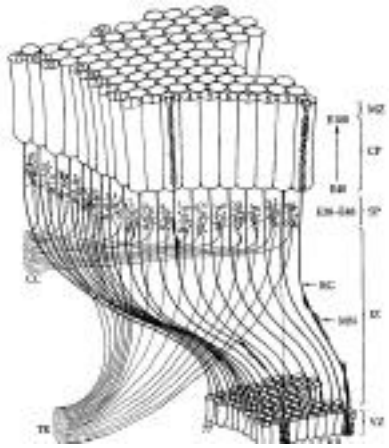
PSY 511.002
Brain Development and Cognition
Seminar
Spring 2001

F 9:30 AM - 12:30 PM
352 Moore Building



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Goals

The human brain consists of approximately 100 billion neurons, but only a fraction of these cells are appropriately connected to one another at birth. As a consequence, the rapid changes in perceptual, cognitive, motor, and emotional behavior observed in early childhood coincide with a period of dramatic development in the nervous system. This seminar will examine recent theoretical and experimental work focused on the relationship between brain and cognitive development early in life.

We will read and examine critically primary source readings that discuss basic patterns and processes of brain development. Our goal will be to understand how cognitive development in infancy and childhood might be related to changes in the nervous system. Topics will include: biological perspectives on development, the processes of brain maturation and their relationship to cognitive development, brain plasticity and its relationship to cognition, the neurological basis of developmental disorders, and processes of self-organization in development.

Resources

Johnson, M.H. (1993). Brain Development and Cognition: A Reader. Oxford: Blackwell.

PSY 511.002 Course Packet [Forthcoming].

Evaluation

Components

Paper presentations, summaries	33.3%
Participation	33.3%
Paper	33.3%

Grading scale

95-100%	A
90-94.9%	A-
87.7-89.9%	B+
83.33-87.6%	B
80-83.32%	B-
75-79.9	C+
70-74.9	C
60-69.9	D
<59.9	F

Academic Integrity

Students are reminded of their responsibility for maintaining academic integrity. Cheating on exams or plagiarism of assignments or papers from other students or from published sources may result in a grade of F for the course and may result in other penalties. An important part of scientific research is providing appropriate references to other work; failure to do so constitutes plagiarism. Much scientific writing involves summarizing the work of others, so it is important to recognize that unacknowledged quotation constitutes plagiarism even in such cases. Acknowledging the work of others requires that (a) quotations be clearly identified as such, and (b) specific references to authors (and for direct quotes, page numbers) be provided. All written work is expected to be in the student's own words!

Structure of course

PAPER PRESENTATIONS

Each week we will discuss 2-3 papers. For each of the assigned readings (except the introductory sections by Johnson) a student will be assigned to prepare both a short (5-10 min) oral presentation that summarizes the main points the paper and a 1 page written summary. The written summaries will be passed out to the other students in class. Each student will have an opportunity to serve as a paper presenter several times throughout the semester.

PARTICIPATION

In addition to the student-led paper presentations, each week those students who are not presenting must submit by email three (3) discussion questions for each reading to be covered that week. The discussion questions must be submitted to me **24**

hours before the class meeting of that week in order to get full class participation credit. In addition, students are expected to contribute actively to class discussions.

PAPER

The final evaluation component will be a 15-20 page paper on a topic related to the themes of the course. A one-page summary of the topic of this paper is due in class the week after Spring Break. The final paper is due on Monday, April 30, 2001 by 5:00 PM. However, during the final two course meetings, each student will provide a short (10-15 min) presentation of the main themes and issues their paper addresses and how these relate to topics discussed in the course.

Schedule

Week 1 (1/8-12) Course organization

Week 2 (1/15-19) Perspectives on development

Lorenz, K. (1965). Critique of the modern ethologists' attitude. In K. Lorenz, Evolution and the Modification of Behavior. Chicago: University of Chicago Press, Chapter 5, pp. 29-48. [Johnson, 1993]

Oyama, S. (2000). The problem of change. In S. Oyama, The Ontogeny of Information (2nd Edition), Durham, NC: Duke University Press, Chapter 3, pp. 24-35. [Packet]

Week 3 (1/22-26) Perspectives on development II

Piaget, J. (1971). The epigenetic system and the development of cognitive functions. In J. Piaget, Biology and Knowledge. Edinburgh University Press and University of Chicago Press, section 2, pp. 14-23. [Johnson, 1993]

Gottlieb, G. (1992). Individual Development and Evolution. Oxford University Press, Chapter 13, pp. 158-172. [Packet]

Week 4 (1/29-2/2) Brain maturation

Nowakowski, R.S. & Hayes, N.L. (2001). General principles of CNS development. [Packet]

