

Primate Lives and Human Cognitive Evolution

Psychology 3770A (Lecture course)

Spring 2013

Instructor: Jean-Baptiste Leca

E-mail: jeanbaptiste.leca@uleth.ca

Office: D851 (University Hall)

Office Hours: Monday from 1:00 – 3:00 pm or by appointment

Teaching Assistant: Nicholas Ducheminsky (nicholas.ducheminsky@uleth.ca)

Class Time: Tuesdays and Thursdays, 4:30 – 5:45 pm

Classroom: B660

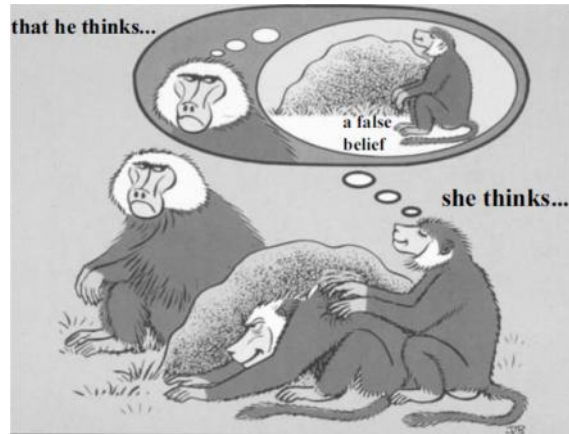
General content and objectives:

This course is an exploration of the mechanisms and evolution of cognitive abilities in non-human primates and humans. The main question we will address in this class is: how and why did primates evolve relatively large brains and complex cognitive abilities (compared to most other animal taxa) in response to various ecological and social problems they faced in their evolutionary history?

First, we will review the theoretical background needed to understand most (if not all) biological phenomena and some psychological processes. With an emphasis on the evolution of non-human primates and humans, we will address issues related to natural selection, adaptation, constraints, and speciation. We will evaluate what fossil and extant primates can tell us about hominin evolution, by using phylogenetic analyses and applying an evolutionary approach to comparative cognition.

Second, we will define and illustrate the fundamental mechanisms by which animals acquire, process, store, and act on information from their environment (i.e., perception, motivation, learning, recognition, categorization, memory, and decision-making). We will explore some of the neural bases, genetic underpinnings, and socio-ecological conditions of cognitive evolution. We will examine how non-human and human primates compare in terms of brain evolution, cognitive abilities, as well as behavioural complexity and flexibility. After detailing the main hypotheses that have been proposed to explain the evolution of primate cognition, we will show how such evolved cognitive processes contribute – along with biological, social and cultural processes – to shape adaptive behaviours expressed by primates to solve their daily ecological and social problems, such as monitoring food availability in space and time, extracting embedded food items, moving as a group, avoiding predators, as well as predicting and manipulating the behaviour of conspecifics.

Third, we will provide elements to answer the following two questions: (1) Is primate cognitive sophistication special in comparison with other animal taxa? (2) If there is such a thing as “the uniqueness of the human mind”, how can we explain the evolution of such uniquely human cognitive abilities? To address these questions, we will take comprehensive and interdisciplinary approaches, and integrate a diversity of methodologies and findings from various fields (e.g., developmental, comparative, and evolutionary psychology, neuroscience, endocrinology, behavioural ecology, ethology, behavioural genetics, evolutionary biology, anthropology, primatology, and linguistics).



Interpretation of a case of deception: A female hamadryas baboon “misleading” her harem leader about her interaction with another male (from Byrne, 2007).

Required readings:

There is no textbook for this course. Instead, a series of carefully chosen reading items (i.e., academic journal articles and book chapters) are made available on Moodle. For each of the 22 topics of this course, two reading items are required (for further details on these items, please see the lecture schedule below). In general, the readings are more conceptual, as opposed to empirical and data-rich, in scope.

Evaluation: There will be three exams and one term paper assignment.

Exams (format: in-class written-format exams with multiple choice, matching, and/or short answers):

- **Exam #1 – 25% of your final grade** (scheduled on Feb. 7). This test will only include the lecture materials and reading items corresponding to Topics 1 to 7.
- **Exam #2 – 25% of your final grade** (scheduled on Mar. 19). This test will only include the lecture materials and reading items corresponding to Topics 8 to 15.
- **Exam #3 – 30% of your final grade** (scheduled on Apr. 23). This test will include 80% of questions about the lecture materials and reading items covered during the final three sessions (Topics 16 to 22), and 20% of questions about all lecture materials and reading items covered during the term.
- Lecture materials will include: 1) lectures (based on the reading items and a series of take-home message slides that I will post on Moodle before each class), 2) videos played in class, and 3) possible in-class/moodle discussions (if/when applicable).

