

# *NEW GRADUATE SEMINAR! (SPRING 2003)*

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## Object Cognition

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### What, When, Where, & Who

- Course # : Psychology 651b/409b (Spring 2003)
- Meeting Time : Tuesday afternoons, 2:30 pm - 4:20 pm, beginning 1/14
- Classroom : SSS 201
- Undergraduates? : Possibly, with instructor permission, depending on class size
- Course Web Page : <http://pantheon.yale.edu/~bs265/bjs-courses.html>

### Instructor Info

- Instructor : Brian Scholl (Assistant Professor, Dept. of Psychology)
- Office : SSS 304
- Email : [Brian.Scholl@yale.edu](mailto:Brian.Scholl@yale.edu)
- Web : <http://www.yale.edu/perception/>
- Phone : 432 - 4629 (but email is preferred!)
- Office Hours : TBA, + just after most classes, or by appointment

### Brief Course Description

Welcome! In this reading and discussion seminar we will explore a central question in cognitive science concerning the nature of the underlying *units* of perception and cognition. One of the most important questions that can be asked about any cognitive or perceptual process involves the nature of the underlying units over which that process operates — such investigations essentially help determine the ‘currency’ of mental processing. A broad spectrum of cognitive science research suggests that many cognitive processes operate over various types of *object* representations, wherein the world has been parsed into discrete units. We will explore the nature of such ‘object cognition’ across many seemingly disparate areas of cognitive science, such as: object-based attention in adult visual cognition, the infant’s ‘object concept’, the notion of persisting auditory objects, higher-level cognitive intuitions about object persistence, the nature of object-based neuropsychological disorders, and philosophical/metaphysical theories of persisting objecthood. In each of these areas, we will ask questions such as: What are the principles by which the mind divides the world into objects? What are the additional rules that help the mind identify a portion of the world as the same *persisting* object over time and motion? Beyond identifying persisting objects, how does the mind/brain keep track of ‘which went where’ in ecological situations involving multiple object representations? How many different types of object representations are there, and how do they interact (and fail to interact)? Beyond studying each of these topics and questions in some depth, a major goal of the seminar will be to integrate and relate material across traditional academic boundaries, since these issues have been explored in many mostly-independent sub-fields of cognitive science. As such, you might consider this course to be a ‘case study’ of cognitive science, where we explore a single set of issues across traditional academic and methodological boundaries

## Course Format

This course will be run as a reading and discussion seminar. Though there will be occasional lectures and guest presentations, the usual format will involve an extended discussion of a set of weekly readings focused on a particular aspect of object cognition. The exact topics which we end up covering will depend on the interests of the course attendees and the interest generated about specific research ideas. In almost all cases, however, the majority of the readings will be drawn from the primary research literature in several fields (vision science, developmental psychology, auditory perception research, neuropsychology, metaphysics, etc.).

The course is cross-listed as both a graduate seminar and a senior undergraduate seminar. Though the course enrollment will be sharply limited to ensure open and intimate discussion, we will likely have room for several advanced undergraduates who may attend with instructor permission.

## Requirements and Evaluation

All students attending the seminar will be expected to carefully study the background reading for each meeting, and to discuss the material in class. Students taking the seminar for credit will, in addition, be expected to submit brief (1-page) weekly reading responses, and to complete a final seminar paper or project on a relevant topic of their own choosing. In more detail:

1. (10%) Participation in Discussions

Your major task: just come to class each week prepared to discuss the day's topic(s)!

2. (30%) Weekly Reading Responses

In each class, the next week's readings will be distributed, along with a question to which you'll have to respond in a short (~ 1-page) essay. These questions will typically involve your own views on various theoretical issues involved in the readings, and they will often serve as the jumping-off point for the ensuing class discussion. Essay responses will be due no later than midnight on each Monday, the day before those readings will be discussed. I estimate that responding to these essays, once you've done the readings, should take no more than 1.5 hours/week.

