Fall Semester 2010
Course Announcement

MOLECULAR GENETICS
CBA 570 (3 UNITS)
GENE 570 (3 UNITS)
MIC 570 (3 UNITS)
IMB 570 (3 UNITS)

Instructor: Harris Bernstein, Ph.D., Office: COM Room 458, Office phone: 626-6069; email: bernstein3@earthlink.net

Start and End Dates: 8/23/10 – 12/8/10

Class Hours: 1:00pm to 2:15pm, Mondays and Wednesdays

Class Location: AHSC, Life Sciences North, Room 452

Instructor’s Office Hours: Mondays and Wednesdays, after class. Will meet students any other time by appointment.

Grades: The grade will be based on student presentations, midterm and final exam (equal credit for each)
**TENTATIVE SCHEDULE**

**MOLECULAR GENETICS (FALL, 2010)**

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<tbody>
<tr>
<td>23(M)</td>
<td>Bacteriophage life cycles</td>
<td>25(W)</td>
<td>Bacteriophage morphogenesis</td>
<td>30(M)</td>
<td>DNA replication I</td>
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<td>Sept</td>
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<td>1(W)</td>
<td>DNA replication II</td>
<td>6(M)</td>
<td>Labor day – no class</td>
<td>8(W)</td>
<td>DNA replication III</td>
<td>13(M)</td>
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<td>6(M)</td>
<td>Bacteriophage morphogenesis</td>
<td>8(W)</td>
<td>DNA replication III</td>
<td>13(M)</td>
<td>Replication origins and initiation of replication</td>
<td>15(W)</td>
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<td></td>
<td></td>
<td>13(W)</td>
<td>DNA replication II</td>
<td>15(W)</td>
<td>Topoisomerases</td>
<td>20(M)</td>
<td>Mutation</td>
<td>22(W)</td>
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<td>22(W)</td>
<td>DNA repair I</td>
<td>27(M)</td>
<td>DNA repair II</td>
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<td>11(M)</td>
<td>Gene transfer in bacteria</td>
<td>13(W)</td>
<td>Exam</td>
<td>18(M)</td>
<td>Plasmids and transposons</td>
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<td>20(W)</td>
<td>Gene expression (transcription and translation)</td>
<td>25(M)</td>
<td>Regulation of gene expression</td>
<td>27(W)</td>
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<td>Nov</td>
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<td>1(M)</td>
<td>Aging of the soma, immortality of the germ line</td>
<td>3(W)</td>
<td>Student presentation*</td>
<td>8(M)</td>
<td>Student presentation*</td>
<td>10(W)</td>
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<td>3(W)</td>
<td>Student presentation*</td>
<td>8(M)</td>
<td>Student presentation*</td>
<td>15(M)</td>
<td>Student presentation*</td>
<td>17(W)</td>
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<td>10(W)</td>
<td>Veterans Day – no class</td>
<td>15(M)</td>
<td>Student presentation*</td>
<td>17(W)</td>
<td>Student presentation*</td>
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<td>Student presentation*</td>
<td>24(W)</td>
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*Topics will be chosen to allow discussion of some specific current major unsolved problems in biology: (1) the molecular basis of aging; (2) the early events in progression to cancer; (3) the adaptive advantage of sexual reproduction. Student talks should be organized to take 30 minutes + 5 minutes for class discussion. The focus should be on basic mechanisms, especially in relation to topics covered previously in the course. Also the material covered should be up to date, i.e. include references to 2008 to 2010 papers, when relevant. The initial portion of the talk should discuss appropriate background information. Concluding remarks should include the broad implications and significance of the studies reviewed.*
No required text for course (there will be handouts for each lecture)

Recommended texts:
Genes X (2010) Lewin, Wiley & Sons or earlier editions

Other resources:
DNA Repair and Mutagenesis (2006) Friedberg et al., ASM Press

Suggested topics for student presentations

Aging and DNA repair
1. Human premature aging syndromes (with predisposition to cancer): Werner syndrome and Bloom syndrome
2. Human premature aging syndromes: Cockayne syndrome, Hutchinson Gilford Progeria and Rothmund-Thomson syndrome
3. Aging and PARP [poly(ADP-ribose) polymerase]. Emphasize the linkage between the role of PARP in DNA repair and longevity.
5. Increase in mutation frequency of sperm with age. Is it a real problem?
6. The role of XPF-ERCC1 endonuclease in nucleotide excision repair and evidence that defects in these genes cause dramatic aging in mice and humans (trichothiodystrophy).

Cancer: Role of DNA damage and repair
7. Inherited genetic defects in recombinational repair predisposing to breast and ovarian cancer in humans; Breast Cancer 1 and 2 (BRCA1, BRCA2).
8. Inherited genetic defects in DNA repair predisposing to cancer in humans; Ataxia Telangiectasia Mutant (ATM) and Nijmegen Breakage Syndrome (NBS).
9. Inherited genetic defects in nucleotide excision repair predisposing to skin cancer in humans; xeroderma pigmentosum (XP).
10. Inherited genetic defects predisposing to cancer in humans; hMSH2, hMSH6, hMLH1, hPMS2. Mismatch DNA repair defects predisposing to hereditary non-polyposis colon cancer.
11. Inherited genetic defects predisposing to cancer in humans; p53 defect. Li Fraumini syndrome.
12. MUTYH-associated polyposis and increased risk of colorectal cancer
13. Field defects (pre-malignant fields of cells in which cancers tend to arise)
14. DNA polymerases that carry out inaccurate trans-lesion synthesis and their possible relationship to cancer.
15. DNA damaging effects of tobacco smoke related to cancer
16. Estrogens, DNA damage and breast cancer

The adaptive advantage of sexual reproduction. Role of DNA repair
18. What is the function of bacterial transformation (bacterial sex)...For review, see Michod et al., Infection, Genetics and Evolution 8; 267-285 (2008).