

**Psychology W3435**  
***Neurobiology of Reproductive Behavior***  
**Spring 2007**  
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**I. Bulletin description**

PSYC W3435 Neurobiology of Reproductive Behavior (seminar)  
 4 pts F Champagne M 10:10-12:00PM 405 Schermerhorn Hall

Prerequisite: At least two other psychology courses or the instructor's permission.

Reproduction encompasses a broad range of behaviors in the life cycle of an organism from mate selection and copulation to parental care. This seminar will examine various aspects of reproduction across species and the neural mechanisms that regulate these behaviors and allow an organism to adapt to environmental change.

**II. A full description of the content of the course**

One of the key characteristics of life is reproduction. However, even a brief survey across species reveals that there are many strategies used to reproduce. How do you select a mate? Do you choose one mate or many? When does mating occur? How will offspring be cared for? Even within species, there can be considerable variation in the strategy chosen. But how is this variation mediated? What are the neural mechanisms involved in reproductive behavior? Throughout this course, we will examine the various aspects of reproduction and the changes which occur in the brain to allow species to reproduce. Seminars will involve discussion of recent experimental work in both humans and animals which has explored this topic.

This course will cover a broad range of topics related to the neurobiology of reproductive behavior such as 1) sexual differentiation, 2) mate selection, 3) male and female sexual behavior, 4) parental care, 5) the transmission of reproductive behavior across generations, and 6) stress and environmental influences on reproduction. The readings will provide an overview of reproductive behavior and explore more detailed aspects of the neuroendocrinology of reproduction. In particular, discussions will focus on the role of olfaction, reward, and stress hormones in mediating species-specific reproductive behaviors. In most species, there are clear differences between males and females in reproductive strategy and we will explore how these differences are manifested at a neurobiological level.

### III. The rationale for giving the course

PSYC W3435 is an advanced seminar, most fitting for undergraduates who are majoring in Psychology or in Neuroscience and Behavior, and for students participating in the Postbac Psychology Program. This course covers both behavioral and neurobiological aspects of reproduction and thus provides an integrated perspective on topics of current interest in the fields of psychology, organismal biology and neuroscience. This course is intended to explore the topic with a comparative approach and would therefore be appropriate for biology students in addition to psychology students.

It fulfills the following degree requirements:

- For the Psychology major or concentration in the College and in G. S., for the Psychology minor in Engineering, and for the Psychology Post-bac, PSYC W3435 will meet the Group II (Psychobiology and Neuroscience) distribution requirement.
- For the Neuroscience and Behavior joint major, W3435 will fulfill the 5<sup>th</sup> Psychology requirement: “one advanced psychology seminar from a list approved by the Psychology Department advisor to the program.”
- For the science requirements of the College and GS, W3435 meets the second term of the requirement, provided that students obtain the necessary permission and have taken the prerequisite two psychology courses. Students who are majoring in Psychology or in Neuroscience and Behavior will have priority over Biology and E3B students, or students who are taking the course for the science requirement.
- For the Barnard Psychology major, PSYC W3435 will fulfill the senior seminar requirement

### IV. The reading list and weekly syllabus

Representative reading assignments are provided but may change.

**Textbook:** Nelson, R.J. (2005) An Introduction to Behavioral Endocrinology. (3<sup>rd</sup> edition) Sinauer Associates Inc., Sunderland MA.

**Week 1: Introduction and Overview**

**Week 2: Sexual Differentiation & Sex Differences in Behavior**  
Selection of presentation topics

**Reading**

Nelson, Chapters 3&4, pages 97-197

Dorner G, Gotz F, Rohde W, Plagemann A, Lindner R, Peters H, Ghanaati Z. (2001) Genetic and epigenetic effects on sexual brain organization mediated by sex hormones. *Neuro Endocrinol Lett.* 22(6):403-9.

**Week 3: Mate Selection**Readings

Yamazaki K, Beauchamp GK, Curran M, Bard J, Boyse EA. (2000) Parent-progeny recognition as a function of MHC odortype identity. *Proc Natl Acad Sci U S A*. 97(19):10500-2.

Iyengar VK, Reeve HK, Eisner T. (2002) Paternal inheritance of a female moth's mating preference. *Nature*. 419(6909):830-2.

Winslow JT, Hastings N, Carter CS, Harbaugh CR, Insel TR. (1993) A role for central vasopressin in pair bonding in monogamous prairie voles. *Nature*. 365(6446):545-8.

