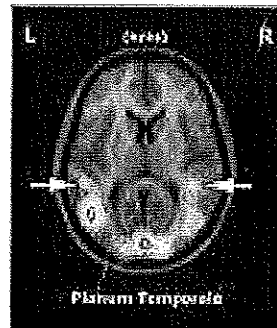
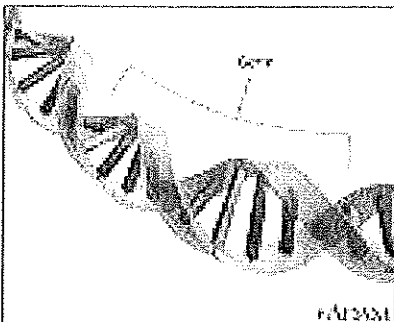


Syllabus
"Genes, Brain, and The Development of Mind"
Current Topics in Developmental Psychology
PSYD26

Winter 2009
Professor Laura-Ann Petitto
Tuesdays 3:00-5:00

Instructor: Professor/Dr. Laura-Ann Petitto
Class Time: Tuesdays, 3:00pm-5:00pm
Petitto's Office: New Science Building, SY122
Office Hours: Mondays, 2:00pm to 3:00pm
Phone: 416-208-4870
E-mail: petitto@utsc.utoronto.ca



COURSE DESCRIPTION

In this advanced seminar we will explore a revolutionary new approach to the study of human development and the development of human higher cognitive capacities. This truly ground-breaking approach builds on the advent of innovative DNA Genotyping analyses of groups of genes that have been linked with aspects of higher cognition. The approach joins 3 disciplines: *DNA Genotyping* with the most advanced *Brain Imaging* technology from cognitive neuroscience and the leading *Behavioral* psycholinguistic and developmental methods from psychology. Together, the unification of these three disciplines affords the most stunning new lens into the evolution and nature of the human mind to date, including human cognition, aspects of emotion and social behavior, language, reading and language disorders, math and numeracy, and creativity. Through exciting discussion, critical evaluation, and lively debate, the course will lay bare this significant modern scientific advancement of thought and methods. It will further consider seriously its greater ethical and moral impact on society and the conduct of scientific inquiry.



REQUIRED READINGS

All of the required course readings can be found on Blackboard for downloading and printing.

BLACKBOARD

Blackboard will be your course "life line." It is where you will find most of the class readings to download, my general communications (e.g., my general announcements), as well as other course materials that were given out in class (e.g., syllabus, and handouts). This is where you will post Questions related to your student-led class presentations that you would like the class to think about – that is, the Questions that you will use to guide important class Discussions. This will be done using the "Discussion Board" feature. Questions for student-led class Discussions must be posted no later than Thursday night (midnight) the week before you present. Blackboard will also be a vital "virtual classroom" where class members may ask and answer each other's questions. Note: Please use only email for any direct questions for and/or communications with me (Professor Petitto).

Recommendation: Immediately familiarize yourself with Blackboard and get in the habit of checking it regularly. If you are registered in the course, simply go to portal.utoronto.ca. Enter your UTOR ID and click on the course.

COURSE STRUCTURE

This course is designed with the most cutting-edge understanding of psychological principles of human learning and memory, involving, for example, how we learn best, how we remember best, and how we learn for life. Lecturing will be kept at a minimum. On most days, the class will consist of student-led discussions with the goal of promoting meaningful understanding, critical thinking, and deep learning of the material.

OBJECTIVES

The primary objectives of this course are to *think* deeply about the material, to *develop critical reasoning skills*, and to *learn* the material in a way that stays with you for life. *Why?* Because the present course material is fundamentally about all of us—the complex factors that impact all human development—and it will reveal developments that we will witness in all young people of our species (be they our own children, children in our extended families, or children in the greater community). Indeed, the contents of this course will help us discover some of the secrets of what it means to be human—to be alive.

