

As we grow and develop, we literally...construct our bodies, incorporating experience into our very flesh
– Anne Fausto-Sterling (2000)

NSC 448
Spring, 2006

Trumbower 140, TR, 3:00 – 4:15pm

Advanced Topics in Neuroscience: Neuroendocrinology

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Office Hours: W, 10:30am - 12:30pm, and by appointment

Course Description

An investigation of the neural control of mammalian endocrine function. Topics discussed will include mechanisms of hormone receptor signaling, the hypothalamic-pituitary axis, sexual differentiation during neural development, hormonal influences on sex and sexual behavior, endocrine regulation of stress, and the relationship between hormones and cognition. Course discussions will focus on research strategies and the analysis of primary texts in the field. Prerequisite: BIO 152 and one course above BIO 200. BIO/NSC 248 is recommended but not required.

Major Course Goals

This course is modeled after a graduate-style seminar. Thus, the majority of our reading and discussion will be drawn from primary research texts within the field. The overall aims of the course are to familiarize you with (1) current problems within neuroendocrinology; (2) research methodologies appropriate to the biological study of stress and sex; and (3) analytical and research writing of the sort that active science scholars might do.

This course grants you a *W* perspective as a general academic requirement. To that end, the course is necessarily writing-intensive and uses writing as a *way* of focusing your ideas about neuroendocrinology. I will use writing both formally and informally in class to engage difficult ideas and precipitate class discussion. Additionally, I will be working with you on strengthening your writing process and your final product. Please treat the writing assignments seriously and continue to challenge yourself to grow as a writer and a thinker.

Sex and gender have socio-political dimensions that arguably augment and shape their scientific study. Although we will spend a significant time discussing biological *mechanisms*, I will also be encouraging you to think critically about the *context* in which endocrine research occurs. A major course question (at least for me) is if it is possible to study sex and gender from a scientific (read: objective) point of view, divorced from cultural and political assumptions about behavior. If science is to be the language through which we will “discover” mechanisms of sex, how can we acknowledge the undeniable role of human society in constructing that language?

Course Resources

- Becker JB, Breedlove SM, Crews D, and McCarthy M (2002) *Behavioral Endocrinology*, 2nd edition. MIT Press, Cambridge. ISBN # 0-262-52321-3
- Fausto-Sterling A (2000) *Sexing the Body: Gender Politics and the Construction of Sexuality*. Basic Books, New York. ISBN # 0-465-07714-5
- Course Reader (available electronically on Blackboard)

These texts are on sale in the College Bookstore (look in the Neuroscience section) and are also readily available from online distributors (including Amazon, Powells, Alibris).

Academic Behavior Code

All assignments are to be completed in line with the Academic Behavior Code of Muhlenberg College. By submitting work in this class, you are pledging that your work reflects academic honesty, is not plagiarized, and is representative of only your ideas.

Appropriate citation in science writing will be discussed in class. If you are unsure of what constitutes plagiarism in science writing, I encourage you to contact me as soon as possible. All violations of citation conventions will be treated as violations of the Academic Behavior Code.

Assignment Summary

Individual assignments (with more specific direction) will be handed out in advance of assignment deadlines. It is my hope that these assignments will mobilize you as a neuroscientist while simultaneously improving your writing, speaking, problem-solving, and theory-making skills.

- ▶ Literature tutorial 80 points

On several dates throughout the semester (see Course Calendar) I will turn over my role as facilitator and teacher to you. In small groups, you will be responsible for leading the class discussion on a research article, **including providing relevant background context to the paper**. You will be assessed *individually* on the merits of your presentation and facilitation.

- ▶ Two quizzes 60 points each

Two in-class quizzes will assess your knowledge of fundamental neuroendocrinology, including class lectures and literature tutorials.

- ▶ Research proposal 200 points, including sub-assignments

As a capstone assignment, you will design a novel research project in neuroendocrinology. The project will be written as a grant application but will be built upon four sub-assignments: (1) a preliminary proposal sketching out the major questions of your project, (2) a research bibliography of critical manuscripts in your project, (3) a written critique of one paper from your research bibliography, and (4) a critical peer review of a proposal. These four sub-assignments are intended to assist you with the writing of your final proposal. Projects will be assessed based on uniqueness, feasibility, novelty, and fundamental understanding of the science contained therein.

A component of this project will be participation in a peer group (details are forthcoming).

- ▶ Class participation 60 points

This course depends on regular and engaged participation. Your facility in discussing assigned readings, your commitment to class material, your peer group participation, and your professionalism will be used to assign participation grades. There will be many times when you will be on the receiving end of a student-led discussion in this class; please support your class colleagues by doing the assigned reading and participating in discussion.

- ▶ **TOTAL** **460 points**

Evaluation

Grades will be assigned based on the sum of the total points you obtain by the end of the semester. Your score will be divided by 460 points and will be translated into a letter grade as follows: A+ = 100-97%, A = 96-93%, A- = 92-90%, B+ = 89-87%, B = 86-83%, B- = 82-80%, C+ = 79-77%, C = 76-73%, C- = 72-70%, D = 69-60%, F = 59% and below.

