

Preliminary Course Information

PSYC G4280 – Core Knowledge

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- I. Bulletin Description
- II. A full description of the content of the course
- III. The rationale for giving the course
- IV. The reading list and weekly syllabus
- V. Course requirements and grading

I. Bulletin Description

PSYC G4280. Core Knowledge (seminar).

4 pts. Monday, 10:10-12, 200C Schermerhorn

Prerequisites: Courses in introductory psychology, cognitive or developmental psychology, and instructor permission.

Core Knowledge explores the origins and development of knowledge in infants and children, with an additional emphasis on evolutionary cognition. In this course, we will examine evidence from cognitive psychology, developmental psychology, comparative psychology, neuroscience, and linguistics to look at the child's conception of objects, number, space, language, agency, morality and the social world. We will look at which aspects of knowledge are uniquely human, which are shared with other animals, and how this knowledge changes as children develop.

II. A full description of the content of the course

In the first class, the grading criteria and mechanics of the class will be discussed, along with an overview of the goals and content of the course. An in-depth case study of the indigo bunting, a bird that navigates using the stars' positions, will provide a framework for thinking about issues of nativism and empiricism, and the relative contributions of evolutionarily-endowed knowledge and environmental experience.

In the second class, we will discuss the manner in which infants process information in their environment. Information processing interacts with memory for presented stimuli, which in turn impacts the strength of the representation and the infant's performance on visual paired-recognition tasks. We will also discuss the role of prematurity, arousal, inhibition, and individual differences on information processing in infancy.

In the third class, we will review work on infant visual perception, focusing primarily on depth perception. Using a natural case study of congenital blindness (and recovered sight), and studies on prism adaptation in adulthood, we will

examine the relative contributions of nature and nurture in determining visual elements of a scene and the plasticity of the mind with respect to spatial perception. We will then discuss the “visual cliff”, dark-rearing and other techniques used to study depth perception in animals, and the development of depth perception in infancy using monocular and binocular depth cues.

In the fourth class, we will examine how infants perceive objects. Issues such as occlusion, object persistence, and object identity will be discussed in the context of Piaget’s original observations on the topic and newer research that uses alternate methods (and finds different patterns of knowledge.) We will also review the input that is available for analysis by very young infants to determine objects’ boundaries, the role of spatiotemporal information in object perception, and cross-modal processing of object characteristics.

In the fifth class, we will discuss classic and current research on the development of numerical understanding. Emphasis will be placed on the large approximate number system, a system for representing large, inexact numbers of items that is found in many different animal species. We will discuss the methods and findings of studies that examine numerical comparison and arithmetic computation. The development of this approximate system in infancy will be reviewed, as well as a case study in cultural psychology on a group that has no precise number words beyond one, two, and “many”.

In the sixth class we will examine questions of agency, what the developing child knows about agency, and how s/he learns about animate agents in the environment. We will discuss research on the system children use to reason about animates and the characteristics of this system relative to one used to reason about objects. The infants’ understanding of goals, action at a distance, rational action towards a perceived goal, eye gaze, imitation, and contingency in a social setting will be covered.

In the seventh class we will look at how children develop the components for a theory of mind- an appreciation that other actors in the world have thoughts and desires that are distinct from the child’s own. We will discuss the growing understanding of the distinction between desires and beliefs, the ability to use eye gaze as informative to others’ knowledge states, language as a driving force in developing a full-blown theory of mind, and classic and current methods to assess the ability by children to determine others’ mental states.

In the eighth and ninth classes, we will review research on language development and the case for a modular, human-only language learning mechanism. We will look at work on infants’ perception of phonemes, the “fast-mapping” of labels onto objects in early childhood, children’s understanding of morphological and syntactic rules, and examine the cases of learning a second language, learning one’s primary language late in life, creating a new language in an impoverished environment, and language learning in non-human primates.

In the tenth class, we will look at how the development of language skills interact with thought. As test cases of the idea that language has an impact on certain types of thought, we will review work on populations whose languages utilize different ways of expressing spatial relationships and gendered articles, and research which manipulates the terms used for talking about time (move a meeting forward vs. backward) and the subsequent outcome for the participants in these studies.

In the eleventh class, we will discuss the foundations of morality and what constitutes a “core” set of moral principles. We will examine research on moral dumbfounding (in which people have a gut, unjustifiable sense of right and wrong), the presence of moral emotions regarding the protection of individuals, relationships, and the soul, and methods used to study early-developing moral ideas such as blocking of goals or causing harm in young infants.

In the final two classes, we will engage in a pedagogical exercise designed to enhance your ability to convey original research, and the motivation for this original research, to colleagues. Students will give a short presentation with time for question-and-answer afterwards, focusing on the topic that forms the foundation of their final paper.