Rakic, P. (1988). Intrinsic and extrinsic determinants of neocortical parcellation: A radial unit model. In P. Rakic and W. Singer (Eds.), Neurobiology of Neocortex, John Wiley & Sons, pp. 5-27. [Johnson, 1993]

Week 5 (2/5-9) Brain maturation II

Huttenlocher, P.R. (1990). Morphometric study of human cerebral cortex. Neuropsychologia, 28, 517-527. [Johnson, 1993]

Chugani, H.T., Phelps, M.E., & Mazziotta, J.C. (1987). Positron Emission Tomography study of human brain functional development. Annals of Neurology, 22, 487-497. [Johnson, 1993]

Week 6 (2/12-16) Brain maturation and cognition

Johnson, M. H. (1995). The development of visual attention: A cognitive neuroscience perspective. In M. S. Gazzaniga (Ed.), The Cognitive Neurosciences (pp. 735-747). Cambridge, MA: MIT Press. [Packet]

Nelson, C.A. (1995). The ontogeny of human memory: A cognitive neuroscience perspective. Developmental Psychology, 31(5), 723-728. [Packet]

Week 7 (2/19-23) Brain plasticity

Greenough, W.T, Black, J.E, & Wallace, C.S. (1987). Experience and brain development. Child Development, 58, 539-559. [Johnson, 1993]

O'Leary, D.M. (1989). Do cortical areas emerge from a protocortex? Trends in the Neurosciences, 12, 400-406. [Johnson, 1993]

Shatz, C.J. (1996). Emergence of order in visual system development. Proceedings of the National Academy of Sciences of the United States of America, 93(2), 602-608. [Packet]

Week 8 (2/26 - 3/2) Brain Plasticity and Cognition

Neville, H., & Bavelier, D. (1999). Specificity and plasticity in neurocognitive development in humans. In M. Gazzaniga (Ed.), The New Cognitive Neurosciences (2nd Ed), Cambridge MA: MIT Press, pp. 83-98. [Packet]

Merzenich, M., Wright, B., Jenkins, W., Xerri, C., Byl, N., Miller, S., & Tallal, P. (1996). Cortical plasticity underlying perceptual, motor, and cognitive skill development: Implications for neurorehabilitation. Cold Spring Harbor Symposia on Quantitative Biology, 61, 1-8. [Packet]

SPRING BREAK (3/5-3/9)

Week 9 (3/12-16) Constraints on plasticity

Paper topic summaries due.

Marler, P. (1991). The instinct to learn. In S. Carey and R. Gelman, The Epigenesis of Mind: Essays on Biology and Cognition, Lawrence Erlbaum Associates, 37-66. [Johnson, 1993]

Stiles, J., Bates, E.A., Thal, D., Trauner, D., & Reilly, J. (1998). Linguistic, Cognitive, and Affective Development in Children with Pre- and Perinatal Focal Brain Injury: A Ten-Year Overview from the San Diego Longitudinal Project. Advances in Infancy Research, Vol. 12. Ablex: Norwood NJ. 131-164. [Packet]

Week 10 (3/19-23) Cognitive Neuroscience Conference—NO MEETING

Week 11 (3/26-30) Self-organization in development

O'Reilly, R.C. & Johnson, M.H. (1994). Object recognition and sensitive periods: A computational analysis of visual imprinting. Neural Computation, 6, 357-390. [Packet]

Thelen, E. (1989). Self-organization in developmental processes: Can system approaches work? In M. Gunnar and E. Thelen (Eds.), Systems and Development. The Minnesota Symposium on Child Psychology, Volume 22, Lawrence Erlbaum Associates, 77-117. [Johnson, 1993]

Week 12 (4/2-6) New Directions

Karmiloff-Smith, A. (1998). Development itself is the key to understanding developmental disorders. Trends in Cognitive Science, 2(10),389-398 . [Packet]

Bates, E.A. & Elman, J.L. (2001). Connectionism and the study of change. In M.H. Johnson (Ed.), Brain Development and Cognition, Blackwell, 623-642. [Packet]

Week 13 (4/9-13) New Directions II

Diamond, A. (2000). A model system for studying the role of dopamine in prefrontal cortex during early development in humans: early and continuously treated phenylketonuria (PKU). In M. Rutter (Ed.), Handbook of Cognitive Neuroscience. Cambridge, MA: MIT Press. [Distributed separately]

Pennington, B.F. (in press). Genetic methods. In M. Johnson, Y. Munakata, & R. Gilmore (Eds.), Brain Development and Cognition: A Reader (Second Ed.). Cambridge: Blackwell. [Packet]

Week 14 (4/16-20) SRCD Conference—NO MEETING

Week 15 (4/23-27) Student presentations

Week 16 (M 4/30) Papers due by 5:00 PM