Welcome to

# Nsci4100 Development of the Nervous System: Cellular & Molecular Mechanisms

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## Student Survey

- Please fill in the blanks on the front of the survey.
- On the back, tell us something interesting about yourself… tell us something you are passionate about, something you did this summer, anything that comes to mind.
- We will collect them soon.

**Why take a course on development of the nervous system?**

**Course website:**

http://mcloonlab.neuroscience.umn.edu/4100/index.htm

- Syllabus
- Schedule (with links to the lecture PowerPoints)
- Discussion
- Directory
- Lectures
- Coffee/Office Hours
- Comments from Previous Students
- Graduation Photos

**Textbooks & Reading Assignments:**

- Development of the Nervous System 3rd edition
  by Sanes, Reh and Harris

- Neuroscience 4th edition
  by Purves et al.

**Lecture notes:**

- PDFs of the PowerPoint presentations will be available via links on the schedule page of the website.
- Generally, they will be posted on Friday for the next week.
- Use discretely.

**Lecture videos:**

- Will be available via a link on the navigation bar of the course website.
- Lectures can be watched live or after the fact.
- Do NOT procrastinate watching the lectures!

**Discussions:**

- Students are to read the assigned journal articles prior to the in class discussion.
- Small groups of students (assigned by the faculty) will discuss each article with the aim of answering certain questions.
- Students who have not read the assigned article may not participate in the discussion.
- A discussion report with the answers to each question is to be printed and turned in by each group at the class period following the discussion.
- The format for the discussion report is available as a Word document on the course website, as well as a link to a PDF of each article for discussion.

## Discussion Report

Discussion date:

Names of group members:

Title of article discussed:

Question or hypothesis addressed by the study presented in the article (1 sentence):

For each major result, what was done, what was found and what it means (up to 10 lines per result; number each result):

Overall conclusion based on the collective results (1 to 3 sentences):

**Examinations:**

- Two midterms and a final exam will be given.
  - Midterm exams on Oct 15 and Nov 12
  - Final exam during finals week; tentatively Thursday, Dec 20, at 1:30pm
- Everyone can have extra time if needed (midterms start at 9:30)
- All exams will be multiple choice.
- Many questions will be complex.
- Old exams are available on the website (links on schedule page).
- Final exam will be cumulative.

**Missed examinations:**

- Missed examinations with a valid and verified excuse can be made up by taking an oral & written exam with an instructor within one week of the regularly scheduled exam.
- Contact Professor McLoon as soon as possible after the missed exam to schedule a make-up.
- If you know ahead of time that you will miss an exam, then please discuss this with Professor McLoon soon.

**Grades (A-F):**

- ~25% midterm exam I
- ~25% midterm exam II
- ~40% final exam
- ~10% discussion reports

**Office hours for Steven McLoon:**

- coffee hour most weeks as per the schedule posted on the ‘coffee hour’ page of the website – day of the week & time will vary; usually it will be at Surdyk’s Café in Northrop
- by appointment
- or email questions: mcloons@umn.edu

## Coffee Hours Next Week

Tuesday (Sept 11) 10:00-11:00am
Friday (Sept 14) 8:30-9:30am

Surdyk’s Café in Northrop Auditorium

Stop by for a minute or an hour!

