*Syllabus*

**PSYC GU4491: The Parental Brain**

**Bianca Jones Marlin, PhD**

Fall 2022: Monday,10:10 am-12:00 pm, Zuckerman Institute, Jerome L. Greene Center

**I. Bulletin description**

PSYC GU4491. The Parental Brain (seminar).

4 pts. Mondays 10:10am – 12pm

Office hours: Wednesday Times 3:00 pm - 4:30pm @ZI (by request only)

Prerequisites: Basic background in neurobiology (for instance PSYC UN1010, UN2450, UN2460, UN2480, or GU4498) and the instructor's permission.

This course will provide an overview of the field of parental and social biology, with an emphasis on changes in the adult rodent brain surrounding childbirth and caretaking behavior. We will explore how the experience of parenthood prepares the brain for survival of offspring. We will also discuss the dynamic between caregivers and parents in order to provide the structure necessary to rear young. This course will illustrate the fortitude of molecular, behavioral and circuit level investigations in concert to unveil mechanisms of social learning.

**II. Full course description:**

Marriage, friendships, family, scientific collaborations - social relationships are the cornerstone of our society. Arguably the most influential social relationship is that between parent and child. Negative parenting stifles healthy personal and familial development and burdens society with increased crime rates and financial loss. Understanding the biological basis for parental behavior is necessary to restore and protect vital parent-child bonds. Unveiling the mechanisms of parental learning opens therapeutic avenues to pathologies associated with poor parenting and failed parent-child bonds.

In the first part of the course, we will explore the major hormonal and neuromodulatory mechanisms of parental behavior and the research tools that are used to study epigenetic modifications in different model systems, including humans. Following this introduction, we will discuss the most sensitive periods during which the parent-child dynamic can be disrupted by environmental factors, including prenatal and early-life stressors. Finally, we will discuss how these experiences may dictate future generations via epigenetic modifications.

The topics of the course will be introduced through overview lectures given by the instructor, followed by journal article presentations by students. The readings will consist of review articles and primary research articles, and will draw upon examples from both human and experimental/animal research. In addition to several classic papers to lay the foundation for parental behavior, the readings emphasize the most contemporary research and understanding of each topic area. The whole class is expected to have read the journal articles in advance and participate in discussion.

Finally, students will have the opportunity to explore and demonstrate a detailed understanding of a paper of their choice relevant to Parental Behavior through a final “News and Views” and accessible science presentation.

**III. Rationale for giving the course:**

The primary goal of this course is to for students to gain in-depth understanding of the parental experience as it pertains to the fields of Psychology and Neuroscience. In order to aid in *remembering*, *understanding*, and *applying* the knowledge gained from the readings and lectures, students will be encouraged to ask questions and participate in discussion throughout the lectures and journal article presentations. In-class small-group activities will give students further opportunity to discuss, *apply*, and *analyze* the topics. Through presentation of journal articles and leading class discussion, students will gain a detailed understanding of a topic, *draw connections* to other course topics, *evaluate* the research, and *create* their own framework for presenting it to the class. The final “News and Views” paper on a paper of the student’s choice will further enable students to *synthesize* information from multiple sources, critically *evaluate* it as a whole, and *author* their own review of the sub-field.

More broadly, students will learn how to read primary scientific research articles, think critically, synthesize information, and write organized, evaluative papers. These skills are necessary to be informed citizens in our increasingly technological society, and in all chosen post-graduate disciplines and careers.

The Psychology Program Goals that will be advanced in this seminar (see http://www.columbia.edu/cu/psychology/dept/ugrad/goals.html) include 1. Knowledge preliminary syllabus base; 2. Research methods; 4. Critical thinking; 5. Values in psychology; 6. Application of psychology; 7. Communication skills—written; 8. Communication skills—oral; 9. Information and technological literacy.

PSYC GU4491 is an advanced seminar, designed particularly for graduate students, for advanced undergraduates who are majoring in Psychology or in Neuroscience and Behavior, and for students participating in the Psychology Postbac Certificate Program. These students will have priority in registration, followed by junior majors followed by non-majors. The seminar will be well suited to students who have completed two or more lecture courses beyond UN1001, such as UN1010 (Mind, Brain, and Behavior), UN2430, W2450 (Behavioral Neuroscience), UN2460 (Drugs and Behavior).

It fulfills the following degree requirements:

• For Psychology Graduate Students, PSYC GU4491 will apply toward the “two seriously graded seminars” requirement of the Master’s degree.

• For the Psychology major or concentration in the College and in G. S. and for the Psychology Postbac Certificate, GU4491 meets the Group II (Psychobiology and Neuroscience) distribution requirement.

• For the Neuroscience and Behavior joint major, GU4491 will fulfill the 5th Psychology requirement: “one advanced psychology seminar from a list approved by the Psychology Department advisor to the program.”