RESPONSIBILITIES

Your primary responsibility in this course will be to think, engage in serious critical reasoning, and to learn about the material at hand. I have a genuine passion for teaching and, as such, I try to think up ways to convey key course material so that you will remember it for always. To this end, I've discovered some key ways to present our course material. To benefit fully from these techniques it is your responsibility to (i) read every assigned reading precisely on time (that is, before you enter each class), (ii) attend classes and fully participate in the activities and discussions, (iii) hand in Reaction Papers at the beginning of each class (save the class in which you present); do monitor Blackboard for class questions/announcements/developments, (iv) lead a class with a classmate, (v) write and present a Poster with a classmate. (Indeed, team work and the benefits it affords, called

"distributed reasoning," are helpful to life-long learning, and, thus, are important in this class!)

GRADING POLICY (See below for details)

- (i) Reaction Papers 25%
- (ii) Class Attendance 10%
- (iii) Class Participation 15%
- (iv) Discussion Leadership 25%
- (v) Poster Presentation 25%



(i) Reaction Papers (Note: Do not hand in for week that you are leading the class.)

- Goal: To promote exciting discussion and to convince me that you read and understood the paper(s).
- How: The content of this paper should include (a) an exceedingly brief statement of the overarching question/finding in the paper (e.g., not more than 2 sentences max). Said another way, do not waste space summarizing the article. Instead, provide a (b) critique/analysis of the findings and/or a critique/analysis of the author(s)' interpretation(s) of findings; and, (c) where relevant, this may include your discussion of an alternative idea or an alternative study/design. Do be sure to focus on your important critique and analysis of the ideas in the paper.
- Format: One (or two) pages MAXIMUM, double-spaced, 1" margins, 12-point "normal" font (such as, Arial, Times). Separately, you may include an additional page for References (should you read any additional articles; this is optional and non-required). Strict adherence to this page limit is obligatory. "Less is more."

(ii) and (iii) Class Attendance and Class Participation

- Goal: To ensure rich individual learning and rich group discussion
- How: I will keep a log throughout the term. Possible indices of good participation include coming to class (and coming on time), general willingness to participate in discussion and/or class activities, respect and kind manner towards the contributions of others, offering constructive comments, feedback, and questions. Beware: We must avoid a situation whereby only a handful of people talk for the entire semester.

(iv) Discussion Leadership

- Goal: To promote outstanding reasoning abilities, life-long learning, and exciting discussion; to promote more in-depth learning of specific course topics.
- How: Students will be selected by lottery to be a "Discussion Leader" for each of the classes listed below as a Student-Led Class/Discussion. Teams of approximately 2 students will constitute the "Discussion Leaders" for a given class. Discussion Leaders will (a) present a *brief* summary of the weekly readings, with the addition of the ONE outside reading that I provided, in addition to at least ONE extra outside reading that your group completed (T=2 extra readings, in addition to the readings assigned to the whole class), and (b) lead a creative and exciting class discussion. Please be sure to identify the outside reading to the class/me, making connections and supporting the additional insights gained by its inclusion. Recall that your class discussion *Questions* must be posted by Thursday night (midnight) of the preceding week. Be careful to

meet, plan, and make certain that each group member is actively (and equally) involved.

- Format: Excellent presentation of ideas (and not just the idea itself) counts in science. Design your presentation such that the ideas are conveyed in a fascinating way that *promotes learning*. For example, use PowerPoint creatively, design class activities that push class members to new conceptual understanding. Break the class into smaller groups to gain new perspectives on the same issue. Be creative, but be careful not to be silly. TV show contests, and the like, should be avoided unless the ideas conveyed are absolutely riveting, apt, and presented in a sophisticated and thought-provoking way.

