Genomics 3403/5403, 3 credits
Instructor: David Liberles
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Please email to arrange office hours or meetings with the instructor when none have been announced.

Course Meetings: TTh 5:30-6:50, Beury Hall 413

Course Goals: This course will cover the process of gene inheritance and descriptions of genome structure, as well as a discussion of gene content and function across lineages. Students will learn about genome-related technologies, including genome sequencing. They will also learn about how genomes vary across species, as well as the forces driving these evolutionary changes. A significant part of the course will cover genome-level data analyses, and students will complete assignments and exams to demonstrate understanding of the information present in genomes and how we know it.

Lecture Topics
1. Inheritance and DNA
2. Genome Sequencing Technologies and Genome Assembly
3. Genome Annotation and Functional Annotation
4. Viral Genomes
5. Bacterial and Archaeal Genomes (and Metagenomic Analysis)
6. Eukaryotic Chromosomes
7. Ciliates and Genome Rearrangement
8. Fungal Genomes
9. Other Eukaryotic Genomes
10. Whole Genome Duplication: The Examples of Plants and Fish
11. The Human Genome
12. Gene and Genome Databases
13. Comparative Genomics I: A history of life on Earth that genomes evolved in
14. Comparative Genomics II: Qualitative discussion of the neutral theory and how genomes evolved
15. ENCODE and genome function: A case study in controversy
16. Comparative Genomics III: Pipelines to build gene family trees
17. Comparative Genomics IV: Gene family evolution (including phylogenetics)
18. Comparative Genomics V: GO, KEGG, and networks/pathways
19. Comparative Genomics VI: An introduction to models
20. Transcriptomics
21. Proteomics
22. Metabolomics and other Omics
23. The genetics and genomics of human disease
24. Cancer genomics
25. Tasmanian Devil Facial Tumor Genomics
26. Population genomics and personalized medicine

There will not be class on October 22 or November 10.

Projects/Grading
1. Quiz (In Class) 10% September 8
2. Gene Family Construction Part I: Identifying a Gene to Study and BLAST 12.5% due September 29
3. Gene Family Construction Part II: Multiple Sequence Alignment, Model Selection, and Phylogenetic Tree Reconstruction (including experimentation with different tree building approaches); Comparison with reference species trees (and rooting) 12.5% due November 3
4. Mid-Term (Take Home/Open Book) 20% due October 27
5. Gene Family Construction Part III: Identifying Positive Selection using PAML (Different tests for selection in PAML and biological hypothesis testing for evolution after gene duplication) 12.5% due November 19
6. Comparing homologous proteins from normal and disease states: Polyphen and Locations of Mutations Using Swiss-Model 12.5% due December 3
7. Final Exam (Take Home/Open Book) 20% due December 11

Problem sets and exams will be strictly graded, but final course grades will be based upon separate curves for 3403 and 5403 based upon natural breaks in the score distribution. Late exams and problem sets will not be accepted, except with prior approval from the instructor. Course attendance is not mandatory, but students will be responsible for knowledge provided during missed classes.

Course Website: To be announced.
Course Website Usage Instructions: The website is navigated by traversing the links on the page and is visualized with common browsers like Chrome or Explorer. The website language will be English.


Course Technology Requirement: Students should have access to a computer and will benefit in some lectures by bringing a laptop to class.

Reading Materials will include primary literature readings indicated on the course website, as well as readings from the class indicated on the lecture notes.

Required Disability Statement: Any student who has a need for accommodation based on the impact of a documented disability, including special accommodations for access to technology resources and electronic instructional materials required for the course, should contact me privately to discuss the specific situation by the end of the second week of classes or as soon as practical. If you have not done so already, please contact Disability Resources and Services (DRS) at 215-204-1280 in 100 Ritter Annex to learn more about the resources available to you. We will work with DRS to coordinate reasonable accommodations for all students with documented disabilities.

Required Statement on Student and Faculty Academic Rights and Responsibilities: Freedom to teach and freedom to learn are inseparable facets of academic freedom. The University has a policy on Student and Faculty and Academic Rights and Responsibilities (Policy #03.70.02) which can be accessed through the following link: http://policies.temple.edu/getdoc.asp?policy_no=03.70.02.
Link to Temple Technology Usage Policy: https://computerservices.temple.edu/technology-usage-policy