Class meets: Tuesdays and Thursdays, 8:45AM -10:00AM, room 533 Science Building
Attendance: Attendance is required. If you miss class, watch the posted lecture and take good notes. Hand in your notes within one week of the class.
Prerequisite: BIO107
Instructor: Dr. David Champlin Office: room 476 A Wing, Science Building, Portland
Email: champlin@maine.edu Office Phone: 228-8349
Office Hours: My office hours will be Tuesdays and Wednesdays, 12:00 - 2:00 PM, but you can make an appointment to meet with me at just about any time. Here is a link that can help you with that: http://media.usm.maine.edu/~champlin/advising.htm

Developmental biologists examine the events from fertilization through the formation of the mature animal or plant and their subsequent reproductive cycles. Much of the focus is on embryogenesis, typically designated as the period between fertilization and birth. Until recently, developmental biology was called embryology.

The study of development has been one of the central questions in biology throughout history. No area of biology is being impacted more dramatically by the modern methods of molecular genetic analysis than developmental biology and the field has been in a golden era of research discovery for about twenty years.

The field of developmental biology is huge, reaching far beyond the embryo. For example, the study of cancer is one aspect of developmental biology. So too is the study of stem cells and the reasons for their prominence in the news. Also included is the study of the reiterative developmental events that occur during the reproductive cycles of animals and plants. A whole new area of study has recently sprung up called “Eco-Devo”. Eco-Devo stands for ecological developmental biology, the analysis of mechanisms by which the environment modulates developmental processes and the role these play in ecosystems. Eco-Devo is the focus of a second semester course, BIO407 Environmental Modulation of Developmental Mechanisms. Of all the topics pursued by developmental biologists, by far the most significant is something called “Evo-Devo”, the evolution of developmental mechanisms. Research in developmental biology is having a profound effect on our understanding of the process of evolution and the history of life on Earth. Evo-Devo is the dominant, unifying theme of this course. The Eco-Devo and Evo-Devo topics introduced in this course are at the epicenter of all biology.
This course emphasizes the importance of clear, descriptive, scientific writing. Whether describing the development of a chick embryo viewed under a microscope through a hole chipped into the egg shell, or describing the molecular genetic interactions of the genes that determine which side of a fruit fly embryo will become the tummy, developmental biologists rely heavily on carefully chosen words. Large portions of each exam will be essay questions. Also, we will write and revise a research paper.

The text we will use is an excellent example of clear, concise scientific writing that focuses on the principles unifying the many areas of developmental biology. While maintaining this focus, we will also incorporate some of the amazing discoveries developmental biologists will undoubtedly report during the semester. It is an incredibly exciting time to be a developmental biologist and my goal for this course is to provide you the tools to share in this excitement.

Grading:
If school is cancelled for any reason, any exam/quiz/assignment will take place the next lecture period.

The maximum number of points for the course is 600 as follows:
Each is described in more detail on our course web site: http://media.usm.maine.edu/~champlin/courseW.htm

- attendance and/or lectures notes from missed class 100 points
- review paper worth 100 points
- two exams each worth 100 points
- cumulative final worth 100 points
- five quizzes each worth 20 points
- three in-class assignments each worth 20 points
- two short writing assignments each worth 20 points

No make-ups for missed quizzes or in-class assignments, but you can drop the lowest two scores of the ten total quizzes / assignments. Each quiz will be announced at least a week ahead of time, but the in-class assignments might not be announced ahead of time.

When anything is handed back, we will go over the distribution of scores and assigned grades. Your final grade will be a weighted average of these grades (see * below) and I will also take into consideration your attendance and class participation in deciding your final grade. If you have questions or concerns about where you stand in the class at any time, please ask me.

* Take the letter grade GPA and multiply it by the fraction of the total points the letter grade was worth and then add up all results.
A=4.00, A-=3.67, B+=3.33, B=3.00, B-=2.67, C+=2.33, C=2.00, C-=1.67, D+=1.33, D=1.00, D-=0.67, F=0.00
Review Paper:

**Option to participate in the 4-H STEM Ambassador Program:** Students who complete the program to the satisfaction of the 4-H director, Sarah Sparks, will write a Review Paper that is just a one-page summary. Here is a link to the web sites:

http://media.usm.maine.edu/~champlin/4HSTEM.htm

http://umaine.edu/4h/youth/4-h-projects/science-engineering-technology/stem-ambassadors/

To participate, contact Sarah Sparks, sarah.sparks@maine.edu, and let her know which one of the training sessions you will attend (listed on the first web site above).

*Development* is one of the top journals in the field of developmental biology. Abstracts for the articles that appear in *Development* are at [http://dev.biologists.org/](http://dev.biologists.org/). You should choose an article that is in the "Research Articles" section (this is a primary research article rather than a review article). You should be able to download articles for free if they are more than six months old. Scan through abstracts in the journal and select one that covers a topic you find interesting - but you don't need to understand any of the details of the article at this point. Once you are set on your research article, the next step will be to identify one or two review articles (These are often cited in the Introduction of the paper) and read them. Bring the article to class on October 6th and we will discuss what your article is about and learn about how to use science databases. Be prepared to describe the article - but you don't need to understand the details at this point.