Term paper assignment – 20% of your final grade (format: word-processed APA-style literature review due in class on April 2, length: 10-15 pages, i.e. 3,000-4,500 words, not including the References section):

This assignment is a good opportunity for you to go into animal/human cognition research in greater depth and to practice your writing skills. You are free to choose any topic related to the mechanisms and evolution of cognition, possibly/preferably one related to those addressed in class from Topic 6 to Topic 22 (please see the lecture schedule below). In order to ensure that you have chosen an appropriate topic and that you are on the right track, you should send me (on Jan. 24), as an email attachment, a document with a tentative title of your paper project and a 300-400 word abstract describing the content of your future paper. I will provide you with more details on the paper (including ideas about possible topics) during the course of the semester.

Grading: The following ranges will be employed in assigning grades in this course (if you are precisely on the border, you will receive the higher letter grade):

A+: 90 – 100	C+: 67 – 70
A: 85 – 90	C: 63 – 67
A-: 80 – 85	C-: 60 – 63
B+: 77 – 80	D+: 55 – 60
B: 73 – 77	D: 50 – 55
B-: 70 – 73	F: 0 – 50

Lecture organization:

Classroom regulations:

- (1) Please arrive to class on time. If you are late, sit at the back to minimize disruption. The instructor will be careful not to run overtime so please remain seated until the end of class.
- (2) If you are disrespectful to other members of the class, you will be asked to leave.
- (3) Please turn off your cell phones while in class (this falls under being disrespectful).
- (4) Relevant interruptions and class participation are welcomed but please raise your hand in order to ask questions or to make comments. Emailed questions may also be discussed in class.

Exam regulations:

(1) Exams #1 and #2 will be returned to the student and a correction will be posted on Moodle. Exam #3 will not be returned to the student but can be reviewed during office hours or by appointment. Marks will be posted on Moodle not less than one week after exams are taken. If you feel that you were marked unfairly or that marks were missed on your exam, please prepare a short statement explaining the problem. The question will then be re-graded and marks adjusted (up or down as is warranted) at the instructor's discretion.

(2) No accommodation will be made for poor performance on exams. Additional work will not be assigned for those who wish to improve their grades.

(3) Students can write missed exams only on two conditions:

- a) They must notify the instructor (jeanbaptiste.leca@uleth.ca) **BEFORE** the exam
- b) They must provide an appropriate documentation (i.e. a medical certificate). Non-medical reasons for missed exams (e.g. a death in the family) must also be supported with appropriate documentation.

These two conditions must be met before a make-up test can be scheduled. If not, missed exams automatically receive a score of zero.

Academic accommodations:

It is the students' responsibility to request academic accommodations. If you are a student with a documented disability who may require academic accommodations and have not registered with the Disabilities Resource Centre, please contact them at 403-329-2766. Students who have not registered with the Disabilities Resource Centre are not eligible for formal academic accommodations. You are also required to discuss your need with your instructor no more than 14 days after the start of the course.

Lecture schedule:

(Note: This schedule may be subject to some changes depending how quickly material is covered)

PART ONE: PRIMATE EVOLUTION

Jan. 15 – Topic 1: Evolutionary processes: natural selection, adaptation, constraints, and speciation

Ridley M. (2003). Natural selection and variation. In: *Evolution* (3rd ed), Oxford University Press, Oxford, pp. 71-91.

Hancock AM, Di Rienzo A. (2008). Detecting the genetic signature of natural selection in human populations: Models, methods, and data. *Annual Review of Anthropology*, 37, 197-217.

Jan. 17 – Topic 2: Evolutionary patterns: phylogeny and comparative approach

Baum DA, Offner S. (2008). Phylogenies and tree-thinking. *The American Biology Teacher*, 70, 222-229.

Singer F, Hagen JB, Sheehy RR. (2001). The comparative method, hypothesis testing, and phylogenetic analysis – An introductory laboratory. *The American Biology Teacher*, 63, 518-523.

