COURSE SYLLABUS for “EVODEVO”

This is a relatively new field, affectionately called "EvoDevo" by its devotees. It is concerned with the comparative genetics of development in different organisms, and applies evolutionary principles to understanding the patterns found. This course will also emphasize the impact of evolutionarily conserved developmental genes and mutations on human health and disease.

Undergraduates and graduate students may be in this course together, but the course is offered as an introduction to the topic and will be accessible for all students. Please have Genetics, BIOL 282 completed or talk to Dr. Pickett about your background.

The course will comprise formal discussions by Dr. Pickett on evolution, population genetics, molecular evolution, development, and developmental genetics, followed by discussions of papers on particular topics, led by Dr. Pickett and by students. Students will also be required to develop written “reaction analyses” on papers specially prepared for student engagement using custom PDF files. I will provide paper versions of these “worksheet” papers for group and individual analysis. These will be analogous to real-time writing assignments and will be graded in class through group discussion. This class will be run as a literature driven seminar course, so your active engagement with the material and all discussions will be crucial to your success and the success of the course, come ready to discuss and do science!!

We will be doing repeated “paper bashing” analyses of developmental literature.

You will be informed of your approximate mid J-term grade on Day 4 of J-Term, Grading will be broken down as follows:

1) 35% on class participation (informed, thoughtful questions, comments and discussion) I will be logging participation
2) 30% on your self-organized group presentations of paper analyses
3) 35% on your written paper analyses, after group editing and feedback review by Dr. P.

Non-required, but suggested texts:
http://www.amazon.com/Reading-Story-DNA-Beginners-Molecular/dp/0199290911
http://www.amazon.com/Endless-Forms-Most-Beautiful-Science-ebook/dp/B001M5B0H4/ref=sr_1_7?ie=UTF8&qid=1412956868&sr=1-7&keywords=developmental+biology
http://www.amazon.com/Your-Inner-Fish-Journey-3-5-Billion-Year-ebook/dp/B0010SKTRA/ref=sr_1_1?ie=UTF8&qid=1412956977&sr=1-1&keywords=inner+fish

**Academic Dishonesty WILL NOT BE TOLERATED IN THIS COURSE.** The grade I assign is my certification that you have attained a certain level of mastery of the course material. An A or a B in this course is something of which you should be proud; you will have lots of chances to improve work after review by peers and the professor and so A and B grades are very attainable through legitimate hard work. I will consider any attempt to discredit the evaluation system (e.g., plagiarism) as serious, and will deal with it severely. Academic dishonesty will be reported in writing to the Department Chairperson, to your Academic Advisor, and to the appropriate Dean, and will result in a 0 on an assignment, which can lead to an F in the course, and possibly other academic sanctions. Honesty is the best policy...

My office, telephone number and email address: Dr. F. Bryan Pickett, Quinlan LSB 242, (773) 508-3367 fpicket@luc.edu

Formal office hours: Each day after class for 1 hour or as needed.