The paper is due in class on November 17th. Please turn in photocopies of the articles you read plus a paper with your own description of the following: Why were the experiments in the *Development* article done? What techniques were employed? What was learned? Before answering these questions, begin your paper with introductory background information you gleaned from the review articles that your classmates would need in order to understand your answers to these questions. There is no length requirement for this paper but it will likely be six pages or a bit more.

**Web Resources:**

I don't use Blackboard much. The following web site will have a copy of the syllabus, handouts, quizzes, exams, as well as examples of exams from previous semesters: [http://media.usm.maine.edu/~champlin/courseW.htm](http://media.usm.maine.edu/~champlin/courseW.htm)

My goal will be to post the PowerPoint presentations and recordings of the lectures. Lecture recordings will each be posted for one week.

There are tremendous resources on the web to help introduce students to developmental biology from the personal web sites of researchers to videos produced by companies selling products that facilitate discovery. The Society for Developmental Biology maintains a good web site ([http://www.sdbonline.org/](http://www.sdbonline.org/)). In general, these sites are big so they are slow to load on some computers. The computers in my research lab are very fast and you are welcome to make an appointment with me to use the computers in my lab for our course. That would be great!
Student Support:
At any point in the semester, if you encounter difficulty with the course or feel that you could be performing at a higher level, consult with me. Students experience difficulty in courses for a variety of reasons. The following are resources on campus for students.

- For writing skills or time management, you can make an appointment to see a student tutor at the Learning Commons located in both the Portland and Gorham libraries. For more information, visit [http://www.usm.maine.edu/learningcommons](http://www.usm.maine.edu/learningcommons). The Writing Center at LAC is also available to all USM students and is a great option for students living in the greater Lewiston/Auburn area. For more information, please visit [http://usm.maine.edu/writingcenter](http://usm.maine.edu/writingcenter).

- If you need accommodations due to a disability, please contact the Disability Services Center for confidential assistance and accommodation authorization. Timely notification of accommodations is essential. For more information, visit [http://usm.maine.edu/dsc](http://usm.maine.edu/dsc).

- University Health and Counseling Services is a student resource that promotes the health and well-being of the USM community. More information can be found at [www.usm.maine.edu/uhcs](http://www.usm.maine.edu/uhcs).

- The University of Southern Maine shall not discriminate on the grounds of race, color, religion, sex, sexual orientation, national origin or citizenship status, age, disability or veteran's status in education, employment, and all other areas of the University. Discrimination inquiries should be directed to Betsy Stivers, Director, Equal Opportunity Center of Excellence. She can be reached at 780-4709 or elizabeth.stivers@maine.edu.

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<thead>
<tr>
<th>Day</th>
<th>Date</th>
<th>Reading</th>
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<tr>
<td>T</td>
<td>8/30</td>
<td>pp.235-253 (sections on nematodes in Ch. 6)</td>
<td>C. elegans, model systems, molecular genetics</td>
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<td>Watch three Audio/Video handouts: 1A, 1B, and 1C</td>
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<td>Th</td>
<td>9/1</td>
<td>Ch. 1</td>
<td>An introduction to developmental biology</td>
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<td>T</td>
<td>9/6</td>
<td>QUIZ 1</td>
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<td>More introduction</td>
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<td>Watch two Audio/Video handouts: Review of transcription regulation, Parts 1 and 2</td>
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<td>Th</td>
<td>9/8</td>
<td>Ch. 3</td>
<td>Vertebrate life cycles</td>
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<td>T</td>
<td>9/13</td>
<td>QUIZ 2</td>
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<td>Vertebrate axes and germ layers</td>
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<td>Th</td>
<td>9/15</td>
<td>CH. 4</td>
<td>Vertebrate axial patterning</td>
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<td>9/20</td>
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<td>More vertebrate body plan</td>
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<td>Th</td>
<td>9/22</td>
<td>Ch. 5</td>
<td>Early patterning of vertebrate nervous systems</td>
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<td>9/27</td>
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<tr>
<td>Th</td>
<td>9/29</td>
<td>Ch. 2</td>
<td>Molecular development of Drosophila</td>
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EXAM 1  Chapters 1, 3, 4, parts of Ch 5 (In Ch 5, for this exam emphasize Figs. 5, 6, 11, 13, 21 35 and Box5E), and part of 6 Ch (pp235-253)

On Thursday, 10/6, Please bring a copy of the primary research article you have selected (or more than one if you haven’t decided) plus your notes on the article.

T  10/11  no class – October Vacation
Th 10/13  More plant development
T  10/18  Ch. 9  Mechanisms of morphogenesis
Th 10/20  More morphogenesis
T  10/25  Ch. 8  Cell differentiation
Th 10/27  Stem cells
T  11/1  More Cell differentiation
Th 11/3  Ch. 11  Organogenesis
T  11/8  More Organogenesis
Th 11/10  EXAM 2  Chapters 2, 7, 8, 9

T  11/15  Ch. 12  Development of the nervous system

Your review paper is due at the beginning of class on Tuesday, 11/17

Th 11/17  More neural development
T  11/22  Ch. 10  The saga of the germ cell
Th 11/24  no class – Thanksgiving Break
T  11/29  More on reproduction
Th 12/1  parts of Ch 13  Growth
T  12/6  Developmental biology in medicine
Th 12/8  Chapter 14 Evo Devo revisited

The Final Exam will be in our regular classroom on: Thursday, Dec. 15th, 8:00 AM – 10:00 AM.
The exam will cover all the material in the course.