

Syllabus

MCB 5471: Current Topics in Molecular Evolution: Evolution through Genetic Exchange

Course Description

Meeting Times: Mondays 11.15am
First Meeting: Monday, 1/23/2017 at 11.15 am
Meeting place: Kresge Library (TLS 2nd floor)
Instructor: J. Peter Gogarten

Content: The course will focus on “Evolution through Genetic Exchange”. Most reading materials will be articles from Nature Reviews in Microbiology, Nature Reviews in Genetics and Nature Microbiology. Many examples will involve prokaryotes; however, interactions between viruses and bacteria and their eukaryotic hosts, and interactions between Eukaryotes will be included. Topics will range from *Symbiosis, the Black Queen Hypothesis* and *Evolution of the Holobiont* to the *Transfer of Adaptive Genes between Multicellular Eukaryotes* (e.g. antifreeze proteins in fish) and *Archaic Admixtures and Introgression in Human Evolution*.

Expectations: The course will meet for one hour every week to discuss one topic.

- All registered students are expected to actively participate in all meetings.
- All participants are required to have read the key-paper assigned for the topic.
- One student will provide a short overview on the topic (less than 20minutes), most of the time will be devoted to discussions.
- The student leading the discussion will go over their approach with the instructor at least **5 days before** the discussion date.
- In addition to the in-classroom discussions, we will utilize the discussion board on [HuskyCT](#). If you do not have access (after the beginning of classes), please send email to gogarten@uconn.edu with your name and netID.
- Every student writes a short paper on one of the weekly topics (max. 4 pages 12pt Times Roman font). The essay is due during the exam period May1st-6th. The instructor will strive to report grades in a timely fashion for those planning to graduate at the end of the semester; consequently, if your essay is handed in after May 3rd, you may temporarily receive an incomplete.

Goals and Objectives:

Know about the following:

- the role of genetic exchange in organismal evolution
- the conflict between Social Darwinism and Mutual Aid
- Mutationism versus the Modern Synthesis
- Introgression, horizontal gene transfer, sex and homologous recombination
- the holobiont concept
- definition of symbiosis, and the different levels on which symbiosis does occur
- the elements of open source genetics
- selfish genetic elements and molecular parasites
- adaptation through gene transfer

- speciation through gene transfer and symbiosis.
- selectively neutral of nearly neutral pathways towards complexity
- the use of parasites (molecular, phages and viruses) as a weapon against competitors
- bacterial species concepts
- the black and red queen hypothesis
- division of labor emerging in microbial populations
- origin of eukaryotes

Course Materials: Most reading materials will be articles from Nature Reviews in Microbiology, Nature Reviews in Genetics and Nature Microbiology. Students will have access to class materials on [HuskyCT](#). If you do not (after the beginning of classes) please send email to gogarten@uconn.edu with your name and netID.

Preliminary Time table:

| | |
|--------------|---|
| 23-Jan | "The Struggle for Existence" vs "Mutual Aid" |
| 30-Jan | Modern Synthesis <i>versus</i> Mutationism |
| 6-Feb | Mechanisms of gene transfer between lineages 1: Transformation, transduction, conjugation, cell fusion, introgression, the weak link hypothesis |
| 13-Feb | Mechanisms of gene transfer between lineages 2: ene transfer agents and cell fusion in Archaea |
| 20-Feb | Selfish gene and the selfish operon theories |
| 27-Feb | Selfish genetic elements: Molecular Parasites (homing endonucleases, introns, transposons) |
| 5-Mar | Beneficial viruses, viruses as weapons, viral mutualistic symbioses |
| Spring break | |
| 19-Mar | Evolution of the Holobiont – Symbiont transmission pathways, hologenome evolution by natural selection |
| 26-Mar | Re-evaluating prokaryotic species |
| 2-Apr | Mutualism in the microbial world: The Black Queen Hypothesis. |
| 9-Apr | Hybridization, and Hybridization barriers; example: Hybridization in human evolution |
| 16-Apr | Evolution of antibiotics and antibiotic resistance |
| 23-Apr | Origin of Eukaryotes |

Grading: Grades will be based on participation, the student's presentation, the short essay, and the outcome of possible pop-up quizzes.

Students also can request an additional oral exam to count 40% to the final grade (let me know before 4/25).

Makeup Work for Legitimate Absences: In case you miss class please contact the instructor in a timely manner to arrange a make-up assignment.

Contact Information:

J. Peter Gogarten
Department of Molecular and Cell Biology
91 North Eagleville Road, Unit 3125, BPB 404
Storrs CT 06269-3125, USA
Phone: 860 486 4061 (office)
860 465 6267 (cell)
Email: gogarten@uconn.edu
www: <http://gogarten.uconn.edu/>

Office hours:

Arrange meetings per email to gogarten@uconn.edu
Mondays 2-4pm
Tuesdays 1.30-3pm
Thursdays 2-3.30pm