(v) Poster Presentation

- Goal: To apply all that you learned throughout the course by designing an original Research Proposal to be presented in APA-style Poster Presentation format, in which you join the 3 disciplines of *Genes, Brain, and Behavior*, though you will not collect any data.
- Topic: The topic of your Research Project/Proposal may be one of your choice in consultation with your partner. Specifically, you will join another person to form a group of at least two people. The topic of your Research Project may not be the same content as your student-led Discussion Leadership presentation.
- How: Teams of approximately 2 students will work together to produce a poster ("Research Project"). The proposed Research Project, will be presented in the form of a standard APA-style poster presentation (typical of professional conferences in the psychological sciences) in which you provide a crystal clear statement of the Question (with appropriate background literature/rationale), Hypotheses, proposed Participants (and/or Participant Groups), Methods, Analyses, and expected research *Results (as per each of your Hypotheses), Discussion/Conclusion (in which the significance/advance of your particular study is highly apparent), and References, in which— crucially— you study a question that joins the 3 disciplines of *Genes, Brain, and Behavior*.

*Said another way, you will provide at least two expected/possible research results, given your Hypotheses (with associated data analyses, as applicable). Moreover, in the Discussion section, you will briefly articulate what each of the possible "Expected Results" would imply, should they be found.

Note: Posters typically contain References that have been abbreviated. Thus, when you present both your planned poster and your final poster, you will hand in a complete/full list of your References using APA-style. The list of References must show—at the very least— ten (10) outside references that you have personally read towards the completion of your final Poster.

- When: See below for date of our group discussion of each group's planned and final Research Proposal, as well as the date for the Poster presentation.



LATENESS POLICY

Lateness is not acceptable unless there is an officially documented medical or personal emergency. Please hand in all Reaction Papers, and all other items, exactly on time. Late items will be docked 10% for each day late. Thank you for your understanding.

STUDENTS WITH DISABILITIES

Students with diverse learning styles and needs are welcome in this course. In particular, if you have a disability/health consideration that may require accommodations, please feel free to approach me and/or the AccessAbility Services Office as soon as possible. The UTSC AccessAbility Services staff (located in S302) are available by appointment to assess specific needs, provide referrals and arrange appropriate accommodations (416) 287-7560 or ability@utsc.utoronto.ca. The sooner you let us know your needs the quicker we can assist you in achieving your learning goals in this course.

EMAIL POLICY

I do my best to answer email promptly but, alas, my daily volume is painfully high. I welcome you to stop by my office hours Mondays from 2:00-3:00pm. Should a question come up, I encourage you first to read the syllabus and our Blackboard site, try asking a classmate, and/or to post your question on the class Discussion Board. You'd be surprised to see how many times our questions are shared by other classmates. If the above doesn't work, either send an email or come to my office hours.

CLASS TOPICS & READINGS

* = Student-Led Discussion

Week	Class Date	Topic of Class	Actions
1	Jan 6	Introduction & Welcome to Class!	Presentation Lottery!
2	Jan 13	Human Higher Cognition, Genes, Brain & Behavior <ul style="list-style-type: none"> • Know the basic goals/methods of the 3 different disciplines and the challenges of bridging different disciplines Read also to know... <ul style="list-style-type: none"> • Know Basic Genetics (What is a gene☺?) • Know Basic Genetic Approaches • (If you still don't understand after reading the articles then <u>you</u> must look this up on your own and come to class prepared to discuss very intelligently.) • Know basic Cognitive Neuroscience/Brain Imaging Approaches • Know basic Behavioral measures • Explore legitimate websites on genetics (e.g., Genetics Home Reference) 	<u>Hand in:</u> Reaction Paper <u>Read:</u> (i) Goldberg & Weinberger (ii) Green et al. (iii) Fossella & Casey (Optional only: Karmiloff-Smith)
*3	Jan 20	Human Higher Cognition, Genes, Brain & Behavior <ul style="list-style-type: none"> • Attention, Memory, and Higher Cognition 	<u>Hand in:</u> Reaction Paper <u>Read:</u> (i) Posner, et al (ii) Espeseth, et al. (iii) Egan, Kojima, et al. + (iv) For presenters only: Plomin, et al.
*4	Jan 27	Language, Genes, Brain & Behavior -I <ul style="list-style-type: none"> • The great debate! Could there be a genetic basis for human language? 	<u>Hand in:</u> Reaction Paper <u>Read:</u> (i) Fisher