**Tentative and Approximate EVODEVO CLASS SCHEDULE** NOTE times and topics may change to incorporate new research

<table>
<thead>
<tr>
<th>Month</th>
<th>Day</th>
<th>Hours</th>
<th>In-Class subjects</th>
<th>Exercise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dec.</td>
<td>29</td>
<td>1 – 2.5</td>
<td>Intro; paper-reading, embryos and techniques</td>
<td>none</td>
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<tr>
<td></td>
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<td>2 - 3</td>
<td>Introduction to EvoDevo (eat food, break) selection, Darwin, drift</td>
<td>Reaction Paper</td>
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<td></td>
<td></td>
<td>3 - 4.5</td>
<td>Write and review reaction paper, Molecular evolution</td>
<td>Review Paper</td>
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<tr>
<td></td>
<td>30</td>
<td>1 - 2</td>
<td>Networks of Genes, Duplication, Sub and Neo Functionalization</td>
<td>Paper Analysis</td>
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<tr>
<td></td>
<td></td>
<td>2-3</td>
<td>Introduction to Functional Evolution Pax6, Pitx1 (eat food, break)</td>
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<tr>
<td></td>
<td></td>
<td>3 – 4.5</td>
<td>Review paper, Hox genes, cell specification in the long axis and limbs</td>
<td>Paper Analysis</td>
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<tr>
<td>Jan</td>
<td>2</td>
<td>1 - 3</td>
<td>Hox genes part 2, the invertebrate/vertebrate cis regulatory transition (efb)</td>
<td>Review Analysis</td>
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<tr>
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<td></td>
<td>3-4.5</td>
<td>Hox genes part 3, Retinoic acid, PFG and the vertebrate organizer</td>
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<tr>
<td></td>
<td>3</td>
<td>1 - 2</td>
<td>Hox genes in rays and skates, evolution of limb fields, coordinate evo.</td>
<td>Paper Analysis</td>
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<tr>
<td></td>
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<td>2 – 3.5</td>
<td>Different rates for different folks, molecular evolution of TGF-beta rec.</td>
<td>Eat food, break</td>
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<tr>
<td></td>
<td></td>
<td>3.5-4.5</td>
<td>Tree building and cladistics</td>
<td>Tree Building</td>
</tr>
<tr>
<td></td>
<td>5</td>
<td>1 - 2.5</td>
<td>Fossils from the Cambrian to today, submarine giants to Haikouichthys</td>
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</tr>
</tbody>
</table>
General Statement Regarding Student Comportment

All students are expected to conduct themselves in a manner that is respectful of the professor and of other students in class. The professor will also show respect to students. Disruptive and rude behavior (talking off topic in class, harassing staff, the professor or other students etc.) will not be tolerated. Students acting inappropriately will be asked to leave the classroom and disciplinary action including but not limited to notification of the Chair, Dean and Academic/Pre-professional Advisors will be taken. Students are expected to arrive in class prior to the starting time listed for the class section. If you arrive late you will enter the classroom quietly and take the first available seat closest to the door so as not to disturb the class. All cell phones, pagers, wireless PDAs etc. will be turned off during class. If your device is activated during class you will leave the class immediately and not return for the duration of that class period. To maintain test security students will not be permitted to leave and return to class for any reason during an examination. Please handle any personal needs prior to starting an examination or the beginning of the class period. A special note for Pre-Medical students, ALL of your faculty write letters of recommendation and/or sit as members of the university Pre-Health Advising Committee. Some collaborate closely with faculties at Stritch School of Medicine and other local medical schools. Pre-Health faculty meet several times a semester to discuss the curricula and progress of students in faculty meetings. Outstanding comportment and a respectful understanding of student and faculty roles by the student is expected in science coursework....'nuff said? 😊.

STUDENTS WITH A DISABILITY:

Students seeking academic accommodations for a disability must meet with Services for Students with Disabilities (SSWD) to verify the disability and to establish eligibility for accommodations. Students may visit SSWD in Sullivan Center - Suite 117, call 773-508-3700, email mailto:sswd@luc.edu or visit LUC.edu/sswd to begin the process. Students should schedule an appointment with Dr. Pickett to discuss any academic concerns and/or accommodations. Students are encouraged to contact SSWD as early in the semester as possible. Dr. Pickett is committed to fair and equitable treatment of all students who have disabilities.

FYI: Dr. Pickett's Highly/Obnoxiously Opinionated Take on Analyses and Discussions of Scientific Papers

Unlike many forms of human "communication", a scientific discussion and paper analysis should attempt to accomplish a meaningful dialog between the speaker and discussion group and a useful transfer of information. A scientifically informed and educated audience should expect the following from a discussion participant or paper review. I provide these guidelines both to help you become a good communicator of scientific ideas, and to guide you in the preparation of your own discussion topics.