Jan. 22 – Topic 3: The primate order: evolution, characteristics, and diversity

Boyd R, Silk JB. (2009). Primate diversity and ecology. In: *How Humans Evolved* (5th ed), W. W. Norton and Company. Inc., New York, pp. 116-147.

Sussman RW, Rasmussen DT, Raven PH. (in press). Rethinking primate origins again. *American Journal of Primatology*. DOI 10.1002/ajp.22096.

Jan. 24 – Topic 4: Hominid and Hominin evolution (+ title and abstract of term paper due)

Stanford CB. (2012). Chimpanzees and the behavior of *Ardipithecus ramidus*. *Annual Review of Anthropology*, 41, 139-149.

Malone N, Fuentes A, White FJ. (2012). Variation in the social systems of extant hominoids: Comparative insights into the social behavior of early hominins. *International Journal of Primatology*, 33, 1251-1277.

Jan. 29 – Topic 5: Evolutionary approach to comparative cognition

de Waal FBM, Ferrari PF. (2010). Towards a bottom-up perspective on animal and human cognition. *Trends in Cognitive Sciences*, 14, 201-207.

Bolhuis JJ, Wynne CDL. (2009). Can evolution explain how minds work? *Nature*, 458, 832-833.

PART TWO: PRIMATE COGNITION

Jan. 31 – Topic 6: Fundamental mechanisms of cognition

Shettleworth SJ. (2001). Animal cognition and animal behaviour. *Animal Behaviour*, 61, 277-286.

Seed A, Tomasello M. (2010). Primate cognition. *Topics in Cognitive Science*, 2, 407-419.

Feb. 5 – Topic 7: Biological bases and socio-ecology of cognitive evolution

Lefebvre L, Sol D. (2008). Brains, lifestyles and cognition: Are there general trends? *Brain, Behavior and Evolution*, 72, 135-144.

Barton RA. (2012). Embodied cognitive evolution and the cerebellum. *Philosophical Transactions of the Royal Society B, Biological Sciences*, 367, 2097-2107.

Feb. 7 – Exam #1

Feb. 12 – Topic 8: Primate brains, cognition, and behaviour

Dunbar RIM. (2010). Brain and behaviour in primate evolution. In: *Mind the Gap: Tracing the Origins of Human Universals* (Kappeler PM, Silk JB, eds), Springer, New York, pp. 315-330.

Lefebvre L. (2012). Primate encephalization. *Progress in Brain Research*, 195, 393-412.

Feb. 14 – Topic 9: Hypotheses for the evolution of cognitive abilities in primates

Byrne RW. (2000). Evolution of primate cognition. *Cognitive Science*, 24, 543-570.

Barrett L, Henzi P, Rendall D. (2007). Social brains, simple minds: Does social complexity really require cognitive complexity? *Philosophical Transactions of the Royal Society B, Biological Sciences*, 362, 561-575.

Feb. 19 & Feb. 21 – Reading week (no class)

Primate physical cognition

Feb. 26 – Topic 10: Spatial, temporal and numerical cognition

Haun DBM, Jordan FM, Vallortigara G, Clayton NS. (2010). Origins of spatial, temporal and numerical cognition: Insights from comparative psychology. *Trends in Cognitive Sciences*, 14, 552-560.

Janson CH, Byrne R. (2007). What wild primates know about resources: Opening up the black box. *Animal Cognition*, 10, 357-367.

Feb. 28 – Topic 11: Causal knowledge and inferential learning in the physical domain

Call J, Tomasello M. (2005). Reasoning and thinking in nonhuman primates. In: *The Cambridge Handbook of Thinking and Reasoning* (Holyoak KJ, Morrison RG, eds), Cambridge University Press, Cambridge, pp. 607-632.

Byrne RW. (2004). The manual skills and cognition that lie behind hominid tool use. In: *The Evolution of Thought: Evolutionary Origins of Great Ape Intelligence* (Russon AE, Begun DR, eds), Cambridge University Press, Cambridge, pp. 31-44.

Primate social cognition

Mar. 5 – Topic 12: Adaptive value of sociality

Silk JB. (2012). The adaptive value of sociality. In: *The Evolution of Primate Societies* (Mitani JC, Call J, Kappeler PM, Palombit RA, Silk JB, eds), The University of Chicago Press, Chicago, pp. 552-564.

Seyfarth RM, Cheney DL. (2012). The evolutionary origins of friendship. *Annual Review of Psychology*, 63, 153-177.

