

**PSYC889J – Developmental Cognitive Neuroscience**  
Spring 2009  
Thursdays 12:30-3:00pm  
Plant Science Building (PLS) 1172

**Instructor**

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**Course Description and Goals:** Developmental cognitive neuroscience is an evolving field that investigates the relations between neural and cognitive development. This seminar will provide an overview of the current research questions, methodologies, and findings from this field. Topics will include: principles of brain development (from a neurocognitive perspective), techniques used for the study of brain development in human infants and children (EEG, ERPs, MRI, fMRI, and NIRS), neurocognitive development (with an emphasis on the domains of memory, attention, language, face processing, and social cognition), developmental plasticity, and neurodevelopmental disorders (e.g., Chromosome 22q11.2 deletion syndrome, Autism, and Williams Syndrome). The goal of the course is to facilitate understanding of the brain bases of developing sensorimotor and cognitive systems, including pathological alterations in developmental disorders.

**Prerequisites:** This course is open to graduate students in psychology, NACS, human development, linguistics, hearing and speech sciences, kinesiology, and related disciplines. Prior coursework in developmental or cognitive science is preferred but not required.

**Course Requirements**

Attendance

Because this seminar will rely on the active analysis of course readings during class discussion, attendance and participation are essential both to learning something from the class and for the course grade. Students are expected to read the assigned material and arrive at class ready to engage in a scholarly discussion of the week's topic.

Readings

Each week, 5 to 6 primary papers are assigned. Students are to complete all the readings for the week before the class meeting and arrive at class reading to engage in a detailed discussion of each paper. Readings will be made available via electronic reserve on Blackboard ([www.elms.umd.edu](http://www.elms.umd.edu)).

Presentations

Each student will lead class discussion 2 times over the course of the semester. Students will work in pairs of 2 and will lead the group's discussion for the week based on the assigned readings. The goal is to engage the group in a discussion, so detailed formal presentations are discouraged. Instead, leaders should construct a detailed agenda of issues for discussion. Each student on the team is expected to play an active role in leading the discussion. Presenting teams are highly

encouraged to meet with the instructor one to two weeks before their presentation to begin preparation. Separate grades will be given for each student's contribution to leading the discussion.

### Reaction Papers

To help facilitate the student lead discussion, students will write 3 reaction papers over the course of the class (1 from each "section" of the course; see below). These papers are due in-class the day of the discussion and can not be written for a class for which the student is leading the discussion. Reaction papers can be based on an individual article, on a pair of articles that contrast, or on the week's reading as a whole (approximately 3 double spaced pages each).

Section 1: January 29, 2009 – February 26, 2009

Section 2: March 5, 2009 – April 2, 2009

Section 3: April 9, 2009 – May 7, 2009

### Final Paper

Students will write a theoretical review paper (approximately 15 double spaced pages) due Monday, May 11. The paper should review of an aspect of the recent literature in developmental cognitive neuroscience. Ideally, students can use this paper as an opportunity to enrich their perspective on their own research topics. Material should be focused and motivated by a clear set of theoretical and empirical questions and inclusion of various perspectives within the field should be discussed. Papers must be original work for this class.

### **Grading**

Late papers will not be accepted and missed assignments cannot be made up except under exceptional circumstances. Final grades will be based on in-class participation (10%), 2 in-class presentations (20% each, 40% total), 3 reaction papers (5% each, 15% total), and a final paper (35%).

### **Course Evaluations**

Online course evaluations via CourseEvalUM will be available between Tuesday, April 28 through Wednesday, May 13 at [www.courseevalum.umd.edu](http://www.courseevalum.umd.edu). Please complete this anonymous evaluation. Your participation makes a real contribution to the academic program and provides critical information to faculty and administrators on how to improve teaching and learning at Maryland.

### **Class Conduct**

All students are expected to conduct themselves professionally and with respect for the speakers and students who participate in this course.

### **Academic Integrity**

The University of Maryland has a nationally recognized Code of Academic Integrity, administered by the Student Honor Council. This Code sets standards for academic integrity at Maryland for all undergraduate and graduate students. As a student you are responsible for upholding these standards for this course. It is very important for you to be aware of the consequences of cheating, fabrication, facilitation, and plagiarism. For more information on the Code of Academic Integrity or the Student Honor Council, please visit: <http://www.shc.umd.edu/>

**Religious Observance**

Students who must miss class for religious reasons can do so without penalty. If you anticipate a conflict, it is your responsibility to notify me in writing (email is acceptable) by Friday, February 6, 2009.

