Proseminar in Developmental Psychology, Fall 2021

October 1: Object representations and naïve physics

ALL READ

Theories: Everyone read these papers/excerpts.

a. Marr, D. *Vision,* introduction (pp. 3-7), chapter 1 (sections 1.2 and 1.3, pp.18-38), and chapter 4 (sections 4.1-4.5, pp. 268-279).
b. Piaget, J. *The construction of reality in the child,* "Development of the object concept, 2: The third stage (pp. 13-44): Read the introduction (pp. 13-14), obs. 13 & 14 (pp. 21-22) and obs. 29 (pp. 37-38) to get a feel for the phenomena that Piaget discovered).
c. Quine, W. V. *Ontological relativity and other essays,* "Speaking of objects," sections 1-3, pp. 1-16.
d. Spelke, (1990). Principles of object perception, *Cognitive Science, 14,* 29-56. Read the intro and the studies of occluded objects (pp. 29-36 and 41-48.)
e. Keen, R. (2003). Representation of objects and events: Why do infants look so smart and toddlers look so dumb? *Current Directions in Psychological Science, 12(3),* 79-83.
f. Xu, F. (2007). Sortal concepts, object individuation, and language. *Trends in Cognitive Sciences, 11,* 400-406.
g. Ullman, T. & Tenenbaum, J. (2020). Bayesian models of conceptual development: Learning as building models of the world. *Annual Review of Developmental Psychology.* Read sections 1-3 if you aren't familiar with their thinking about cognitive development; read just section 3 ("Core knowledge as startup software", pp. 11-14) if you are.

READ ONE, BE PREPARED TO EXPLAIN THE EMPIRICAL ARGUMENT TO THE CLASS

Evidence: Everyone read ONE paper from the following in each topic and be prepared to present it, briefly and informally, in class.

1. Perceiving partly occluded objects from motion
    a. Valenza, E., Leo, I., Gava, L. & Simion, F. (2006). Perceptual completion in newborn human infants. *Child Development, 77,* 1810-1821.
    b. Ostrovsky, Y., Meyers, E., Ganesh, S., Mathur, U. & Sinha, P. (2009). Visual parsing after recovery from blindness. *Psychol. Sci.* **20,** 1484–1491.
2. Representing objects as cohesive
    a. Cheries, E. W., Mitroff, S. R., Wynn, K., & Scholl, B. J. (2008). Cohesion as a constraint on object persistence in infancy. *Developmental Science, 11*(3), 427-432.
    b. Van Marle, K. & Scholl, B. (2003). Attentive tracking of objects vs. substances. *Psychological Science, 14,* 498-504.
3. Representing objects as solid and persisting over occlusion
    a. Baillargeon, R. & DeVos, J. (1991). Object permanence in young infants: Further evidence. *Child Development, 62,* 1227-1246.

b. Clifton, R. K., Rochat, P., Litovsky, R., & Perris, E. E. (1991). Object representation guides infants' reaching in the dark. *J. Exp. Psychol.: Human Perception & Performance, 17(2),* 323-329.
c. Chiandetti, C. & Vallortigara, G. (2011). Intuitive physical reasoning about occluded objects by inexperienced chicks. *Proc. Roy. Soc. B., 278,* 2621-2627.

4. Beyond core knowledge of objects
   a. Stahl, A. E. & Feigenson, L. (2015). Observing the unexpected enhances infants' learning and exploration. *Science, 348(6230),* 91-94.
   b. Smith, L. B. (2003). Learning to recognize objects. *Psychological Science, 14(3),* 244-250.
   c. Ullman, T., et al. (2017). Mind games: Game engines as an architecture for intuitive physics. *Trends in Cognitive Sciences, 21(9),* 649-655.

Suggested questions for your response papers, and for discussion in class:

1. What do studies of object perception in infancy seem to say about Piaget's and/or Quine's theories of the development of object representation? How might Piaget or Quine reply?
2. Do any of the studies discussed in the readings support claims of innateness? If so, what studies and what claims? If not, why not?
3. What does it mean to say that a diverse set of phenomena (say, those exhibited in the readings in sections 1-3 above) depend on a single cognitive system? What counts as evidence for or against such a claim?
4. The Xu and Smith papers suggest that language affects representations of objects, but it isn't clear how. What role do you think language might play in (a) the development of representations of object kinds, or (b) the development of abilities to categorize objects by their shapes?
5. Marr writes (p. 36) that "the quintessential fact of human vision [is] that it tells us about shape and space and spatial arrangement. Here [lies] a way to formulate its purpose—*building a description of the shapes and positions of things from images."* But later he writes (p. 268) "The construction of the 2½ D sketch is a pivotal point for theory, marking the last step before a surface's interpretation and *the end, perhaps, of pure perception* (italics are mine)." What are the critical differences between representations of surfaces and objects, in Marr's scheme? What does research on object representations in infants, in this week's readings, suggest about Marr's scheme? Do infants' object representations fit within Marr's scheme for vision or lie outside it, and if the latter, where? More generally, does the work on infants' object representations bear on how we think about vision? Does Marr's work on vision bear on how we think about object representations in infancy and their later development?
6. How do Ullman and Tenenbaum think about innate knowledge of objects, and how does their thinking relate to that of others whose empirical work (on controlled-reared animals, or congenitally blind adults, or very young human infants) you read for today?