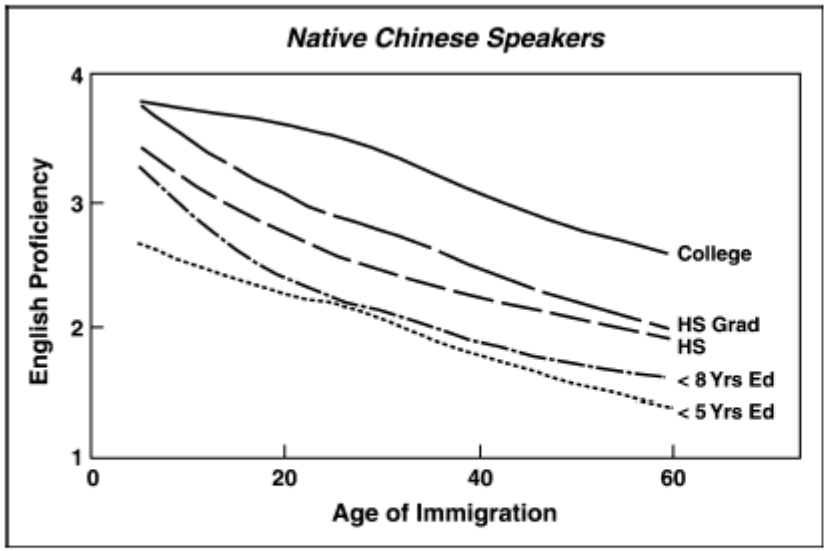


Fig. 2. Loess fits (span = .75) for English proficiency by age of immigration among Chinese immigrants. Results are shown separately for different education levels: less than 5 years ("<5 Yrs Ed"), less than 8 years ("<8 Yrs Ed"), some high school ("HS"), high school graduate ("HS Grad"), and some college ("College").

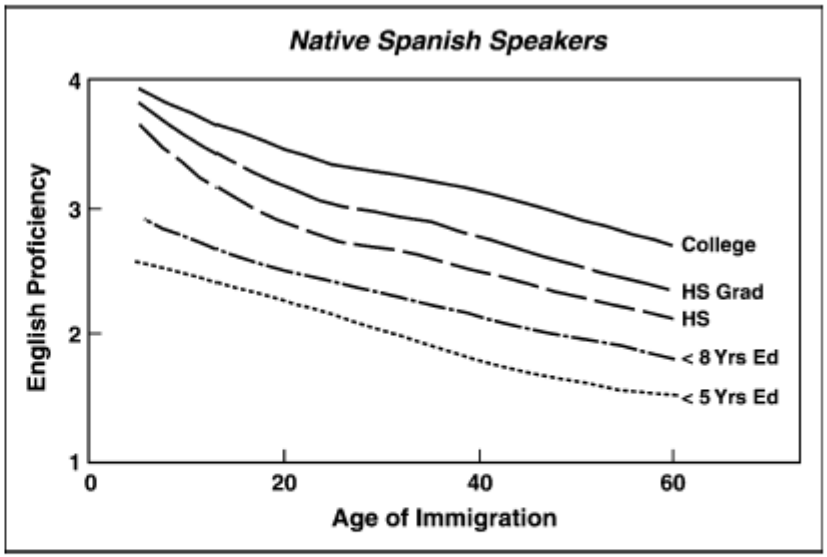


Fig. 3. Loess fits (span = .75) for English proficiency by age of immigration among Spanish-speaking immigrants. Results are shown separately for different education levels: less than 5 years ("<5 Yrs Ed"), less than 8 years ("<8 Yrs Ed"), some high school ("HS"), high school graduate ("HS Grad"), and some college ("College").

Hakuta, K., Bialystok, E., & Wiley, E. (2003). Critical evidence a test of the critical-period hypothesis for second-language acquisition. *Psychological Science*, *14*(1), 31-38