Miscellany

- All assignments are due on the date indicated. I **do not** grant extensions on papers or exams except in case of a medical emergency (documentation required). I will accept late papers but please bear in mind that they will be penalized a full point (see rubric) for each day that they are past due.
- Please turn in papers with a single staple in the upper left hand corner. Make sure that your paper bears your name, the date, is paginated, uses 10, 11, or 12 point font, and has been proofread for grammar and spelling errors. You may submit your paper to me electronically if you wish, but please make sure that your formatting is standard.
- I evaluate writing using a 10 point rubric. Please familiarize yourself with this scale. All papers will be assigned a score based on the rubric and then that score will be adjusted to account for the total points possible on that assignment (e.g., you received a score of 8 on the rubric and the assignment is worth 50 points; thus, your grade is 40 out of 50).
- Please read my “Writing Tips for Neuroscientists.” Following the recommendations will ensure that your writing is fluent and effective in this class (and others, too).
- Please let me know if you have a documented learning disability that will require special accommodation. I will be glad to assist you.
- As in any public gathering, please silence all communication gadgetry **before** coming to class.
- Because this is an advanced class, I expect a fair amount of initiative, curiosity, and independence to be a part of your work. You are no longer passive recipients of knowledge (if you ever were) – please take responsibility for your learning and own it as an advanced student. To that end, sauciness and creativity are encouraged so long as they undergird a seriousness of critical intent. Whining and dependency are frowned upon.

Course Calendar

BBCM = Becker JB, Breedlove SM, Crews D, and McCarthy M (2002) *Behavioral Endocrinology*, 2nd edition. MIT Press, Cambridge.

AFS = Fausto-Sterling A (2000) *Sexing the Body: Gender Politics and the Construction of Sexuality*. Basic Books, New York.

Tuesday, January 17

Introductions

Is endocrinology dead?

Thursday, January 19

Sex and intersex: How many sexes are there?

- AFS, Chapters 1 and 2

Tuesday, January 24

Sex and intersex: Medical construction of gender I

- AFS, Chapters 3 and 4

Thursday, January 26

Sex and intersex: Medical construction of gender II

- AFS, Chapters 3 and 4

Tuesday, January 31

Sexing the brain: Are there differences between men and women?

- AFS, Chapter 5

Thursday, February 2

Endocrine research methodology I

- BBCM, Chapter 2

Tuesday, February 7

Endocrine research methodology II

- BBCM, Chapter 2

Thursday, February 9

Molecular endocrinology I: Biochemistry of steroids

- Handouts, TBA

Tuesday, February 14

Molecular endocrinology II: Steroid receptor structure and function

- BBCM, Chapter 2

Thursday, February 16

Hypothalamus and pituitary

- BBCM, Chapter 1

Tuesday, February 21

Preliminary proposal due

Sex determination and developmental endocrinology

- BBCM, Chapter 3

Thursday, February 23

♀ neuroendocrine circuits I

- BBCM, Chapter 4

Tuesday, February 28

♀ neuroendocrine circuits II

- BBCM, Chapter 4

Thursday, March 2

Quiz I: Cultural criticism of sexology, neuroendocrine fundamentals

Tuesday, March 7 and Thursday, March 9

NO CLASS – Spring Recess

Tuesday, March 14

♂ neuroendocrine circuits

- BBCM, Chapter 5

Thursday, March 16

Research bibliography due

Hormones and cognition

- BBCM, Chapters 14 and 15

Tuesday, March 21

Literature tutorial I

- LeVay S (1991) A difference in hypothalamic structure between heterosexual and homosexual men. *Science* 253: 1034-1037.

Thursday, March 23

Literature tutorial II

- Fisher AE (1956) Maternal and sexual behavior induced by intracranial chemical stimulation. *Science* 124: 228-229.
- Bermant G (1961) Response latencies of female rats during sexual intercourse. *Science* 133: 1771-1773.

Tuesday, March 28

Literature tutorial III

- Ottem EN et al (2004) Dual-phenotype GABA/glutamate neurons in adult preoptic area: sexual dimorphism and function. *Journal of Neuroscience* 24: 8097-8105.

Thursday, March 30

Literature tutorial IV

- De Vries GJ et al (2002) A model system for study of sex chromosome effects on sexually dimorphic neural and behavioral traits. *Journal of Neuroscience* 22: 9005-9014.

Tuesday, April 4

Literature critique due
Literature tutorial V

- Young LJ et al (1999) Increased affiliative response to vasopressin in mice expressing the V1a receptor from a monogamous vole. *Nature* 400: 766-768.

Thursday, April 6

Literature tutorial VI

- Han SK et al (2005) Activation of gonadotropin-releasing hormone neurons by kisspeptin as a neuroendocrine switch for the onset of puberty. *Journal of Neuroscience* 25: 11349-11356.

Tuesday, April 11

Literature tutorial VII

- Boehm U et al (2005) Feedback loops link odor and pheromone signaling with reproduction. *Cell* 123: 683-695.

Thursday, April 13

Writing discussion and idea-sharing

Tuesday, April 18

Quiz II: Neuroendocrine circuits, literature of neuroendocrinology

Thursday, April 20

History of sexology I: Freud

- Handouts, excerpt from *Three Essays on Sexuality*

Tuesday, April 25

History of sexology II: Kinsey

- Handouts, TBA

Thursday, April 27

Research proposals are due to peer reviewers

History of sexology III: Masters and Johnson

- Handouts, TBA

Tuesday, May 2

Research proposal presentations and discussion

Thursday, May 4

Reviewer responses due

Research proposal presentations and discussion

TBA, Finals Week

Final research proposal due