Fall Semester 2009
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., COM Room458, 626-6069

Start and End Dates: 8/24/09 – 12/14/09

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

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, 2009)

Aug	24(M)	Bacteriophage life cycles
	26(W)	Bacteriophage morphogenesis
	31(M)	DNA replication I
Sept	2(W)	DNA replication II
	7(M)	Labor day – no class
	9(W)	DNA replication III
	14(M)	Replication origins and initiation of replication
	16(W)	Topoisomerases
	21(M)	Mutation
	23(W)	DNA repair I
	28(M)	DNA repair II
	30(W)	Inherited human conditions defective in DNA repair
Oct	5(M)	Mechanism of recombination I
	7(W)	Mechanism of recombination II
	12(M)	Gene transfer in bacteria
	14(W)	Exam
	19(M)	Plasmids and transposons
	21(W)	Gene expression (transcription and translation)
	26(M)	Regulation of gene expression
	28(W)	Aging of the soma, immortality of the germ line
Nov	2(M)	Student presentation*
	4(W)	Student presentation*
	9(M)	Student presentation*
	11(W)	Veterans Day – no class
	16(M)	Student presentation*
	18(W)	Student presentation*
	23(M)	Student presentation*
	25(W)	Student presentation*
	30(M)	Student presentation*
Dec	2(W)	Student presentation*
	7(M)	Student presentation*
	9(W)	Student presentation*
	14(M)	Final Exam

*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 60 minutes + 15 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 2009 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.

MOLECULAR GENETICS (FALL, 2009)

Suggested topics for student presentations

Aging and DNA repair

1. Human premature aging syndromes (with predisposition to cancer): **Werner syndrome, Bloom syndrome and Rothmund-Thompson syndrome**
2. **Human premature aging syndromes:** Cockayne syndrome and **Hutchinson Gilford Progeria**
3. Aging and **PARP** [poly(ADP-ribose) polymerase]. Emphasize the linkage between the role of PARP in DNA repair and longevity.
4. Loss of neuronal function in normal aging. Role of DNA damage and mutation, other. [see Wilson, Bohr, McKinnon, Mechanisms of Aging and Development 129: 349-352 (2008)].
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.

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. Field defects (pre-malignant fields of cells in which cancers tend to arise)
13. DNA polymerases that carry out inaccurate trans-lesion synthesis and their possible relationship to cancer.

The adaptive advantage of sexual reproduction. Role of DNA repair

14. What is the function of bacterial transformation (bacterial sex)…For recent review, see Michod et al., Infection, Genetics and Evolution 8; 267-285 (2008).
15. How asexual bdelloid rotifers deal with DNA damage (See Gladyshev and Meselson, PNAS, 105(13), 5139-5144 (2008). Also News Feature in Nature by Erika Hayden, pp678-680 (2008)