**Course sequence:**

- Neuro101

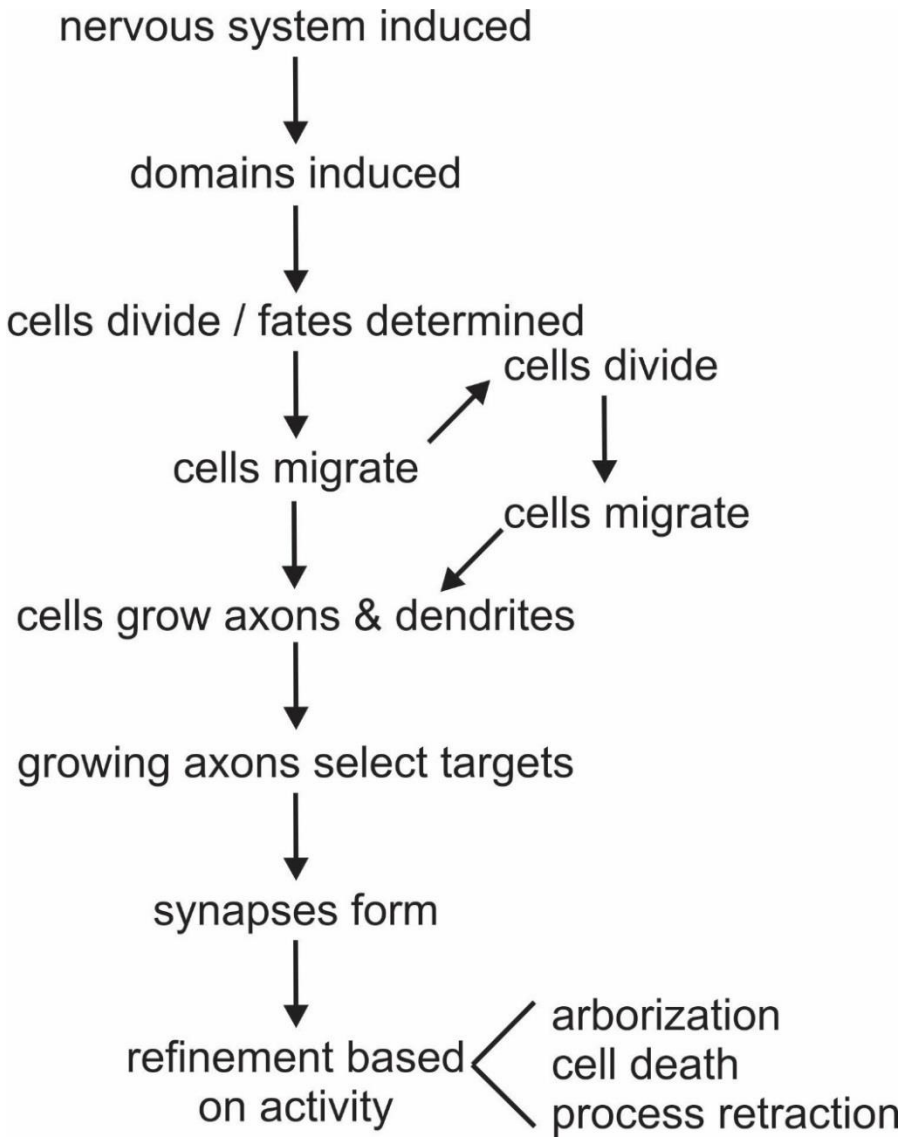
Development-

- Embryology of the nervous system
- **Cellular mechanisms of development**
- Development of behavior
- Diseases of development

