Syllabus

MEETING TIME and PLACE: Wednesdays 4 to 6:30, Meyer 815

INSTRUCTOR: Chiye Aoki, Professor of Neural Science and Biology  ca3@nyu.edu, 1056 Meyer, office hour by appointment

MAXIMUM NUMBER OF STUDENTS: 15

PRE-REQUISITES: BINS, CMNeurobio

DESCRIPTION:

Is your brain still growing? Are events more memorable to you now than they will be later in life? Why do so many mental illnesses emerge for the first time during adolescence? We will ask and try to answer these questions, as we read and discuss papers on adolescent brain development and behavior.

Brain function is exquisitely dependent on childhood experience. Starting from the foundational works of Torsten Wiesel and David Hubel, much has been learned about the molecular mechanisms underlying developmental plasticity of the juvenile brain. In contrast, relatively less is known about the developmental events during the succeeding, final developmental stage – adolescence. Adolescence is characterized by great bursts in creativity and energy, but is also the stage when many mental illnesses emerge for the first time. What is the neurobiological basis for the vulnerability of teens to addiction, depression, anxiety, risky behaviors, schizophrenia or eating disorders? Might some of the vulnerabilities be tied to developmental changes that occur during adolescence? How is the teen brain different from a juvenile’s brain or an adult’s brain, molecularly and structurally? These are some of the questions that will be addressed through critical readings and discussions.

General structure. A different topic for discussion has been chosen for every week, usually revolving one or two key authors in the field. Students will take turns presenting assigned papers, usually on research that has used an animal model (30 min per student/paper). Every week, except for week 1, everyone will be tested on preparedness to discuss the papers by taking a 5 min quiz at the beginning of class. Each student will have a minimum of two opportunities to present papers and lead discussions.

Course grade will be based on the 5-min quiz scores + class participation (20%), class presentations (10% for the first + 20% for the second = 30%), and a term paper (50%).

The term paper. The topic for the term paper will be mutually agreed upon by the student and Professor Aoki. The tentative title of the term paper will be due on Feb 17. The first version of the bibliography will be due on March 2. A rough draft may be submitted for evaluation and feedback on March 30. A more polished draft may be submitted on April 13. Students will receive an un-graded evaluation of the March 30 version and a tentative grade with written critique for the version submitted on April 13. On April 27 and May 4, students will take turn describing the content of the term paper as an oral presentation, so as to receive helpful criticisms and suggestion from classmates. The final draft is due anytime during Week 15 but no later than May 17.

An essential component for the term paper is the quality (originality, substantiation) of the student’s working hypothesis revolving one of the questions addressed during the semester OR delineation of an unanswered question, with a convincing explanation as to why it is important to test the hypothesis or get
an answer to the question. Other essential components are: the description of the subject matter, description of the background literature leading up to the question/hypothesis, suggestions of experiments that can address the question or test the hypothesis and why that approach would be useful, an explanation of what the expected outcome would be, if your hypothesis were to be correct or wrong, and a bibliography.

Here are some of the questions I will be using to assess the quality of the paper, adapted from educators at Northern Illinois University and Barbara Walvoord, Winthrop University, Virginia Community College System, Univ. of Washington, NYU and Hunter College).

Clarity...Is the working hypothesis or unanswered question presented clearly? Is the demarcation between what is known and what remains unknown clear?

Organization...Is the sequence of ideas and transitions logical, smooth and effective? Are sub-headers or opening sentences being used effectively to bind together related information?

Support/reasoning...Are ideas substantiated by published works and clearly segregated from ideas that are yours? Have you presented your opinion as to whether the findings that you’ve reviewed are well-grounded or are speculative? If so, have you provided an explanation for your opinion? How thorough is the citation of relevant work, without being redundant or out-dated? Is the importance of the question explained convincingly?

Completeness...Is the writing free of grammatical errors, typos, or redundancies? Is each sentence written clearly and simply? Will the completed paper be submitted on time?

**LEARNING OBJECTIVES:**

Familiarization with current literature on adolescent brain development and behavior.