Mar. 7 – Topic 13: Regulation of social relationships

Aureli F, Fraser ON, Schaffner CM, Schino G. (2012). In: *The Evolution of Primate Societies* (Mitani JC, Call J, Kappeler PM, Palombit RA, Silk JB, eds), The University of Chicago Press, Chicago, pp. 531-551.

Silk JB. (2002). The form and function of reconciliation in primates. *Annual Review of Anthropology*, 31, 21-44.

Mar. 12 – Topic 14: Knowledge of social relationships

Seyfarth RM, Cheney DL. (2012). Knowledge of social relations. In: *The Evolution of Primate Societies* (Mitani JC, Call J, Kappeler PM, Palombit RA, Silk JB, eds), The University of Chicago Press, Chicago, pp. 628-642.

Rendall, D. (2004). 'Recognizing' kin: Mechanisms, media, minds, modules and muddles. In: *Kinship and Behaviour in Primates* (Chapais B, Berman B, eds), Oxford University Press, Oxford, pp. 295-316.

Mar. 14 – Topic 15: Collective cognition and group decision making

Fischer J, Zinner D. (2011). Communication and cognition in primate group movement. *International Journal of Primatology*, 32, 1279-1295.

King AJ, Sueur C. (2011). Where next? Group coordination and collective decision making by primates. *International Journal of Primatology*, 32, 1245-1267.

Mar. 19 – Exam #2

Mar. 21 – Topic 16: Theory of mind and metacognition

Call J, Tomasello M. (2008). Does the chimpanzee have a theory of mind? 30 years later. *Trends in Cognitive Sciences*, 12, 187-192.

Smith JD. (2009). The study of metacognition. *Trends in Cognitive Sciences*, 13, 389-396.

Mar. 26 – Topic 17: Cooperation, reciprocity, altruism, and prosociality

Boyd Silk JB. (2009). The evolution of cooperation. In: *How Humans Evolved* (5th ed), W. W. Norton and Company. Inc., New York, pp. 176-197.

Schino G, Aureli F. (2009). Reciprocal altruism in primates: Partner choice, cognition, and emotions. *Advances in the Study of Behavior*, 39, 45-69.

Mar. 28 – Topic 18: Individual differences, personality, and cognition

Freeman HD, Gosling SD. (2010). Personality in nonhuman primates: A review and evaluation of past research. *American Journal of Primatology*, 72, 653-671.

Herrmann E, Call J. (2012). Are there geniuses among the apes? *Philosophical Transactions of the Royal Society B, Biological Sciences*, 367, 2753-2761.

Apr. 2 – Topic 19: Innovation, social learning, and cultural intelligence (+ Term paper due)

Rendell L, Fogarty L, Hoppitt JE, Morgan TJH, Webster MM, Laland KN. (2010). Cognitive culture: theoretical and empirical insights into social learning strategies. *Trends in Cognitive Sciences*, 15, 68-76.

van Schaik CP, Burkart JM. (2011). Social learning and evolution: the cultural intelligence hypothesis. *Philosophical Transactions of the Royal Society B, Biological Sciences*, 366, 1008-1016.

Apr. 4 – Topic 20: Primate communication and the evolution of human language

Slocombe KE, Waller BM, Liebal K. (2011). The language void: the need for multimodality in primate communication research. *Animal Behaviour*, 81, 919-924.

Arbib MA, Liebal K, Pika S. (2008). Primate vocalization, gesture, and the evolution of human language. *Current Anthropology*, 49, 1053-1076.

PART THREE: HUMAN COGNITIVE EVOLUTION

Apr. 9 – Topic 21: Overview of cognitive abilities in non-primate animals: Is primate cognition special?

Roth G, Dicke U. (2012). Evolution of the brain and intelligence in primates. *Progress in Brain Research*, 195, 413-430.

Byrne RW, Bates LA. (2010). Primate social cognition: Uniquely primate, uniquely social, or just unique? *Neuron*, 65, 815-830.

Apr. 11 – Topic 22: Continuity or discontinuity between human and non-human minds: Explaining human cognitive uniqueness

Penn DC, Holyoak KJ, Povinelli DJ. (2008). Darwin's mistake: Explaining the discontinuity between human and nonhuman minds. *Behavioral and Brain Sciences*, 31, 109-178.

Premack D. (2010). Why humans are unique: Three theories. *Perspectives on Psychological Science*, 5, 22-32.

Apr. 23 – Exam #3