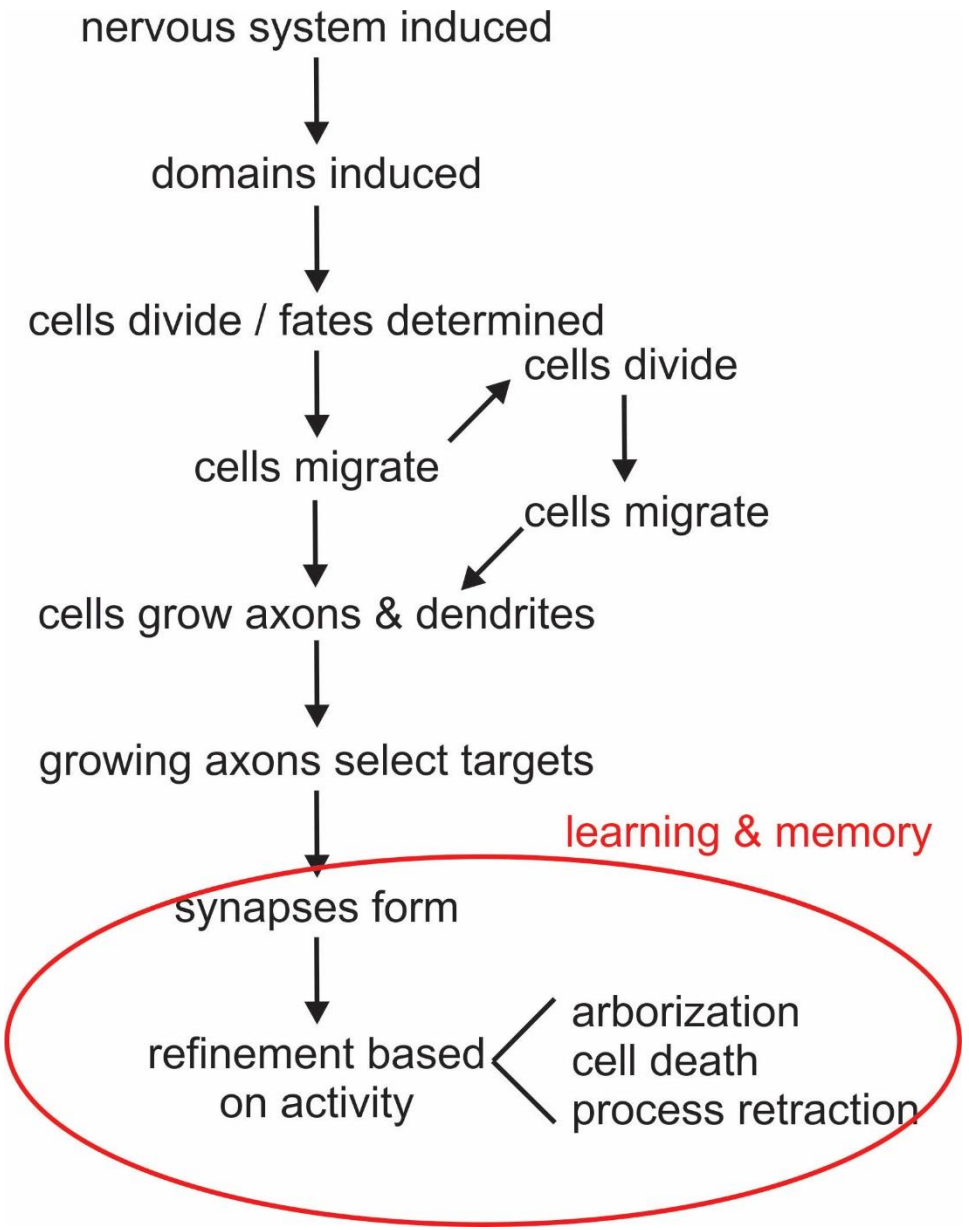
Adult-

- Neurogenesis
- Reaction to injury & regeneration
- Cell replacement & stem cells

