Behaviorism and the Cognitive Revolution

BCS 153, Spring 2018
Verbal Behavior

- **Alfred Whitehead** – how could behaviorism ever explain language and language learning?

- **Skinner** writes *Verbal Behavior*
  - Emphasizes use of language in context, feedback from parents as conditioners
Chomsky's critique of Skinner

- **Chomsky's Critique:**
  - Skinner doesn't address “real” linguistic behavior; doing so requires a theory of internal mental representation
    - Hard to see how stimulus+response can make sense of linguistic knowledge, performance
  - Children's knowledge appears to radically surpass their input
  - Skinner's ideas are untested hypotheses
    - It is especially difficult to see how to apply laboratory pigeon studies to the richness of human-like thinking
  - **A key failure:** Skinner speculates about the causes of verbal behavior without understanding what verbal behavior is
Downfall of behaviorism
(see Gallistel 1998)

- Critically relied on a “blank slate.”
  - Is a blank slate obviously false?

- Critically supposed that animals respond during learning.
  - This is false. Birds learn their parents song without explicit behavior. Baby indigo buntings learn the geometry of the sky in order to direct migration.
Figure 3. Photograph of the interior of the Robert T. Longway Planetarium at Flint, Michigan, showing the Spitz B projector and the arrangement of the test units.
Downfall of behaviorism
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- Too constraining – assumes that we already know the relevant biology.
  Example: we are lucky that early geneticists did not constrain their theory to known biology at the time!

- Many kinds of learning/information processing aren't associations.
  - Path integration (aka “dead reckoning”)
Path integration
Path integration
(Wehner 2003)
Downfall of behaviorism

- Consider how hard it would be to explain the operation of an ordinary computer with only references to input/output relations.
Another troubling example for behaviorism: mental rotation
Mental Rotation
Shepard and Metzler 1971

Fig. 1. Examples of pairs of perspective line drawings presented to the subjects. (A) A “same” pair, which differs by an 80° rotation in the picture plane; (B) a “same” pair, which differs by an 80° rotation in depth; and (C) a “different” pair, which cannot be brought into congruence by any rotation.

Fig. 2. Mean reaction times to two perspective line drawings portraying objects of the same three-dimensional shape. Times are plotted as a function of angular difference in portrayed orientation: (A) for pairs differing by a rotation in the picture plane only; and (B) for pairs differing by a rotation in depth. (The centers of the circles indicate the means and, when they extend far enough to show outside these circles, the vertical bars around each circle indicate a conservative estimate of the standard error of that mean based on the distribution of the eight component means contributed by the individual subjects.)
Rise of cognitive psychology

- Really what we want is an integrative account of behavior.
  - This almost certainly requires statements about unseen processes and representations.
Pinker's Five Major Ideas
(Pinker 2002)

- The mind can be grounded/realized in the physical world via computation, information, and feedback.
- The mind cannot be a blank slate.
- An infinite range of behaviors can be generated by finite combinations of mental operations.
- Universally shared mental representations underlie “superficial” variation seen between cultures, between languages.
- The mind is complex, with many interrelated parts.