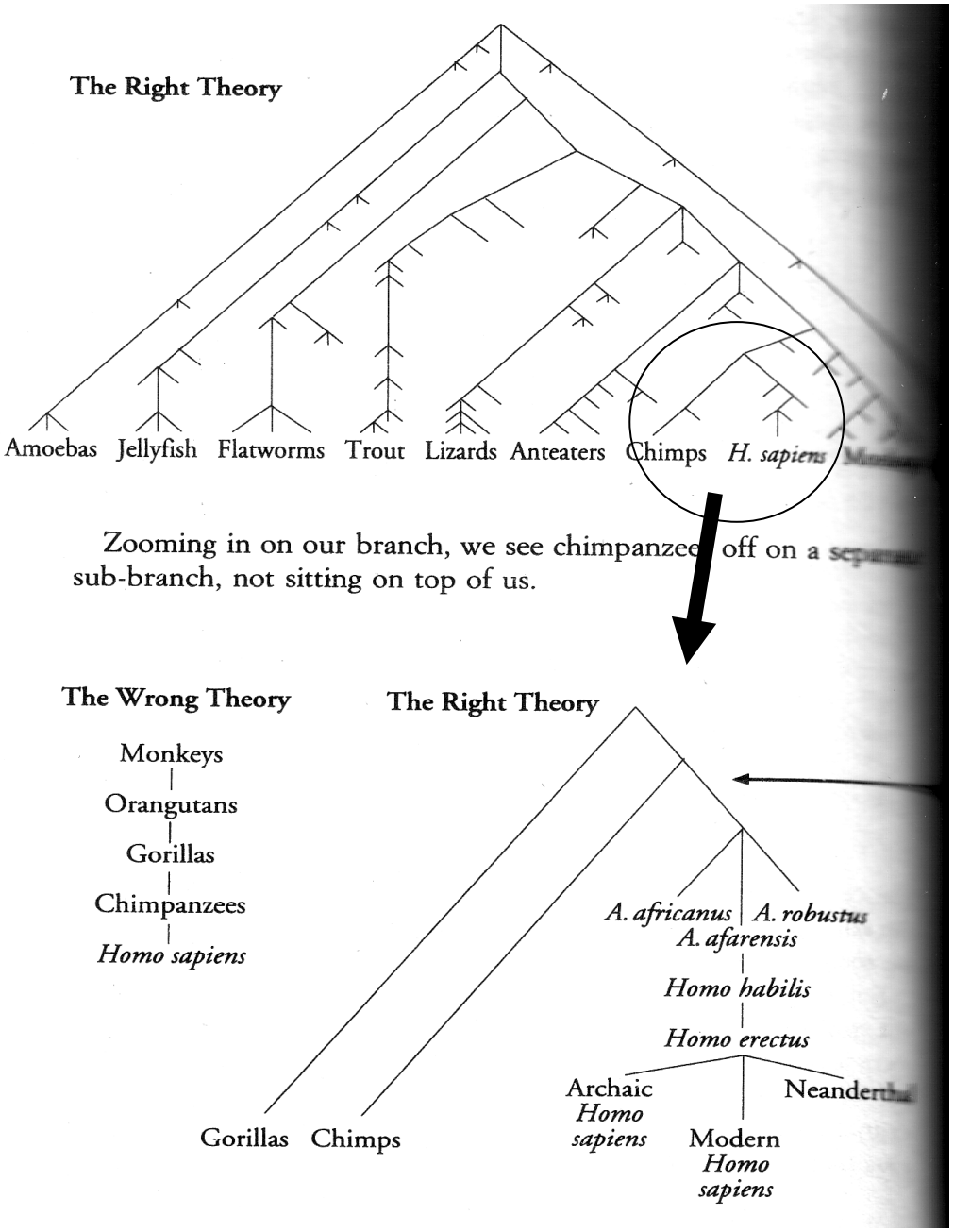
Furthermore, if language evolved (is an instinct), then should you not expect something related to human language monkeys or other animals?

Pinker in his book “The Language Instinct” claims that the absence of language in other species does not challenge the language instinct hypothesis.

Humans are not descendents of Chimpanzees/Monkeys

The wrong conception is that evolution is like a ladder – a progression to more and more complex organisms.

Instead, we are very distant cousins to chimpanzees/monkeys, with common ancestors, long extinct.



Evolution is like a bush, not a ladder. 99% of all species are now extinct.

Language may have begun to emerge here – 5-7 million years ago. In which case, no similar selective process may have worked on chimps/gorillas.

- Given that all the properties of languages (universal, better learned early than late, etc.) can have multiple interpretations, it is difficult to make any strong conclusions.
- If language is not an instinct, then perhaps language is the by-product of increased intelligence?
  - Evolution would then play a general role in supporting language by selecting for greater intelligence.

Debate!

In defense of the view that language is the direct product of selective adaptation:

- Pinker, S., & Bloom, P. (1992). Natural language and natural selection. *The adapted mind: Evolutionary psychology and the generation of culture*, 451-494. [target article with dozens of peer commentaries and authors' response]

In defense of the view that language is not the direct product of selective adaption. Rather, selective adaptation made smart brains, and then we used our intelligence to invent language – like chess.

- Christiansen, M.H. & Chater, N. (2008). Language as shaped by the brain. *Behavioral & Brain Sciences, 31,* 489-558 [target article with dozens peer commentaries and authors' response]