# Sequential Cellular Events in Neurodevelopment



# Sequential Cellular Events in Neurodevelopment

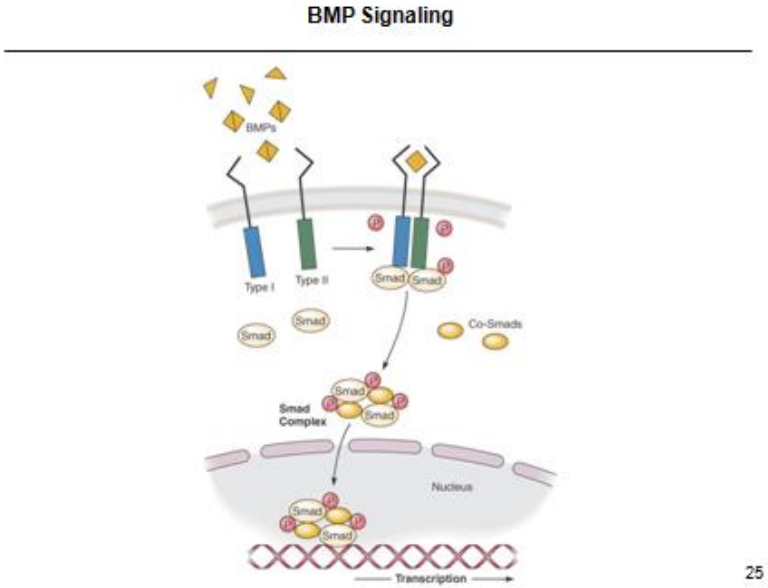


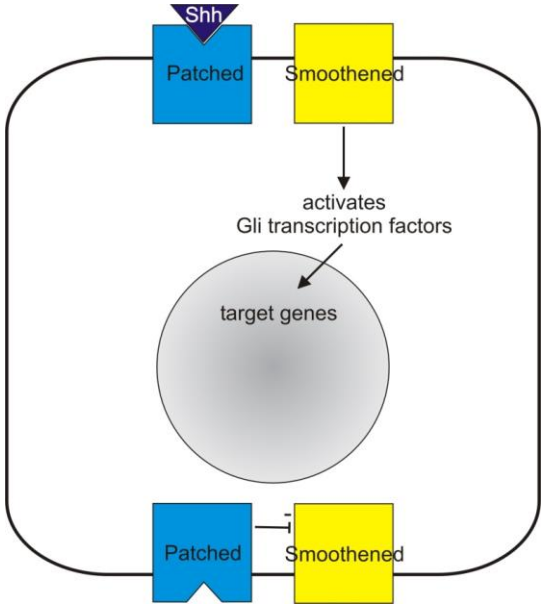
## Keep track of molecules!

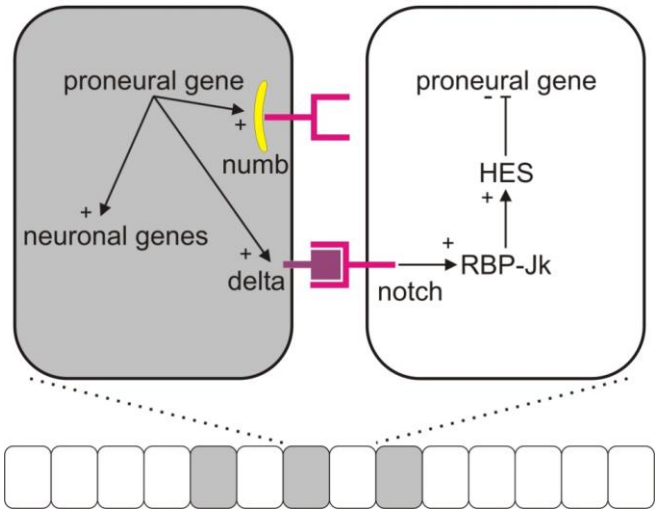
- BMPs
- Hedgehogs
- Wnts
- Notch
- RTKs
  - EGF
  - FGFs
  - Trks
  - Ephs
- Neurotrophins
- CAMs
  - Cadherins
  - Ig-like
- Caspases

# Keep track of molecules!

- ligand (cell surface or secreted)
- receptor
- signal transduction cascade
- target genes
- functions



## How can I learn everything?

- **Study regularly… do not depend on cramming.**
  There is too much material to hope to learn it at one time. Cramming does not lead to long-term memory.

- **Repetition, repetition and repetition… did I mention repetition?**
  Neural connections are strengthened by repeated activation.

- **Test yourself… do not just reread notes.**
  Active learning is more effective than passive learning.

- **Teach others… do not just reread notes.**
  Active learning is more effective than passive learning.

- **Turn off ALL distractions when you study… yes, music, TV, email, phone and facebook.**
  Numerous studies have shown this to be true.

## How can I learn everything?

- **Take handwritten notes during lecture.**

  A recent study showed that students who took handwritten notes during lecture had better recall of the material than those who took notes on a computer or who just listened.

- **Review the most difficult material just before going to bed**.

  The transfer of short-term memory to long-term memory takes place during sleep.

- **Get a full night sleep every night… really!**

  Again, the transfer of short-term memory to long-term memory takes place during sleep. [A recent study showed that blocking REM sleep in mice prevented memory consolidation (Boyce et al., 2016, *Science* 352:812).]

## How can I learn everything?

- **Exercise regularly.**

  Cell division in the dentate gyrus of the hippocampus is required for certain types of long-term memory, and exercise increases cell division in this region and improves memory.

- **Eat a balanced diet.**

  The brain requires energy and a full complement of basic molecules to function and build neural circuits;  these can only come from a balanced diet.

- **Shoot your television!**

  If you normally watch 2 hours of television per night, then dropping television would give you an additional 14 hours per week or 224 hours for the semester.

## How can I learn everything?

- **Active learning wins!**
  Write notes or notecards.
  Make drawings (from memory).
  Give lectures.
  Discuss the material.
  Take practice exams.

## How can I learn everything?

- **In previous years, the students with the top grades in the course often studied together regularly.**