III. The rationale for giving the course

This course provides an overview of the methods and theories regarding cognitive development, specific to the domain of innate and fundamental properties of the mind. It serves to introduce several well-defined topics in cognitive development that many scientists believe to be foundational to our ability to navigate the world. The course will emphasize the unique approach to cognition through a developmental and evolutionary lens, using a timescale that is ontogenetic (the development through the life span) and phylogenetic (the development through evolutionary time.)

PSYC G4280 is an advanced seminar, designed particularly for graduate students, for advanced undergraduates who are majoring in Psychology or in Neuroscience and Behavior, and for students participating in the Postbac Psychology Program. These students will have priority in registration, followed by junior majors followed by non-majors.

It fulfills the following degree requirements:

- For Psychology Graduate Students, PSYC G4280 will apply toward the “two seriously graded seminars” requirement of the Master’s degree.
- For the Psychology major or concentration in the College and in G. S., for the Psychology minor in Engineering, and for the Psychology Postbac, G4280 meets the Group I (Perception and Cognition) distribution requirement.

- For the Neuroscience and Behavior joint major, G4280 will fulfill the 5th Psychology requirement: “one advanced psychology seminar from a list approved by the Psychology Department advisor to the program.”
- For non-majors in the College and GS, G4280 will count as one term of the natural science requirement, provided that students obtain the necessary permission and have taken the prerequisite psychology courses. Graduate students, and students who are majoring in Psychology or in Neuroscience and Behavior, will have priority over students who are taking the course for the science requirement, and we anticipate the course will rarely be used for the latter.
- For the Psychology Postbac certificate, PSYC G4280 will fulfill the advanced seminar requirement.
- For the Barnard Psychology major, PSYC G4280 will fulfill the senior seminar requirement.

IV. The reading list and weekly syllabus

Below is a list of suggested readings for each class. Most readings are available online through CLIO. If not, they will be placed on Courseworks.

Weekly Topic and Readings (subject to revision):

1. (9/12/11) Introduction to the course
2. (9/19/11) Memory and Information Processing

Colombo, J., Richman, W. A., Shaddy, D. J., Greenhoot, A. F., & Maikranz, J. (2001). HR-Defined phases of attention, look duration, and infant performance in the paired-comparison paradigm. *Child Development*, Vol. 72, 1605–1616.

Hunter, M. & Ames, H. (1988) A multifactor model of infant preferences for novel and familiar stimuli. In Advances in Infancy Research, Rovee-Collier C, Lipsitt L (eds), vol. 5. Ablex: Stamford; 69–95.

McCall, R. & Carriger, M. (1993) A Meta-Analysis of Infant Habituation and Recognition Memory Performance as Predictors of Later IQ. *Child Development*, Vol. 64(1), 57-79.

Richards, J.E. (1997). Effects of attention on infants' preference for briefly exposed visual stimuli in the paired-comparison recognition-memory paradigm. *Developmental Psychology*, Vol. 33, 22-31.

Rose, S., Feldman, J., & Jankowski, J. (2003) Infant Visual Recognition Memory:

Independent Contributions of Speed and Attention. *Developmental Psychology*, Vol. 39(3), 563-571.

Wetherford, M. & Cohen, L. (1973) Developmental Changes in Infant Visual Preferences for Novelty and Familiarity. *Child Development*, Vol. 44(3), 416-424.

3. (9/26/11) Visual Perception

Gibson, E. & Walk, R. (1960) The "Visual Cliff". *Scientific American*, Vol. 202, 67-71.

Gregory, R. & Wallace, J. (1963) Recovery from early blindness. *Experimental Psychology Society Monograph*, Vol. 2.

Harris, C. (1965) Perceptual Adaptation to Inverted, Reversed, and Displaced Vision. *Psychological Review*, Vol. 72(6), 419-444.

Held, R. & Hein, a. (1963) Movement-Produced stimulation in the development of visually guided behavior. *Journal of Comparative and Physiological Psychology*, Vol. 56(5), 872-876.

Slater, A., Mattock, A. & Brown, E. (1990) Size constancy at birth: Newborn infants' responses to retinal and real size. *Journal of Experimental Child Psychology*, Vol. 49(2), 314-322.

4. (10/3/11) Object Perception

Baillargeon, R. (1987) Object permanence in 3½- and 4½-month-old infants. *Developmental Psychology*, Vol. 23(5), 655-664.

Carey, S. & Xu, F. (2001) Infants' knowledge of objects: Beyond object files and object tracking. *Cognition*, Vol. 80, 179-213.

Kellmann, P. & Arterberry, M. (1998) Object Perception. In The Cradle of Knowledge: Development of Perception in Infancy. Kellman, P. & Arterberry, M. (Eds). Cambridge: MIT Press; 135-177.

Kellmann, P. & Spelke, E. (1983) Perception of partly-occluded objects in infancy. *Cognitive Psychology*, Vol. 15, 483-524.