3. (60%) Final Paper or Project

The only other requirement for the course will be a final paper or project, due at the very end of the semester (a week before the final grades are due — a date which may differ for different classes of students). This requirement is flexible: it can be met by a standard 10 - 15 page research paper, a 10 - 15 page proposal for some experiments you would like to run, or actually constructing and running a pilot experiment (with a very brief write-up and/or presentation). We will discuss the nature of this paper/project more fully in class, and I will frequently highlight potential topics as we encounter them. At some point near the end of the semester, I will also ask you to submit a brief list of brainstormed ideas for the paper. I invite you to view this paper/project not as an irritating class-specific requirement, but rather as an opportunity to integrate this course with your own more general research goals, by actually proposing (and then perhaps running) an experiment of your own design, which may contribute to your own graduate research goals even beyond this seminar (perhaps even eventually yielding a published paper, as has occasionally happened in previous seminars).

# Readings

A finalized reading list is not possible at this point, since which topics we cover (and how much time we spend on them) will be largely determined by your interests — especially toward the end of the seminar. The exact list of readings for each meeting will typically be distributed at least a week in advance (e.g. announced in the previous class), and will typically involve several research papers, with a total of perhaps 100 pages per week.

There will be no reading packet. Readings which are available electronically will always be posted on a class website, where you can print them out at your leisure. Other readings which are not available electronically will be placed in the Kirtland Hall mailroom at least 1 week prior to class, so that you may copy them yourselves using the Kirtland copy machine. These readings will be placed each week in a manila folder in the bottom row of mailboxes on the same wall as the main door (i.e. the faculty mailbox area), directly *under* my own mailbox.

Here is a sample list of topics and readings which we may cover, depending on your interests as the course evolves. Only a few readings are listed here for each topic, to give you the flavor of what we are likely to discuss.

## Object Cognition in Infancy: The Data

- Aguiar, A., & Baillargeon, R. (2002). Developments in young infants' reasoning about occluded objects. *Cognitive Psychology*, 45, 267 - 336.
- Feigenson, L., & Halberda, J. (submitted). Sets education: Infants chunk object arrays. . . . Manuscript submitted for publication.
- Feigenson, L., Carey, S., & Hauser, M. (2002). The representations underlying infants' choice of more: Object files versus analog magnitudes. *Psychological Science*, 13(2), 150 - 156.
- Huntley-Fenner, G., Carey, S., & Solimando, A. (2002). Objects are individuals but stuff doesn't count: Perceived rigidity and cohesiveness influence infants' representations of small groups of distinct entities. *Cognition*, 85(3), 223 - 250.
- Spelke, E., Kestenbaum, R., Simons, D. J. and Wein, D. (1995). Spatiotemporal continuity, smoothness of motion and object identity in infancy. *British Journal of Developmental Psychology*, 13, 113 - 142.
- Tremoulet, P., Leslie, A., and Hall, D. G. (2000). Infant individuation and identification of objects. *Cognitive Development*, 15, 499-522.
- Wilcox, T., & Baillargeon, R. (1998). Object individuation in infancy: the use of featural information in reasoning about occlusion events. *Cognitive Psychology*, 37, 97 - 155.
- Wilcox, T., & Chapa, C. (2002). Infants' reasoning about opaque and transparent occluders in an individuation task. *Cognition*, 85(1), B1 - B10.
- Wynn, K. (1992). Addition and subtraction by human infants. *Nature*, 358, 749 - 750.
- Wynn, K., Bloom, P., & Chiang, W-C. (2002). Enumeration of collective entities by 5-month-old infants. *Cognition*, 83 (3), B55 - B62.
- Xu, F., & Carey, S. (1996). Infants' metaphysics: the case of numerical identity. *Cognitive Psychology*, 30, 111 - 153.

## Object Cognition in Infancy: Underlying Theoretical Mechanisms

- Carey, S., & Xu, F. (2001). Infant knowledge of objects: Beyond object files and object tracking. *Cognition*, 80(1/2), 179 - 213.
- Haith, M. (1998). Who put the cog in infant cognition? Is rich interpretation too costly? *Infant Behavior & Development*, 21, 167 - 179.
- Hood, B. (2001). What do infants know about objects? [Editorial]. *Perception*, 30, 1281 - 1284.
- Scholl, B. J., & Leslie, A. M. (1999). Explaining the infant's object concept: Beyond the perception/cognition dichotomy. In E. Lepore & Z. Pylyshyn (Eds.), *What is cognitive science?* (pp. 26 - 73). Oxford: Blackwell.
- Spelke, E. (1998). Nativism, empiricism, and the origins of knowledge. *Infant Behavior & Development*, 21, 181 - 200.