			(ii) Liégeois, et al. (iii) Rujescu, et al. +(iv) For presenters only: Vargha-Khadem, et al.
*5	Feb 3	Language, Genes, Brain & Behavior -II <ul style="list-style-type: none"> • Language and Reading Disorders – Dyslexia • Language Disability, Transient & Persistent Language Difficulties 	<u>Hand in:</u> Reaction Paper <u>Read:</u> (i) Fisher & Francks (ii) Spinath, et al. (iii) Bishop, et al. +(iv) For presenters only: van der Lely & Ullman
*6	Feb 10	Emotion & Social Behavior, Genes, Brain & Behavior <ul style="list-style-type: none"> • ADHD • Depression in Children • Cognitive/Emotional attention deficits • Other Social qualities like being monogamous or not! 	<u>Hand in:</u> Reaction Paper <u>Read:</u> (i) Waldman, et al. (ii) Kaufman, et al. (iii) Canli, et al. Read also very short Newspaper articles (not for Reaction Paper): (iv) Anthes +(vi) For presenters only: Walum et al. Optional: Raz et al.
7	Feb 17	Reading Week: No classes	
*8	Feb 24	Math & Numeracy, and Human Creativity Genes, Brain, Behavior <ul style="list-style-type: none"> • Math, Numeracy, Dyscalculia • Creativity Genes • Polymorphisms associated with Creative Dance 	<u>Hand in:</u> Reaction Paper <u>Read:</u> (i) Ansari & Kamiloff-Smith (ii) Reuter, et al. (iii) Bachner-Melman, et al. Read also very short Newspaper articles (not for Reaction Paper): (iv) Henderson (v) Connor +(iv) For presenters only: Berens, Nelson, Petitto, and Dunbar
9	Mar 3	RESEARCH PROPOSAL CLASS DISCUSSION/EVALUATION: Groups present <i>planned</i> Research Proposal ideas (<u>no</u> Posters	(i) <u>Hand in:</u> Each group to hand in today a written, 1-page

		today) at 5 minutes per group to present (TIME YOURSELVES), with 5 minutes for class questions & answers (T=10 minutes per group). Please come on time to begin promptly at 3:00 and to end at 5:00. Out of respect for your peers, please plan on keeping to this timetable. Thank you.	description of research topic with (separately) a planned list of the 10 references to be read. <i>Cont'd on next page</i> (ii) <u>Hand in (during class)</u> : Research Proposals Feedback/ Evaluation forms
10	Mar 10	RESEARCH PROPOSAL MEETINGS (obligatory) To be discussed	
*11	Mar 17	Ethical & Moral Consideration, Genes, Brain, Behavior <ul style="list-style-type: none"> • What are the ethical and moral considerations? • Are they insurmountable? • Explore the not-so-legitimate sites (think "outside the box," e.g., consider the social implications of genetic+brain+behavior research in light of "designer baby" websites) 	<u>Hand in</u> : Reaction Paper <u>Read</u> : Nusslein-Volhard
12	Mar 24	POSTER PRESENTATIONS of your Research Proposals. <u>First</u> half of class will present today <u>with</u> their Posters. Presentation length: 5 minutes (TIME YOURSELVES), with 5 minutes for class questions & answers (T=10 minutes per group). Come several minutes before 1:00pm to set up so as to begin precisely on time. Polished, articulate oral presentations are expected of visually compelling posters. Do not read from poster. Professionalism always. Please take this activity seriously. It is both part of (i) the "learning for life" process and (ii) your professional training in psychological reasoning.	<u>Hand in</u> : Groups who present hand in their final Poster, plus <i>final</i> list of the 10 References that were read. <u>Hand in (during class)</u> : Poster Presentation Feedback/ Evaluation forms
13	Mar 31	POSTER PRESENTATIONS of your Research Proposals. <u>Second</u> half of class will present today <u>with</u> their Posters. Presentation length: 5 minutes (TIME YOURSELVES), with 5 minutes for class questions & answers (T=10 minutes per group). See additional notes above (March 24). *** <i>Summary & Integration</i> <ul style="list-style-type: none"> • Question: Utility of scientific revolution for Society? 	<u>Hand in</u> : Groups who present hand in their final Poster, plus <i>final</i> list of the 10 References that were read. <u>Hand in (during class)</u> : Poster Presentation Feedback/ Evaluation forms