**Inclement Weather and Campus Emergency Policy**

We will hold class unless there is an official closure or delay announced by the University. Official closures and delays are announced on the campus website (<http://www.maryland.edu/>) and snow phone line (301-405-SNOW) as well as local radio and TV stations. In the event that the campus is closed for an extended time due to emergency, students will be notified by e-mail regarding how the course will be continued or completed. Please make sure that you have a current e-mail address listed with the University at all times.

**Students with special needs or disabilities**

If you are a student with a documented disability, please speak to me privately by Friday, February 6, 2009 to discuss academic accommodations that will help you be successful in class.

## Schedule

Changes in topics or reading assignments will be announced in class.

### Overview

Section	Date	Topic
Section 1	January 29, 2009	Introduction
	February 5, 2009	The emerging field of developmental cognitive neuroscience
	February 12, 2009	Brain development
	February 19, 2009	Methods, paradigms, and techniques for studying brain development
	February 26, 2009	Plasticity, experience, self organization, and interactive specialization
Section 2	March 5, 2009	Vision, orienting, and attention
	March 12, 2009	Perception and recognition: Objects, faces, number, and visual spatial abilities
	March 19, 2009	No class - Spring Break
	March 26, 2009	A neurobehavioral perspective on memory development (Note:1-3:30pm)
	April 2, 2009	No class - SRCD
Section 3	April 9, 2009	Language (Note: 1-3:30pm, 2101 Benjamin Bldg)
	April 16, 2009	Executive functioning, planning and development of frontal cortex
	April 23, 2009	Social cognition, emotion/cognition interactions
	April 30, 2009	Future directions and implications for education and media
	May 7, 2009	No class - TR away

### January 29 – Introduction

### February 5 –The emerging field of developmental cognitive neuroscience

Diamond, A., & Amso, D. (2008). Contributions of neuroscience to our understanding of cognitive development. *Current Directions in Psychological Science*, 17(2), 136-140.

Johnson, M. H. (2005). The biology of change. *Developmental Cognitive Neuroscience*. (pp. 1-18). Malden, MA: Blackwell Publishing.

Lewin, R. (1984). Why is development so illogical? *Science*, 224, 1327-1329.

Munakata, Y, Casey, B.J., & Diamond, A. (2004). Developmental cognitive neuroscience: progress and potential. *TRENDS in Cognitive Sciences*, 8(3), 122-128.

Nelson, C. A., de Haan, M., & Thomas, K. M. (2006). Why should developmental psychologists be interested in the brain? Historical Background. *Neuroscience of Cognitive Development*. (pp. 1-3). Hoboken, NJ: John Wiley & Sons.

Nelson, C. A., Moulson, M. C., & Richmond, J. (2006). How does neuroscience inform the study of cognitive development? *Human Development*, 49, 260–272.

## **February 12 – Brain development**

Casey, B.J., Jones, R. M., & Hare, T. A. (2008). The adolescent brain. *Annals of the New York Academy of Sciences*, 1124, 111–126.

Cicchetti, D. (2002). How a child builds a brain: Insights from normality and psychopathology. In W. Hartup & R. Weinberg (Eds.), *Minnesota symposia on child psychology: Child psychology in retrospect and prospect* (Vol. 32, pp. 23-71). Mahwah, NJ: Lawrence Erlbaum Associates.

de Haan, M. & Johnson, M. H. (2003). Mechanisms and theories of brain development. In M. de Haan & M. H. Johnsons (Eds.), *The Cognitive Neuroscience of Development* (pp. 1-18). East Sussex: Psychology Press.

Johnson, M. H. (2005). Building a brain. In *Developmental Cognitive Neuroscience* (pp. 19-52, esp. 40-52). Malden, MA: Blackwell Publishing.

Lewin, R. (1980). Is your brain really necessary? *Science*, 210, 1232-34.

Moulson, M. C., & Nelson, C. A. (2008). Neurological development. In M. M. Haith & J. B. Benson (Eds.), *Encyclopedia of Infant and Early Childhood Development*, Elsevier, Inc.

Nowakowski, R. S. & Hayes, N. L. (2002). General principles of CNS development. In M. H. Johnson, Y. Munakata & R. O. Gilmore (Eds.), *Brain Development and Cognition: A Reader* (pp. 57–82), Oxford, UK: Blackwell Publishing.

## **February 19 – Methods, paradigms, and techniques for studying brain development**

Casey, B.J., Tottenham, N., Liston, C. & Durston, S. (2005). Imaging the developing brain: What have we learned about cognitive development? *TRENDS in Cognitive Sciences*, 9(3), 104-110.