## Object-Based Attention in Adult Visual Cognition

- Avramami, J. (1999). Objects of attention, objects of perception. *Perception & Psychophysics*, 61, 1604 - 1612.
- Driver, J., Davis, G., Russell, C., Turatto, M., & Freeman, E. (2001). Segmentation, attention, and phenomenal visual objects. *Cognition*, 80, 61 - 95.

- Egly, R., Driver, J., & Rafal, R. (1994). Shifting visual attention between objects and locations: Evidence for normal and parietal lesion subjects. *Journal of Experimental Psychology: General*, 123, 161 - 177.
- Luck, S., & Vogel, E. (1997). The capacity of visual working memory for features and conjunctions. *Nature*, 390, 279 - 281.
- Neisser, U., & Becklen, R. (1975). Selective looking: Attending to visually specified events. *Cognitive Psychology*, 7, 480 - 494.
- O'Craven, K., Downing, P., & Kanwisher, N. (1999). fMRI evidence for objects as the units of attentional selection. *Nature*, 401, 584 - 587.
- Scholl, B. J. (2001). Objects and attention: The state of the art. *Cognition*, 80(1/2), 1 - 46.
- Scholl, B. J., & Xu, Y. (2001). The magical number 4 in vision. [Commentary] *Behavioral and Brain Sciences*, 24(1), 145 - 146.
- Scholl, B. J., Pylyshyn, Z. W., & Feldman, J. (2001). What is a visual object? Evidence from target merging in multiple-object tracking. *Cognition*, 80(1/2), 159 - 177.
- Treisman, A. & DeSchepper, B. (1996). Object tokens, attention, and visual memory. In T. Inui and J. McClelland (Eds.) *Attention and Performance XVI: Information Integration in Perception and Communication* (pp. 15 - 46). Cambridge, MA: MIT Press.
- vanMarle, K., & Scholl, B. J. (in press). Attentive tracking of objects vs. substances. *Psychological Science*.
- Vecera, S., & Farah, M. (1994). Does visual attention select objects or locations? *Journal of Experimental Psychology: Human Perception & Performance*, 23, 1 - 14.
- Xu, Y. (2002). Limitations of object-based feature encoding in visual short-term memory. *Journal of Experimental Psychology: Human Perception & Performance*, 28(2), 458 - 468.

## **Object Persistence in Adult Visual Cognition**

- Feldman, J., & Tremoulet, P. (submitted). Individuation of visual objects over time. Manuscript submitted for publication.
- Gordon, R., & Irwin, D. (2000). The role of physical and conceptual properties in preserving object continuity. *Journal of Experimental Psychology: Learning, Memory, & Cognition*, 26(1), 136 - 150.
- Kahneman, D., Treisman, A., & Gibbs, B. J. (1992). The reviewing of object files: Object-specific integration of information. *Cognitive Psychology*, 24, 174 - 219.
- Nevarez, H. G., & Scholl, B. J. (2002). Why so slow?: The role of speed discontinuities in maintaining object persistence through occlusion. [In preparation]
- Scholl, B. J., & Nakayama, K. (2002). Causal capture: Contextual effects on the perception of collision events. *Psychological Science*, 13(6), 493 - 498.
- Scholl, B. J., & Pylyshyn, Z. W. (1999). Tracking multiple items through occlusion: Clues to visual objecthood. *Cognitive Psychology*, 38, 259 - 290.
- Sekuler, A., & Sekuler, R. (1999). Collisions between moving visual targets: What controls alternative ways of seeing an ambiguous display? *Perception*, 28, 415 - 432.
- Watanabe, K., & Shimojo, S. (1998). Attentional modulation in perception of visual motion events. *Perception*, 27, 1041 - 1054.
- Watanabe, K., & Shimojo, S. (2001). When sound affects vision: Effects of auditory grouping on visual motion perception. *Psychological Science*, 12, 109 - 116.
- Yantis, S. (1995). Perceived continuity of occluded visual objects. *Psychological Science*, 6, 182 - 186.