Meltzoff, A. & Borton, R. (1979) Intermodal matching by human neonates. *Nature*, Vol. 282(5737), 403-404.

Regolin, L. & Vallortigara, G. (1995) Perception of partly occluded objects by young chicks. *Perception & Psychophysics*, Vol. 57(7), 971-976.

Spelke, E., Kestenbaum, R., Simons, D. & Wein, D. (1995) Spatiotemporal continuity, smoothness of motion and object identity in infancy. *British Journal of Developmental Psychology*, Vol. 13, 113-142.

5. (10/10/11) Number

Gordon, P. (2004) Numerical Cognition without Words: Evidence from Amazonia *Science*, Vol. 306(5695), 496-499.

Lipton, J. & Spelke, E. (2003) Origins of number sense: Large-number discrimination in human infants. *Psychological Science*, Vol. 14(5), 396-401.

McCrink, K & Spelke, E. (2010) Core multiplication in childhood. *Cognition*, Vol. 116(2), 204-216.

McCrink, K. & Wynn, K. (2004) Large number addition and subtraction by 9-month-old infants. *Psychological Science*, Vol. 15(11), 776-781.

Pica, P., Lemer, C., Izard, V., & Dehaene, S. (2004) Exact and Approximate Arithmetic in an Amazonian Indigene Group. *Science*, Vol. 306(5695), 499-503.

Xu, F. & Spelke, E. (2000) Large number discrimination in 6-month-old infants. *Cognition*, Vol. 74, B1-B11.

Wynn, K. (1992) Addition and subtraction by human infants. *Nature*, Vol. 358, 749-750.

6. (10/17/11) Agency

Cassia, V., Turati, C., & Simion, F. (2004) Can a nonspecific bias toward top-heavy patterns explain newborns' face preference? *Psychological Science*. Vol. 15(6), 379-383.

Gergely, G., Bekkering, H., & Kiraly, I. (2002) Rational imitation in preverbal infants. *Nature*, Vol. 415, 755.

Gergely, G., Nadasdy, Z., Csibra, G., & Biro, S. (1995) Taking the intentional stance at 12 months of age. *Cognition*. Vol. 56(2), 165-193.

Johnson, S.C., Slaughter, V., & Carey, S. (1998). Whose gaze will infants follow? Features that elicit gaze-following in 12-month-olds. *Developmental Science*, Vol. 1, 2, 233-238.

Somerville, J., Woodward, A. & Needham, A. (2005) Action experience alters 3-month-old infants' perception of others' actions. *Cognition*, Vol. 96, B1-B11

Woodward, A. (1998) Infants selectively encode the goal object of an actor's reach. *Cognition*, Vol. 69, 1-34.

7. (10/24/11) Theory of Mind

Baron-Cohen, S. (2008) Theories of the autistic mind. *The Psychologist*, Vol. 21(2), 112-118.

Baron-Cohen, S., Leslie, A., & Frith, U. (1985) Does the autistic child have a "theory of mind"? *Cognition*. Vol.21(1), 37-46.

deVilliers, J. and deVilliers, P. (2003) Language for thought: Coming to understand false beliefs. In D. Gentner & S. Goldin-Meadow (Eds.), Language in mind: Advances in the study of language and thought. MIT Press.

Onishi, K. & Baillargeon, R. (2005) Do 15-Month-Old Infants Understand False Beliefs? *Science*, Vol. 308(5719), 255-258.

Perner, J. & Wimmer, H. (1985) John thinks that Mary thinks that...: Attribution of second-order beliefs by 5- to 10-year-old children. *Journal of Experimental Child Psychology*, Vol. 39(3), 437-471.

Pyers, J., & Senghas, A. (2009) Language promotes false-belief understanding: Evidence from learners of a new sign language. *Psychological Science*. Vol.20(7), 805-812.

8. (10/31/11) Language 1

Baldwin, D. (1993) Infants' ability to consult the speaker for clues to word reference. *Journal of Child Language*, 20(2), 395-418.

Carey, S. & Bartlett, E. (1978). *Acquiring a single new word*. Proceedings of the Stanford Child Language Conference, Vol. 15, 17-29.

Eimas, P., Siqueland, E., Jusczyk, P., & Vigorito, J. (1971) Speech perception in infants. *Science*. Vol. 171(3968), 303-306.

Markman, E. M. (1992) Constraints on word learning: Speculations about their nature, origins, and domain specificity. Gunnar, Megan R [Ed]; Maratsos, Michael [Ed]. Modularity and constraints in language and cognition. (pp. 59-101) Hillsdale, NJ, England: Lawrence Erlbaum Associates, Inc; England.

Werker, J. F., & Tees, R. C. (1984). Cross-language speech perception: Evidence for perceptual reorganization during the first year of life. *Infant Behavior and Development*, 7(1), 49-63

9. (11/14/11) Language 2

Berko, J. (1958). The Child's Learning of English Morphology. *Word*, 14, 150-177.