Part A: Introduction of the Topic and Necessary Background Information

REMEMBER!! You Are Telling a Story; Not Presenting the Slides You Took on Your Personal Journey of Scientific Discovery. Be clear in introducing the topic, tell us why it is important and orient us to the material to be discussed. It is always tempting to assume that the rest of the world finds our topic as interesting and compelling as we do. In a perfect world everyone in the discussion group would have read all pertinent past work, the work of author's competitors and colleagues and their latest missives appearing in the West Albanian Journal of Biological Ephemera or less importantly in Cell. Unfortunately the real demands of the profession dictate declining time...
investments in perusing the general scientific literature as we advance in the profession. As such it is important to provide sufficient background information to address the following issues. All good discussions of experiments should contain these components, regardless of the perceived "importance", "relevance" "translational use" or "hotness" of the field.

1. **Introduce the Questions**: What scientific questions (hypotheses) will be addressed by the experiments described today?

2. **Introduce the Field**: What previous questions and answers led to the asking of the questions under discussion today? This places the work under discussion into an appropriate scientific context.

In your average discussion of an experiment the relative order of 1 and 2 may be reversed etc. but talks that begin without this careful delineation of the field of work and the questions under consideration generally leave the discussion group with a stunned, stupefied, and bloated feeling that endures throughout the paper analysis. In my experience the only thing to look forward to in a poorly organized and introduced analysis is the conclusion.

Following the general introduction, many speakers elect to briefly introduce aspects of the major experimental methodology involved, although it is also important to reintroduce methods while discussing each experiment.

**Part B: Experimentalia**

In the introduction to an experiment or set of experiments we are told the major scientific questions that will be addressed by the experimental results presented in the talk. Each experiment or small set of closely related experiments should be introduced with the following issues in mind. Repeat this process with every experiment discussed that addresses a different question or element of the hypothesis.

1. **What question(s) or aspects of the main hypothesis will be addressed by the experiment?**

2. **What experimental approach will be used to address this aspect of the hypothesis?** Describe and discuss the techniques to be used.

3. **What are the results expected if the experimental result supports or fails to support the hypothesis?**

The data set for each experiment should then be presented. When presenting data clearly orient the audience to the figure. What do the X and Y axes represent on a graph? What does an upward, downward etc. trend in the data mean? What do the columns and rows on a table represent? If a statistical test was used during data interpretation, what was it and what did it tell us about the data? What DNA, RNA, protein etc. was loaded on a gel and in which gel lane, how was it processed? What organ, leaf, brain, eye, fin, stem etc. structure is being shown and why? What is the anterior to posterior, dorsal to ventral, or proximal to distal orientation of the organ or organism shown? What are the major anatomical landmarks and what anatomical compartment of the body are we exploring. Clearly walk the audience through all figures!!

4. **Restate the question or hypothesis tested by the experiment, and conclude your presentation of each experiment by discussing how the data you discussed supported, or failed to support the hypothesis that led to the performance of the experiment.**

Repeat this process for each experiment, or group of related experiments you present. Leave time to summarize the results of several experiments and discuss how they support the overall hypothesis. A closely related set of experiments could also benefit from their own introductory slide and summary slide.
C. Conclusion

1. Briefly restate your original hypothesis or question

2. Discuss data sets in summary form, do they support, or fail to support your hypothesis.

3. Place your set of experiments into the context of other work in the field, discuss how your work extends your discipline’s field of inquiry.

If you are presenting your talk in a civilized environment, you will upon concluding your talk be plied with snacks and sophisticated refreshments prior to dinner with an adoring throng of well-wishers. Alternatively, if you are a graduate student presenting a talk, you will often be shown the way to the bus stop. But at least it’s over and the stomach butterflies can be released from captivity (huzzah!!)! As you mature as a speaker keep the previous guidelines in mind, but feel free to evolve your talks and change/discard approaches suggested above. This outline provides useful training wheels for the novice, but if you discover a clear and compelling way to integrate Quantum Interpretive Dance into your Biochemistry Ph. D. dissertation defense, please don’t let my guidelines needlessly inhibit your creativity.