DeBoer, T., Scott, L.S., & Nelson, C.A. (2007). Methods for acquiring and analyzing infant event-related potentials. In: Michelle de Haan (Ed.), *Infant EEG and Event-Related Potentials*. (pp. 5-37). New York: Psychology Press.

Johnson, M. H., Halit, H., Grice, S. J., & Karmiloff-Smith, A. (2002). Neuroimaging of typical and atypical development: A perspective from multiple levels of analysis. *Development and Psychopathology*, 14, 521–536.

Meek, J. (2002). Basic principles of optical imaging and application to the study of infant development. *Developmental Science*, 5(3), pp. 371-380.

Paetau, R. (2002). Magentoencephalography in pediatric neuroimaging. *Developmental Science*, 5(3), 361-371.

Thomas, K. M., & Tseng, A. (2008). Functional MRI methods in developmental cognitive neuroscience. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd edition*, (pp. 311-323). Cambridge, MA: The MIT Press

## **February 26 - Plasticity, experience, self organization, and interactive specialization**

Cicchetti, D. (1996). Equifinality and multifinality in developmental psychopathology. *Development and Psychopathology*, 8, 597-600.

Constantine-Paton, M. (2000). The plastic brain. *Neurobiology of Disease* 7, 515–519.

Elbert, T., Heim, S., & Rockstroh, B. (2001). Neural plasticity and development. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 1st Edition*. (pp. 191-202). Cambridge, MA: The MIT Press.

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

Johnson, M. H. (2005). Interactive specialization. *Developmental Cognitive Neuroscience*. (pp. 164-177). Malden, MA: Blackwell Publishing.

Nelson, C. A. (1999). How important are the first 3 years of life? *Applied Developmental Science*, 3(4), 235-238.

Nelson, C. A., de Haan, M., & Thomas, K. M. (2006). Neural Plasticity: Background. *Neuroscience of Cognitive Development* (pp. 30-43). Hoboken, NJ: John Wiley & Sons.

## **March 5 - Vision, orienting, and attention**

Dannenmiller, J. L. (2001). Early visual development. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 1st Edition*. (pp. 221-235). Cambridge, MA: The MIT Press.

Johnson, M. H. (2005). Vision, orienting and attention. *Developmental Cognitive Neuroscience*. (pp. 53-77, esp. 53-72). Malden, MA: Blackwell Publishing.

Nelson, C. A., de Haan, M., & Thomas, K. M. (2006). Development of attention. *Neuroscience of Cognitive Development* (pp. 154-158). Hoboken, NJ: John Wiley & Sons.

Richards, J. E. (2008). Attention in young infants. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd Edition*. (pp. 479-497). Cambridge, MA: The MIT Press.

Rothbart, M. K. & Posner, M. I. (2001). Mechanism and variation in the development of attentional networks. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 1st Edition*. (pp 353- 363). Cambridge, MA: The MIT Press

### **March 12 - Perception and recognition: Objects, faces, number, and visual spatial abilities**

Atkinson & Braddock (2003). Neurobiological models of normal and abnormal visual development. In M. de haan & M. H. Johnson (Eds.), *The Cognitive Neuroscience of Development*. (pp: 43-71). East Sussex: Psychology Press.

Carey, S. (2001). Bridging the gap between cognition and developmental neuroscience: The example of number representation. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 1st edition*. (pp. 415-431) Cambridge, MA: The MIT Press.

de Haan, M. (2008). Neurocognitive mechanisms for the development of face processing. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd edition*. (pp. 509-520). Cambridge, MA: The MIT Press.

Johnson, M. H., Mareschal, D., & Cisbra, G. (2008). The development and integration of the dorsal and ventral visual pathway in object processing. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd edition*, (pp. 467-478). Cambridge, MA: The MIT Press.

Stiles, J., Paul, B., & Ark, W. (2008). The development of visuospatial processing. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd edition*. (pp. 521-540). Cambridge, MA: The MIT Press.

### **March 19 – No class – Spring Break**

### **March 26 – A neurobehavioral perceptiveness on memory development – Tracy Riggins**

**Note: Joint class with Dr. Bolger, Meeting time: 1-3:30pm, Location: PLS 1172**

Bauer, P. J. (2008). Toward a neuro-developmental account of the development of declarative memory. *Developmental Psychobiology*, 50, 19-31.

de Haan, M., Mishkin, M., Baldeweg, T., & Vargha-Khadem, F. (2006). Human memory development and its dysfunction after early hippocampal injury. *TRENDS in Neurosciences*, 29(7), 374-381.

Nelson, C. A. (2000). Neural plasticity and human development: the role of early experience in sculpting memory systems. *Developmental Science*, 3:2, 115-136.