Bibliography

- Anthes, E. (2008, December). Nomadic hand-me-downs. *Discover Magazine*, page 12.
- Ansari, D. and Karmiloff-Smith, A. (2002). Atypical trajectories of number developmental neuroconstructivist perspective. *TRENDS in Cognitive Sciences*. 6(12), 511-516.
- Bachner-Melman, R., Dina, C., Zohar, A. H., Constantini, N., Lerer, E., Hoch, S., Sella, S., Nemanov, L., Gritsenko, I., Lichtenberg, P., Granot, R., & Ebstein, R. P. (2005). AVPR1a and SLC6A4 gene polymorphisms are associated with creative dance performance. *PLoS Genetics*, 1(3), e42.
- Berens, M., Nelson, J., Petitto, L. A., and Dunbar, K. (2008, November). Identification of potentially influential genes in pursuing expertise in the performing arts. *Abstracts of the Society for Neuroscience*. Washington, D.C., USA. Read this short article, in addition to the actual Poster on Petitto's website: <http://www.utsc.utoronto.ca/~petitto/>. Click on first link at top upper right. Note: This SFN Poster can serve as a fine guide for your own posters.
- Bishop, D. V. M., Price, T. S., Dale, P. S., & Plomin, R. (2003). Outcomes of early language delay II: etiology of transient and persistent language delay. *Journal of Speech, Language, and Hearing Research*, 46, 561-575.
- Canli, T., Omura, K., Haas, B. W., Fallgatter, A., Constable, R. T., & Lesch, K. P. (2005) Beyond affect: a role for genetic variation of the serotonin transporter in neural activation during a cognitive attention task. *PNAS*, 102(34), 12224-12229.
- Connor, S. (2003, Monday, 17 February). Mutation in creativity gene 'led to rise of Man.' *The Independent*.
- Egan, M. F., Kojima, M., Callicott, J., Goldberg, T. E., Kolachana, B. S., Bertolino, A., Zaitzev, E., Gold, B., Goldman, D., Dean, M., Lu, B., & Weinberger, D. (2003). The BDNF val66met polymorphism affects activity-Dependent secretion of BDNF and human memory and hippocampal function. *Cell*, 112, 257-269.
- Espeseth, T., Greenwood, P.M., Reinvang, I., Fjell, A. M., Walhovd, K. B., Westlye, L. T., Wehling, E., Lundervold, A., Rootwelt, H., & Parasuraman, R. (2006). Interactive effects of APOE and CHRNA4 on attention and white matter volume in healthy middle-aged and older adults. *Cognitive, Affective, and Behavioral Neuroscience*, 6, 31-43.
- Fisher, S. E., & Francks, C. (2006). Genes, cognition and dyslexia: learning to read the genome. *TRENDS in Cognitive Sciences*, 10(6), 250-257.