Development of skills in critical reading of scientific literature, scientific writing, oral presentation, discussions and debates.
SCHEDULE:


One of the problems with surveying the literature of this field is that the term, ‘adolescence’ has been used differently among investigators. What are the key developmental events that define the beginning and the end of adolescence? How different is adolescent behavior? How different are their brains?

References cited on Jan 27:


Homework: Required reading for the upcoming week’s topic on “Vulnerability of Adolescents to Alcoholism

Week 2. February 3. Vulnerability of Adolescents to Alcoholism

Required Reading:


Suggested reading to review the topic on Feb 3:

Homework: Required reading for the upcoming week’s topic on “GABA receptors: A molecular substrate for alcoholism”

Week 3. February 10. GABA Receptor: A Molecular Substrate for Alcoholism

Required Reading:

- Homework question: What is zolpidem, picrotoxin, PTZ, FAE, THIP, DGC, DHM; What is meant by ‘extrasynaptic’?

Suggested reading, to help digest this paper:


Homework: Required reading for upcoming week’s topic on “The Impact of Gonadal Hormones on Hippocampal Physiology and Learning”

Week 4. February 17. The impact of gonadal hormones on hippocampal physiology and learning

Required Reading: Papers by Sheryl Smith


Homework: Submit a tentative topic for the term paper.

Week 5. February 24. Literature Search Training at Bobst Library, Avery Fisher Center West Room, Floor 2 With Kelly Johnson

Homework: Required reading for the upcoming week’s topic on “Vulnerability of Adolescents to Nicotine Addiction” plus a bibliography of the term paper, due March 2.
Week 6. March 2. Vulnerability of Adolescents to Nicotine Addiction

**Required Reading:**


**Homework:** Required reading for the upcoming week’s topic on “Progression from Licit Drug Use During Adolescence to Illicit Drug Use in Adulthood”

Week 7. March 9. Progression from Adolescent Licit Drug to Illicit Drug Use in Adulthood

**Required Reading:**


Homework: Required reading on the upcoming week’s topic on “Developmental Changes of the Dopamine System and Striatum During Adolescence”

Optional homework: First draft of the term paper, due March 30

SPRING BREAK

Week 8. March 23. Developmental Changes of the Dopamine System and Striatum During Adolescence

Required Reading:

• SL Andersen, AT Thompson, M Rutstein, JC Hostetter, MH Teicher (2000) Dopamine receptor pruning in prefrontal cortex during the periadolescent period in rats. Synapse 37(2) 167-9.

Suggested Review Articles


Homework: Required reading for the upcoming week on “Eating Disorders”.

Optional homework: A rough draft of the term paper, due March 30

Required Readings: Papers by Aoki


Homework: Required reading for the upcoming week’s discussion on “Neurogenesis During Adolescence”

Week 10. April 6. Hippocampal Neurogenesis During Adolescence.

Required Reading: Papers by Tracy Shors

- N Toni and S Sultan (2011) Synapse formation on adult-born hippocampal neurons. European Journal of Neuroscience 33: 1062-68. (Review Article)
- DM Curlik, G DiFeo, TJ Shors (2014) Preparing for adulthood: thousands upon thousands of new cells are born in the hippocampus during puberty, and most survive with effortful learning. Frontiers in Neuroscience 8:70.

Homework: Required reading for the upcoming week’s topic on “The Impact of Stress On The structure of Adolescent Brain”.

Optional but strongly recommended homework: Improved draft of the term paper, due April 13.


Required Reading:


Suggested Reviews:


Homework: Required reading for the upcoming week’s discussion on “The Influence of Adolescence on Fear Memories”

Week 12. April 20
The Influence of Adolescence on Fear Memories and Anxiety

Required reading: Papers by Francis Lee


Recommended reading:


Week 13. April 27.
Student Presentations of Term Paper Topics (12 minutes + 3 min for discussion maximum per student)

Student Presentations of Term Paper Topics (12 minutes + 3 min for discussion maximum per student)

Week 15. Term Paper Due May 17.