## **Auditory Objecthood**

- Bregman, A. S. (1990). *Auditory scene analysis: The perceptual organization of sound*. Cambridge, MA: MIT Press. [Selections]
- Bregman, A. S., & Dannenbring, G. L. (1977). Auditory continuity and amplitude edges. *Canadian Journal of Psychology*, 31, 151 - 159.
- Dannenbring, G. (1976). Perceived auditory continuity with alternately rising and falling frequency transitions. *Canadian Journal of Psychology*, 30, 99 - 114.
- Darwin, C. J., & Hukin, R. W. (1999). Auditory objects of attention: the role of interaural time-differences in attention to speech. *Journal of Experimental Psychology: Human Perception & Performance*, 25, 617 - 629.
- Kubovy, M., & Van Valkenburg, D. (2001). Auditory and visual objects. *Cognition*, 80(1/2), 97 - 126
- Warren, R., Obusek, C., & Ackroff, J. (1972). Auditory induction: Perceptual synthesis of absent sounds. *Science*, 176, 1149 - 1151.

## **Higher-Level Cognition and Objecthood: Psychological Intuitions & Metaphysics**

- Bloom, P. (2000). Object names and other common nouns. Chapter 4 of *How children learn the meanings of words*. Cambridge, MA: MIT Press.

- Hall, D. G. (1996). Naming solids and nonsolids: Children's default construals. *Cognitive Development*, 11, 229 - 264.
- Hall, D. G. (1998a). Continuity and the persistence of objects: When the whole is greater than the sum of the parts. *Cognitive Psychology*, 37, 28-59.
- Haslanger, S. (1989). Persistence, Change, and Explanation. *Philosophical Studies*, 56, 1 - 28.
- Haslanger, S. (in press). Persistence through time. In M. Loux & D. Zimmerman (Eds.), *Oxford Handbook of Metaphysics*. Oxford: Oxford University Press.
- Hirsch, E. (1982). *The concept of identity*. New York: Oxford University Press. [Selections]
- Wiggins, D. (1967). *Identity and spatio-temporal continuity*. Oxford: Basil Blackwell. [Selections]
- Wiggins, D. (1980). *Sameness and substance*. Oxford, England: Basic Blackwell. [Selections]
- Xu, F. (1997). From Lot's wife to a pillar of salt: Evidence that physical object is a sortal concept. *Mind & Language*, 12, 365 - 392

### **Object Cognition in other Primates**

- Hauser, M., & Carey, S. (in press). Spontaneous representations of small numbers of objects by rhesus macaques: Examinations of content and format. *Cognitive Psychology*.
- Munakata, Y., Santos, L., O'Reilly, R., Hauser, M.D., & Spelke, E.S. (2001). Visual representation in the wild: how rhesus monkeys parse objects. *Journal of Cognitive Neuroscience* 13(1): 44-58.
- Santos, L. (submitted). Core knowledges. Manuscript submitted for publication
- Santos, L., & Hauser, M. (2002). A non-human primate's understanding of solidity: Dissociations between seeing and acting. *Developmental Science*, 5(2), F1 - F7.
- Santos, L., Sulkowski, G., Spaepen, G., & Hauser, M. (2002). Object individuation using property/kind information in rhesus macaques (*Macaca mulatta*). *Cognition*, 83(3), 241 - 264.
- Sulkowski, G & Hauser, M.D. (2001). Can rhesus monkeys spontaneously subtract? *Cognition* 79: 239-262.
- Uller, C., Hauser, M.D., & Carey, S. (2001). Spontaneous representation of number in cotton-top tamarins. *Journal of Comparative Psychology* 115: 248-257