• For non-majors in the College and GS, pending approval of the Committee on Science Instruction, GU4491 can count as one term of the natural science requirement, provided that students have taken the prerequisite psychology courses. Graduate students, and students who are majoring in Psychology or in Neuroscience and Behavior, and postbac certificate students will have priority over students who are taking the course for the science requirement. For this reason, as well as because of the course prerequisites, we anticipate the course will rarely be used for the science requirement.

• For the Psychology Postbac certificate, PSYC GU4491 will fulfill the advanced seminar requirement.

**IV: Syllabus**

Text: The Neurobiology of Parental Behavior. Numan & Insel

<https://link.springer.com/book/10.1007/b97533> (available through Columbia Libraries)

*PDFs of all articles will be available through Course Works/Canvas*

**09/12/2022:** *What is parental behavior?*Overview of course

**09/19/2022:** *What is maternal behavior?*(1/3)Representation across species

1. Elyada & Mizrahi, 2015. Current Opinion Neurobiology

https://pubmed.ncbi.nlm.nih.gov/26143475/

1. Dulac et al., 2014. Science

<https://www.science.org/doi/10.1126/science.1253291>

1. The Neurobiology of Parental Behavior. Numan & Insel
   1. Chapter 2- Hormonal and Nonhormonal Basis of Maternal Behavior
   2. Chapter 3- Experiential Factorrs Influencing Maternal Behavior

**09/26/2022:** *What is maternal behavior?* (2/3) Changes in the mammalian maternal brain

1. Cohen & Mizrahi, 2015. The Journal of Neuroscience

<https://www.jneurosci.org/content/35/4/1806>

1. Vinograd et al., 2017. Cell Reports

<https://pubmed.ncbi.nlm.nih.gov/29020623/>

1. The Neurobiology of Parental Behavior. Numan & Insel
   1. Chapter 5- Neuroanatomy of Maternal Behavior

**10/03/2022:** *What is maternal behavior?* (3/3) Changes in the mammalian maternal brain

1. Marlin et al., 2015. Nature

<https://www.nature.com/articles/nature14402>

1. The Maternal Brain, Scientific American

<https://www.scientificamerican.com/article/the-maternal-brain/>

3. The Neurobiology of Parental Behavior. Numan & Insel

1. Chapter 6- Neurochemistry and Molecular Biology of Maternal Behavior

**10/10/2022:** *What is parental behavior?* Virgin mouse behaviors in Females

1. Carcea et al., 2021**.** Nature

<https://www.nature.com/articles/s41586-021-03814-7>

1. Schiavo et al., 2020. Nature

https://pubmed.ncbi.nlm.nih.gov/33029014/

1. The Neurobiology of Parental Behavior. Numan & Insel
   1. Chapter 9 - Neural Basis of Parental Behavior Revisited

**10/17/2022:** *What is paternal behavior?* Sensing change in males

1. Wu et al., 2014. Nature

<https://pubmed.ncbi.nlm.nih.gov/24828191/>

1. The Neurobiology of Parental Behavior. Numan & Insel
   1. Chapter 7 – Paternal Behavior
2. Szyf, 2014. Nature

https://www.nature.com/articles/nn.3603

**10/24/2022:** *What can parents teach for generations?* Transgenerational Epigenetic Inheritance in males

1. Dias and Ressler, 2014. Nature Neuroscience. <https://www.nature.com/articles/nn.3594>
2. “Can we really inherit Trauma?” 2018. New York Times

<https://www.nytimes.com/2018/12/10/health/mind-epigenetics-genes.html>

1. Klengel et al., 2016. Neuropsychopharmacology

<https://www.nature.com/articles/npp2015249.pdf>

1. van Steenwyk et al., 2018. Environmental Epigenetics

https://pubmed.ncbi.nlm.nih.gov/30349741/

**10/31/2022:** *What can parents teach for generations?* Transgenerational Epigenetic Inheritance in females

1. Buchen, 2010. Nature

<https://www.nature.com/articles/467146a>

1. Monk et al, 2008. Developmental Psychobiology

<https://pubmed.ncbi.nlm.nih.gov/23062303/>

1. The Neurobiology of Parental Behavior. Numan & Insel
   1. Chapter 9 - Human Implications

**11/07/2022: Academic holiday, no class**

**11/14/2022: Society for Neuroscience Conference:** Watch movie “Three Identical Strangers”

https://www.imdb.com/title/tt7664504/

**11/21/2022:**  1.*Group Discussion: “Three Identical Strangers”**Ethics in Parental Behavior Studies*

<https://www.cnn.com/2019/01/09/health/unethical-experiments/index.html>

*2. Accessible Science Presentation Group Assignments: Popular Science Presentation*

