

**BI 118 “Morphogenesis of Developmental Systems” 2021  
COURSE OUTLINE**

**Instructor: Prof. Angela Stathopoulos** (x5855, [angelike@caltech.edu](mailto:angelike@caltech.edu))

**Teaching Assistant: Peiwei Chen** ([pcchen@caltech.edu](mailto:pcchen@caltech.edu))

**Lectures 10:30am-11:50am Tuesday/Thursday, virtual**

BI118 will be taught using one suggested textbook, Gilbert’s “Developmental Biology” (12<sup>th</sup> edition), plus various other materials assigned as hoc as reference. This is an advanced course, and some background in respect to molecular biology is expected. The format is lecture plus discussion. Journal articles will be assigned after each lecture, and discussed the following class. The journal articles are required reading. For those registered in the course, attendance at lectures is required (except for emergencies). The course is either given for letter grade or P/F.

Students will choose a topic to research and write a proposal over the course of the term. This year the proposal will all center on one (large) topic: the ability of viruses (such as **SARS-CoV-2**) to infects cells and cytopathic effects (ability to affect cells’ morphogenesis). Projects require instructor approval by Jan. 14<sup>th</sup>.

**The Course Syllabus is as follows:**

**Tues. Jan 5. Class I: Lecture.** Introduction. Transcription factors, gene expression, and pattern.

**Thurs. Jan 7. Class II: Lecture.** Homeobox transcription factors – roles in patterns. HW1 due.

**Tues. Jan 12. Class III. Journal Club**

**He et al.** An axial Hox code controls tissue segmentation and body patterning in *Nematostella vectensis*. *Science* 28 Sep 2018:Vol. 361, Issue 6409, pp. 1377-1380

**Thurs. Jan 14. Class IV. Lecture.** Signaling pathways – interplay of cell adhesion and cell signaling. HW2 due.

Project progress 1: Before class on Jan 14, arrange a 15-20 minute meeting with Prof. Stathopoulos, to get your final project approved. Arrive at the meeting with at least two final project ideas to discuss.

**Tues. Jan 19. Class V. Journal Club**

**Tsai et al.** An adhesion code ensures robust pattern formation during tissue morphogenesis. *Science*. 2020 Oct 2;370(6512):113-116.

**Thurs. Jan 21. Class VI: Lecture** Cleavage, gastrulation & introduction to cell migration. HW3 due.

Project progress 2: Abstract and outline due.

**Tues. Jan 26. Class VII: Journal Club**

**Yi et al.** Keratins are asymmetrically inherited fate determinants in the mammalian embryo *Nature* volume 585, pages 404–409(2020)

**Thurs. Jan 28. Class VIII: Lecture** Cell shape/protrusions – cytonemes as signaling centers. HW4 due.

Project progress 3: Introduction paragraphs due.

**Tues Feb 2. Class VIV: Journal Club**

**Du et al.** Feedback regulation of cytoneme-mediated transport shapes a tissue-specific FGF morphogen gradient. *Elife*. 2018 Oct 17;7:e38137.

**Thurs. Feb 4. Class X: Lecture** Planar cell polarity. HW5 due.

Midterm exam distributed.

Project progress 4: Body text due.

**Tues. Feb 9. Class XI: no class. Take-home midterm exam due** to Prof. Stathopoulos' office by 11:55am (by end of class). Open Book/Notes. No internet. Individual Effort. 3-5 questions based on lecture materials and manuscript discussions. Two hour time limit.

**Thurs. Feb 11. Class XII: Journal Club.**

**Shindo and Wallingford.** PCP and septins compartmentalize cortical actomyosin to direct collective cell movement *Science*. 2014 Feb 7;343(6171):649-52

**Tues Feb 16. Class XIII: Lecture** Invasive cell behavior and the role of the extracellular matrix; apicobasal polarity. HW6 due.

Read: <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5186408/>

Project progress 5: First full draft due.

**Thurs. Feb 18. Class XIV: Journal Club**

Matus DQ, et al. Invasive Cell Fate Requires G1 Cell-Cycle Arrest and Histone Deacetylase-Mediated Changes in Gene Expression. *Developmental cell*. 2015;35:162–174.

**Tues. Feb 23. Class XV: Lecture** Closure of holes: wound healing; Formation and branching of tube. HW7 due.

Project Progress 6: Final full draft due.

**Thurs Feb 25. Class XVI: Journal Club**

Iida et al. JNK-mediated Slit-Robo signaling facilitates epithelial wound repair by extruding dying cells. Sci Rep. 2019 Dec 20;9(1):19549. doi: 10.1038/s41598-019-56137-z.

**Tues. Mar 2. Class XVII: PROJECT PRESENTATIONS**

**Thur. Mar 4. Class XVIII: PROJECT PRESENTATIONS**

**Tues. Mar 9. Class XIX: HW8 due. Review – Q&A**

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**Final exam due by March 17.** Take home exam due to Prof. Stathopoulos' office by 5pm. Open Book/Notes. No internet. Individual Effort. 5-7 questions based on lecture materials and manuscript discussions. Four hour time limit.

**HW+JC participation: 25% of grade**  
**Midterm: 25 % of grade**  
**Project: 20 % of grade**  
**Final Exam: 30% of grade**

**Class participation.** This is based on course attendance, journal club discussions, and homework. At the end of each lecture 2-3 homework questions will be assigned, which will be presented by student at the second half of the next lecture class (typically one week later).

**Project.** Students are expected to make progress throughout the term on a final writing project of their choosing. By the beginning of class Thursday January 12<sup>th</sup>, students are expected to have completed a 15-20 minute a meeting with the TA, Heather Curtis, to propose at least two final project ideas and have one of them approved. Project examples include writing a grant proposal, a review essay, a Wikipedia page, or conduct a modeling project. Suggested length is 3 pages, single spaced. Students will submit their progress on the project **before** each lecture, and on March 5<sup>th</sup> and 7<sup>th</sup> they will have 20 minutes to present them in class.

**Class website:** Lecture notes, Homework, Journal Articles will be posted.