### **Object-based Neuropsychological Disorders**

- Behrmann, M., & Tipper, S. (1999). Attention accesses multiple reference frames: Evidence from unilateral neglect. *Journal of Experimental Psychology: Human Perception & Performance*, 25, 83 - 101.
- Cooper, A., & Humphreys, G. (2000). Coding space within but not between objects: Evidence from Balint's syndrome. *Neuropsychologia*, 38, 723 - 733.
- Driver, J., Baylis, G., Goodrich, S., & Rafal, R. (1994). Axis-based neglect of visual shapes. *Neuropsychologia*, 32, 1353 - 1365.
- Humphreys, G. W., & Riddoch, M. J. (1995). Separate coding of space within and between perceptual objects: Evidence from unilateral visual neglect. *Cognitive Neuropsychology*, 12, 283 - 311.
- Humphreys, G. W., Cinel, C., Wolfe, J., Olson, A., & Klempen, N. (2000). Fractionating the binding process: Neuropsychological evidence distinguishing binding of form from binding of surface features. *Vision Research*, 40, 1569 - 1696.
- Rafal, R. (1998). Neglect. In R. Parasuraman (Ed.), *The attentive brain* (pp. 489 - 525). Cambridge, MA: MIT Press.
- Rafal, R. D. (1997). Balint syndrome. In T. Feinberg & M. Farah (Eds.), *Behavioral neurology and neuropsychology* (pp. 337 - 356). New York: McGraw-Hill.
- Subbiah, I., & Caramazza, A. (2000). Stimulus-centered neglect in reading and object-recognition. *Neurocase*, 6, 13 - 31.
- Tipper, S., & Behrmann, M. (1996). Object-centered not scene-based visual neglect. *Journal of Experimental Psychology: Human Perception & Performance*, 22, 1261 - 1278.

### **Higher-Level Attributions to Objects: Animacy & Intentionality**

- Abell, F., Happé, F., & Frith, U. (2000). Do triangles play tricks? Attribution of mental states to animated shapes in normal and abnormal development. *Cognitive Development*, 15, 1 - 16.
- Bloom, P., & Veres, C. (1999). The perceived intentionality of groups. *Cognition*, 71, B1 - B9.
- Blythe, P., Todd, P., & Miller, G. (1999). How motion reveals intention: Categorizing social interactions. In G. Gigerenzer, P. Todd, & the ABC Research Group, *Simple heuristics that make us smart* (pp. 257 - 285). New York: Oxford University Press.
- Castelli, F., Happé, F., Frith, U., & Frith, C. (2000). Movement and mind: A functional imaging study of perception and interpretation of complex intentional movement patterns. *Neuroimage*, 12, 314 - 325.
- Csibra, G., Gergeley, G., Biró, S., Koós, O., & Brockbank, M. (1999). Goal attribution without agency cues: The perception of 'pure reason' in infancy. *Cognition*, 72, 237 - 267.

- Gelman, R., Durgin, F., & Kaufman, L. (1995). Distinguishing between animates and inanimates: Not by motion alone. In D. Sperber, D. Premack, & A. Premack (Eds.), *Causal cognition: A multidisciplinary debate* (pp. 150 - 184). Oxford: Clarendon Press.
- Heberlein, A. et al. (1998). Impaired attribution of social meanings to abstract dynamic geometric patterns following damage to the amygdala. *Society for Neuroscience Annual Meeting Abstracts*.
- Heider, F., & Simmel, M. (1944). An experimental study of apparent behavior. *American Journal of Psychology*, 57, 243 - 249.
- Michotte, A. (1950/1991). The emotions regarded as functional connections. Reprinted in Thinès, G., Costall, A., & Butterworth, G. (Eds.), *Michotte's experimental phenomenology of perception* (pp. 103 - 116). Hillsdale, NJ: Erlbaum, 1991
- Opfer, J. (2002). Identifying living and sentient kinds from dynamic information: The case of goal-directed versus aimless autonomous movement in conceptual change. *Cognition*, 86, 97 - 122.
- Scholl, B. J., & Tremoulet, P. D. (2000). Perceptual causality and animacy. *Trends in Cognitive Sciences*, 4(8), 299 - 309.