**11/28/2022:** *Parental Behavior in non-model species*- The naked mole rat queen & The Queen Bee

Zuckerman Lab Tour: Abdus-Saboor Lab, Marlin Lab

1. Sasaki et al., 2021. Nature Scientific Reports

<https://www.nature.com/articles/s41598-021-84992-2.pdf>

1. Popular Science “The secret to being a great naked mole rat mom”

https://www.popsci.com/poop-parenting-naked-mole-rats/

**12/05/2022: News & Views paper due:** “News and Views on Parental Behavior Paper from 2021-2022”

**12/12/2022: Group Assignment & Literature Review paper due:** Accessible Science Presentation- The Maternal Brain, The Virgin Brain, The Paternal Brain- Accessible Science Visual Art Presentation

**V. Course requirements and grading:**

Grades:

15% Participation

15% Presentation of original research journal article discussion

25% Individual Assignment: “News and Views on Parental Behavior Paper from 2021-

2022”

10% Group Assignment: Accessible Science Presentation: The Maternal Brain, The

Virgin Brain, The Paternal Brain

5% Topic & bibliographic citations for literature review paper

30% Literature review paper

Participation (15%): All students are expected to participate in weekly paper discussions, virtually or in-person. If class is over Zoom, I request that students keep their camera on to foster a more collaborative discussion and simulate in-person class. To effectively participate, it is expected that all students read the assigned articles in advance of the class. Papers will be assigned to a student to present. Fellow students are expected to participate in the journal club conversation. Each student (non-presenting) should come prepared with at least one question for the original research article(s) being presented. If medical or other emergencies prevent students from attending a class, an email to Dr. Marlin is required *in advance of class* to explain the absence.

Presentation (15%): Each student will present 1-2 original research articles and lead the class discussion. Journal articles are pre-selected by the instructor. Students are expected to walk the class through the background/rationale, methods, results, and discussion, including what is novel, and potential pitfalls/misinterpretation, and possible future directions. Students should try to engage class in discussion through questions. Each presentation should be ~45 mins.

News & Views paper (25%): All students are required to select a recent paper (2021-2022) relevant to parental behavior for a final 2-3 page (single spaced) “News and Views” piece. Students will submit the topic/title and short rationale for its selection to Dr. Marlin for approval/feedback.

Group Assignment (10%): Students will present a 10-minute piece on an assigned vantage point of parental behavior aimed at a general audience. This presentation can include video, visual aid or ted talk like presentation. All in-person presentations will be recorded for grading.

Topic and references (5%): All students are required to select a topic relevant to Behavioral Epigenetics for a final literature review paper. The topic may expand on a topic presented in the course, may be a relevant topic not covered within the course, or may synthesize information across areas of the course. The student will submit the topic/title, a short rationale for its selection, and at least 10 FULL citations for their proposed literature review paper on or before **11/11/2022 via email to Dr. Marlin**. Topics will be approved by the instructor, and in some instances the instructor may suggest ways to broaden or focus the topic as appropriate. For the citations: review papers are acceptable but should be kept to a minimum.

Literature review paper (30%): All students will write a substantial, *original* 8-12 page paper (double spaced, not including references) on the chosen topic. At least 15 citations in APA format must be included. The paper will be submitted on the final day of class **(12/12/2022).**

**VI: Other**

Academic honesty

As members of this academic community, we are responsible for maintaining the highest level of personal and academic integrity: “[E]ach one of us bears the responsibility to participate in scholarly discourse and research in a manner characterized by intellectual honesty and scholarly integrity.… The exchange of ideas relies upon a mutual trust that sources, opinions, facts, and insights will be properly noted and carefully credited. In practical terms, this means that, as students, you must be responsible for the full citations of others’ ideas in all of your research papers and projects… [and] you must always submit your own work and not that of another student, scholar, or internet agent” (from the Columbia University Faculty Statement on Academic Integrity. All allegations of academic misconduct will be immediately referred to the office of Student Conduct and Community Standards.

<https://www.college.columbia.edu/faculty/resourcesforinstructors/academicintegrity/statement>).

Plagiarism – whether intentional or inadvertent – is a serious violation of academic integrity. If you have any questions about what constitutes plagiarism and/or how to properly cite sources, please come to me. I am more than happy to help. Similarly, if you put yourself in a situation, e.g., starting an assignment very late, in which you think your best option might be to cut some corners, see me. It is far better to have a few points deducted from a paper than to compromise your academic integrity and potentially put your academic standing in jeopardy.

Disability Services

Students with special needs who may require classroom/test accommodations should make an appointment with me before or during the first week of class. You should also contact the Office of Disability Services (ODS) in Lerner Hall before the start of the course to register for these accommodations. The procedures for registering with ODS can be found at <http://health.columbia.edu/services/ods> or by calling (212) 854-2388.

Writing Center

I encourage you to visit the Writing Center, where you can receive free individual consultations on your writing at any stage in the writing process, including brainstorming. Writing consultants work with all members of the Columbia community on any academic or nonacademic writing. You can make an appointment and view drop in hours on their website [[www.college.columbia.edu/core/uwp/writing-center].](http://www.college.columbia.edu/core/uwp/writing-center%5D.)