- Fisher, S. E. (2006). Tangled webs: tracing the connections between genes and cognition. *Cognition*, 101(2), 270-297.
- Fossella, J. A., & Casey, B. J. (2006). Genes, brain and behavior: Bridging disciplines. *Cognitive, Affective, and Behavioral Neuroscience*, 6(1), 1-8.
- Green, A. E., Munafo, M. R., DeYoung, C. G., Fossella, J. A., Fan, J., and Gray, J. R. (2008). Using genetic data in cognitive neuroscience: From growing pains to genuine insights. *Nature*, 9(September), 710-720.
- Goldberg, T., & Weinberger, D. R. (2004). Genes and the parsing of cognitive processes. *TRENDS in Cognitive Sciences*, 8(7), 325-335.
- Henderson, M. (2003, 17 February) 'Genetic changes' triggered Man's artistic abilities. *The New York Times*.
- Karmiloff-Smith, A. (2006). The torturous route from genes to behavior: A neuroconstructivist approach. *Cognitive, Affective, and Behavioral Neuroscience*, 6, 9-17.
- Kaufman, J., Yang, B-Z., Douglas-Palumberi, H., Grasso, D., Lipschitz, D., Houshyar, S., Krystal, J. H., & Gelernter, J. (2006). Brain-derived neurotrophic factor-5-HTTLPR gene interactions and environmental modifiers of depression in children. *Biological Psychiatry*, 59, 673-680.
- Liegeois, F., Baldeweg, T., Connelly, A., Gadian, D.g., Mishkin, M., & Vargha-Khadem, F. (2003). Language fMRI abnormalities associated with FOXP2 gene mutation. *Nature Neuroscience*, 6(11), 1230-1237.
- Nusslein-Volhard, Christiane. (2006) *Coming to Life: How Genes drive Development*. Kales Press: Carlsbad, CA. Chapter 9, pg 133-145.
- Plomin, R., Turic, D. M., Hill, L., Turic, D. E., Stephens, M., Williams, J., Owen, M. J., O'Donovan, M. C. (2004). * *A functional polymorphism in the succinate-semialdehyde dehydrogenase (aldehyde dehydrogenase 5 family, member A1) gene is associated with cognitive ability. *Molecular Psychiatry*, 9, 582-586
- Posner, M. I., Rothbart, M.K., & Sheese, B.E. (2007). Attention genes. *Developmental Science*, 10(1), 24-29.
- Raz, A., Hines, T., Fossella, J., & Castro, D. (submitted for publication). Paranormal experience and the COMT dopaminergic gene: a preliminary attempt to associate phenotype with genotype using an underlying brain theory.

- Reuter, M., Roth, S., Holve, K., & Hennig, J. (2006). Identification of first candidate genes for creativity: a pilot study. *Brain Research*, 1069, 190-197.
- Rujescu, D., Meisenzahl, E. M., Krejcová, S., Gieling, I., Zetzsche, T., Reiser, M., Born, C. M., Moller, H-J., Veske, A., Gal, A., & Finckh, U. (2007). Plexin B3 is genetically associated with verbal performance and white matter volume in human brain. *Molecular Psychiatry*, 12, 190-194.
- Spinath, F. M., Price, T. S., Dale, P. S., & Plomin, R. (2004). The genetic and environmental origins of language disability and ability: a study of language at 2, 3 and 4 years of age in a large community sample of twins. *Educational Psychology*, 75(2), 445-454.
- van der Lely, H. K.J. & Ullman, M. (2001). Past tense morphology in specifically language impaired and normally developing children. *Language and Cognitive Processes*, 16, 177-217.
- Vargha-Khadem, F., Gadian, D. G., Copp, A., & Mishkin, M (2005). FOXP2 and the neuroanatomy of speech and language. *Nature Reviews Neuroscience*, 2, 131-138.
- Waldman, I. D., Nigg, J. T., Gizer, I. R., Park, L., Rappler, M. D., & Friderici, K. (2006). The adrenergic receptor 2-a gene (ADRA2a) and neuropsychological executive functions as putative endophenotypes for childhood ADHD. *Cognitive, Affective, and Behavioral Neuroscience*, 6, 18-30.
- Walum, H., Westberg, L., Henningsson, S., Neiderhiser, J. M., Reiss, D., Igl, W., Ganiban, J. M. Spotts, E. L., Pedersen, N., Eriksson, E., Lichtenstein, P. (2008). Genetic variation in the vasopressin receptor 1a gene (AVPR1A) associates with pair-bonding behavior in humans. *Proceedings of the National Academy of Science*, vol 105/no.37, pages 14153-14156.