Nelson, C.A. (2007). A Developmental Cognitive Neuroscience Approach to the Study of Atypical Development: A Model System Involving Infants of Diabetic Mothers. In G. Dawson, K. Fischer, and Donna Coch (Eds.), *Human Behavior and the Developing Brain*, 2nd edition. (pp. 1–27). Guilford Press: New York.

Richmond & Nelson (2008). Mechanisms of change: A cognitive neuroscience approach to declarative memory development. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd edition*. (pp 541-552). Cambridge, MA: The MIT Press.

Riggins, T., Miller, N. C., Bauer, P. J., Georgieff, M. K., & Nelson, C. A. (2009). Electrophysiological indices of memory for temporal order in early childhood: Implications for the development of recollection. *Developmental Science*, 12(2), 209-219.

## **April 2 – No class – Meeting for the Society for Research in Child Development**

### **April 9 – Language – DJ Bolger**

**Note: Joint class with Dr. Bolger, Meeting time: 1-3:30pm, Location: Benjamin Building 2102**

*Readings TBA*

## **April 16 - Executive functioning, planning and development of frontal cortex**

Diamond, A (2002). A model system for studying the role of dopamine in the prefrontal cortex during development in humans. In M. H. Johnson , Y. Munakata, & R. Gilmore (Eds.), *Brain Development and Cognition: A Reader* (2nd ed., pp.441-493). Oxford: Blackwell.

Johnson, M. H. (2005). Frontal cortex, object permanence, and planning. *Developmental Cognitive Neuroscience*. (pp. 146-157). Malden, MA: Blackwell Publishing.

Nelson, C. A., de Haan, M., & Thomas, K. M. (2006). The development of higher cognitive (executive) functions. *Neuroscience of Cognitive Development* (pp. 143-153). Hoboken, NJ: John Wiley & Sons.

Olson, E. A. & Luciana, M. (2008) The development of prefrontal cortex functions in adolescence: Theoretical models and a possible dissociation of dorsal versus ventral. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd edition*. (pp.575-590). Cambridge, MA: The MIT Press



Zelazo, P. D., Carlson, S. M., Kesek, A. (2008). Development of executive function in early childhood. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd edition*. (pp. 553-574). Cambridge, MA: The MIT Press.

### **April 23 - Social cognition, emotion/cognition interactions**

Crone, E. A. & Van Der Molen, M. (2008). Neurocognitive development of performance monitoring and decision making. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd edition*. (pp.883-895). Cambridge, MA: The MIT Press.

Davis, E. P., Parker, S. W., Tottenham, N., & Gunnar, M. R. (2003). Emotion, cognition, and the hypothalamic-pituitary-adrenocortical axis: a developmental perspective. In M. de haan & M. H. Johnson (Eds.), *The Cognitive Neuroscience of Development*. (pp. 181-206). East Sussex: Psychology Press.

Nelson, C.A., Zeanah, C. H., Fox, N. A., Marshall, P. J., Smyke, A. T., Guthrie, D. (2007). Cognitive recovery in socially deprived young children: The Bucharest early intervention project. *Science*, 318, 1937-1940.

Nelson, C. A., de Haan, M., & Thomas, K. M. (2006).Development of social cognition. *Neuroscience of Cognitive Development* (pp. 119-142). Hoboken, NJ: John Wiley & Sons.

Shackman, J. E., Wisner Fries, A. B., & Pollak, S. D. (2008). Environmental influences on brain-behavioral development: Evidence from child abuse and neglect. In C. A. Nelson & M. Luciana (Eds.), *Handbook of Developmental Cognitive Neuroscience 2nd edition*. (pp.869-881). Cambridge, MA: The MIT Press.

### **April 30 - Future directions and implications for education and media**

Ansari, D & Coch, D. (2007). Bridges over troubled waters: Education and Cognitive Neuroscience. *TRENDS in Cognitive Sciences*, 10(4), 146-151.

Goswami, U. (2006). Neuroscience and education: from research to practice? *Nature Reviews Neuroscience* 7, 406-413.

Johnson, M. H. (2005). Toward an integrated developmental cognitive neuroscience. *Developmental Cognitive Neuroscience* (pp. 178-187). Malden, MA: Blackwell Publishing.

Nelson, C. A., de Haan, M., & Thomas, K. M. (2006). The future of developmental cognitive neuroscience. *Neuroscience of Cognitive Development* (pp. 159-160). Hoboken, NJ: John Wiley & Sons.

Thompson, R.A. & Nelson, C.A. (2001). Developmental Science and the Media. *American Psychologist*, 56(1), 5-15.

**May 7 – No class – TR away**