Bloom, P. (1990) Syntactic distinctions in child language. *Journal of Child Language*. Vol.17(2), pp. 343-355.

Johnson, R. & Newport, E. (1989) Critical period effects in second language learning: The influence of maturational state on the acquisition of English as a second language. *Cognitive Psychology*, Vol. 21, 60-99.

Newport, E.(1990) Maturation constraints on language learning. *Cognitive Science*, Vol. 14, 11-28.

Senghas, A. and Coppola, M. (2001) Children creating language: how Nicaraguan sign language acquired a spatial grammar. *Psychological Science*, 12, 323-328.

Terrace, H., Petitto, L., Sanders, R., & Bever, T. (1979) "Can an ape create a sentence". *Science*, Vol. 206 (4421), 891-902.

10. (11/21/11) Language and Thought

Boroditsky, L. (2001) Does language shape thought? Mandarin and English speakers' conceptions of time. *Cognitive Psychology*, Vol. 43, 1-22.

Boroditsky, L., Schmidt, L., & Phillips, W. (2003). Sex, Syntax, and Semantics. In Gentner & Goldin-Meadow (Eds.) Language in Mind: Advances in the study of Language and Cognition.

Hespos, S., & Spelke, E. (2004) Conceptual precursors to language. *Nature*. Vol. 430(6998), pp. 453-456.

Levinson, S. C. (2001). Covariation between spatial language and cognition, and its implications for language learning. In M. Bowerman and S. C. Levinson (Eds.), Language acquisition and conceptual development (pp. 566-588). Cambridge: Cambridge University Press.

Li, P., & Gleitman, L. (2002) Turning the tables: Language and spatial reasoning. *Cognition*. Vol. 83(3), pp. 265-294.

11. (11/28/11) Morality

Cushman, F. (2008) Crime and punishment: Distinguishing the roles of causal and intentional analyses in moral judgment. *Cognition*. Vol.108(2), 353-380.

Haidt, J. (2001) The emotional dog and its rational tail: A social intuitionist approach to moral judgment. *Psychological Review*. Vol.108(4), pp. 814-834.

Hamlin, J.K., Wynn, K. & Bloom, P. (2007) Social evaluation in preverbal infants. *Nature*. Vol. 450(7169), 557-559.

Kuhlmeier, V., Wynn, K. & Bloom, P. (2003) Attribution of dispositional states by 12-month-olds. *Psychological Science*. Vol.14(5), 402-408.

Rozin, P., Lowery, L., Imada, S., & Haidt, J. (1999) The CAD triad hypothesis: A mapping between three moral emotions (contempt, anger, disgust) and three moral codes (community, autonomy, divinity). *Journal of Personality and Social Psychology*. Vol.76(4), 574-586.

12. (12/5/11) Paper presentations

13. (12/12/11) Paper presentations

V. Course requirements and grading

Class presentations:

On the first day of class, students will sign up for 1-2 class meetings (depending on the number of students) during which he/she will present two articles from the required readings. Students should prepare a presentation which incorporates thought-provoking questions addressed to the class. The presentation should be comprehensive, but be open enough in format to allow for ongoing discussion.

Class participation:

Students are required to read all assigned papers before class, and ask relevant questions during each class meeting.

Discussion questions:

Students will compose questions about the readings and post their questions on Courseworks no later than 24 hours before class. Students are not allowed to replicate already posted questions. Discussion leaders should incorporate these questions into their presentation. Evaluation of the quality and quantity of questions will be included in the final grade.

Final paper presentation:

The last two classes will be devoted to a presentation of the grant experiments proposed in your final paper. Presentations will be 10 minutes, with 5 minutes for questions from your classmates, and will be graded on how well you convey the

importance of the topic, the clarity of the discussion of the design and stimuli which address your question of interest, and your responses to the questions asked.

Research proposal:

The final paper should take the form of a grant proposal. The topic can be of the student's choosing, but it must be on a subject that was discussed in class. The student must submit his/her paper idea by midterm and meet with the instructor at least one month prior to the due date, for discussion. The student's proposal should include a literature review on the topic, and should be based on the assigned readings as well as original research done in a psychology database such as PsychInfo on the topic. Important criteria for grading will be theoretical motivation and rigor, attention to design and methods, and inventiveness and value of the proposed studies. The paper should be 12-15 pages (double-spaced). It is recommended that students begin research on a topic fairly early in the semester so that he/she can develop and reflect on the ideas via class, and talk them over with the instructor during the individual meetings.

Papers will be due on Thursday 12/14, the last day of reading period.

Grading will be determined as follows:

20% Reading Presentation(s)
15% Class Participation
15% Online questions
15% Paper presentation
35% Paper