Other readings TBA

**Week 4: Male Sexual Behavior**Reading

Nelson, Chapter 5, pages 199-271

Crews D. (2005) Evolution of neuroendocrine mechanisms that regulate sexual behavior. *Trends Endocrinol Metab*. 16(8):354-61.

Dominguez JM, Hull EM. (2005) Dopamine, the medial preoptic area, and male sexual behavior. *Physiol Behav*. 86(3):356-68.

Hull EM, Muschamp JW, Sato S. (2005) Dopamine and serotonin: influences on male sexual behavior. *Physiol Behav*. 83(2):291-307

Keverne EB. Importance of olfactory and vomeronasal systems for male sexual function. *Physiol Behav*. 83(2):177-87.

**Week 5: Female Sexual Behavior**Reading

Nelson, Chapter 6, pages 273-335

Dixson A. (2001) The evolution of neuroendocrine mechanisms regulating sexual behaviour in female primates. *Reprod Fertil Dev*. 13(7-8):599-607.

Other readings TBA

**Week 6: Pre-Partum Changes in Physiology and Behavior**Readings

Russell JA, Douglas AJ, Ingram CD. (2001) Brain preparations for maternity – adaptive changes in behavioral and neuroendocrine systems during pregnancy and lactation. *Progress in Brain Research*. 133:287-302.

Other readings TBA

**Week 7: Midterm Exam**

**Week 8: Maternal Care: Lactation**

Readings

Catheline G, Touquet B, Lombard MC, Poulain DA, Theodosis DT. (2006) A study of the role of neuroglial remodeling in the oxytocin system at lactation. *Neuroscience*. 137(1):309-316.

Theodosis DT. (2002) Oxytocin-secreting neurons: A physiological model of morphological neuronal and glial plasticity in the adult hypothalamus. *Front Neuroendocrinol*. 23(1):101-35.

Other readings TBA

**Week 9: Postpartum Maternal Behaviour**

Readings

Mann PE, Bridges RS. (2001) Lactogenic hormone regulation of maternal behavior. *Prog Brain Res*. 133:251-62.

Gammie SC. (2005) Current models and future directions for understanding the neural circuitries of maternal behaviors in rodents. *Behav Cogn Neurosci Rev*. 4(2):119-35.

Levy F, Keller M, Poindron P. (2004) Olfactory regulation of maternal behavior in mammals. *Horm Behav*. 46(3):284-302.

Other readings TBA

**Week 10: Paternal Care**

Readings

Lonstein JS, De Vries GJ. (2000) Sex differences in the parental behavior of rodents. *Neurosci Biobehav Rev*. 24(6):669-86.

Gubernick DJ, Teferi T. (2000) Adaptive significance of male parental care in a monogamous mammal. *Proc Biol Sci*. 267(1439):147-50.

Other readings TBA

**Week 11: Transmission of Reproductive Behavior Across Generations**

Readings

Champagne FA, Curley JP. (2005) How social experiences influence the brain. *Current Opinion in Neurobiology*, 15(6):704-9.

Champagne F, Meaney MJ. (2001) Like mother, like daughter: evidence for non-genomic transmission of parental behavior and stress responsivity. *Progress in Brain Research*,133:287-302.

Other readings TBA

**Week 12:     **Stress and Reproductive Behavior****Readings

Kalantaridou SN, Makrigiannakis A, Zoumakis E, Chrousos GP. (2004) Stress and the female reproductive system. *J Reprod Immunol*. 62(1-2):61-8.

Champagne FA, Meaney MJ. (2006) Stress During Gestation Alters Postpartum Maternal Care and the Development of the Offspring in a Rodent Model. *Biol Psychiatry*.

Other readings TBA

**Week 13:     **Environmental Regulation of Reproductive Behavior****Readings

TBA

**V.     Course requirements**

Each week, students will attend a two-hour seminar. Class time will be devoted to the presentation and discussion of book chapters and journal articles. The reading is intended to provide background knowledge on the relevant topics, to cover current research on those topics, and to serve as a stimulus for discussion. Two students sign up to lead the discussion each week.

The students take a written midterm exam with essay questions covering the material in the textbook, the papers and the class discussions. During the second half of the semester, the students write a term paper due on the Monday of Reading Week. The 10-15 page paper should take the form of a critical review paper that addresses a specific question related to the topics of the seminar.

Grading is allocated as follows:

Midterm exam	20%
Term paper	30%
Participation and Presentations	50%