

**Introduction to Biomedical Sciences
Genome-Based Studies of Human Health and Disease**

**3 credits
BMS 601A Section Number 4805
Fall 2009**

Course Director: **Thomas Begley**, tbegley@albany.edu
Phone 591-7153, office located in CRC 211, (East Campus), 1 Discovery Drive, Rensselaer, NY, 12144
office hours, contact the course director for an appointment.

Class meets: Mon. & Wed. 8:00 - 9:20 PM in the Massry Conference Room in the Cancer Research Center, East Campus, University at Albany

Course Description: This course will discuss the use of biomedical sciences to study human health. Importantly, students will gain an understanding of how molecular biology, genomics, proteomics, and cell biology lead to improvements in public health. Students will learn about genome scale technologies and their application to population studies. Particular focus will be on the influence of one's genetic composition and environment on disease onset and progression. In addition, students will learn how to integrate genome based approaches into their research and will become familiar with scientific writing and review.

Learning Objective: Students will learn about role of genetics and the environment in human disease, and the use genome-scale technologies for studying disease. In addition, students will learn about the molecular and biochemical mechanisms associated with human health and disease. Students will apply fundamental concepts in the core areas of biochemistry, molecular biology, neurobiology, and cell biology. They will demonstrate additional depth of knowledge in systems biology and genomics. Also, students will learn about the fundamentals of grant writing, grant review, and how to seek out funding opportunities. Students will also develop both verbal and written communication skills through presentations and homework assignments and apply fundamental concepts in the biomedical sciences to public health issues, in particular, in the detection, treatment, and prevention of disease. Student will also critically evaluate the work of their peers in biomedical sciences and will be required to demonstrate broad knowledge of the genetic basis of cellular function and demonstrate basic knowledge of human genetic diseases and disorders. Students will ultimately be required to demonstrate a foundation of knowledge in the core areas of biomedical sciences and identify the strengths and limitations of various laboratory methodologies. They will also explain the biological and molecular basis of public health and articulate how biological, chemical, and physical agents affect human health. Finally, students will be required to explain how genetics and genomics affect disease processes, public health policy and practice.

Textbook: None, papers or literature will be given to students for use in class and for presentations as indicated. Readings will be posted on ERes. Note recently published articles relevant to individual lectures may also be introduced and will be supplied by the instructor.

EReserves: Papers are accessible via UAlbany's ERes web based system, on line via the library or as handouts as the Instructors feel appropriate.

Prerequisites: A basic understanding of molecular biology, genetics, and biochemistry.

Grading: Course is graded A-E. Grading will be based on homework assignments (20%), two exams (40%), class participation (10%) and the preparation and presentation of a National Research Service Award (NRSA) Grant or suitable alternative*(30%). Homework will consist of written critiques and the proper completion of administrative forms associated with the writing project. Homework will be evaluated based on the student's ability to identify strengths and weaknesses of the stated work. In addition, proper completion of the administrative forms, as described in the associated directions, will determine grades for the administrative section of the writing project. Attendance is mandatory and along with active participation in class discussions, will be used to determine the participation grade. Exams will consist of essay-based questions and will test understanding of class materials and assigned readings. The grant assignment or suitable alternative will be a semester-long project that results in a 10-page research proposal and final oral presentation (20-minute power point) of the project. Grades for this project are based on organization, clarity, scientific understanding and writing style and the ability to orally present and discuss your project.

* A suitable alternative to the NRSA grant-writing project is available for those students who would be better served by another granting agency or who would rather write a review article. Those wishing to undertake other grant forms (i.e. public health grants available from the CDC or foundation grants) or who wish to prepare an extensive review of a public health issue can do so in consultation with Dr. Begley.

SCHEDULE OF LECTURES

	Date	Person	Lecture	Due Dates
Monday	31-Aug	Thomas Begley	Introduction, Overview of Writing Project	
Wednesday	2-Sep	Sridar Chittur	Genomic Array Platforms	
Monday	7-Sep	Labor Day	off	
Wednesday	9-Sep	Sridar Chittur	FACS Analysis	
Monday	14-Sep	Scott Tenenbaum	Systems Biology in Public Health	
Wednesday	16-Sep	Thomas Begley	Genome Based Analysis of Drug Targets	Reading assignment #1
Monday	21-Sep	Qishan Lin	Proteomics I	Reading assignment #2
Wednesday	23-Sep	Qishan Lin	Proteomics II	Administrative Forms Due (Homework 1)
Monday	28-Sep	Yom Kippur	No class	
Wednesday	30-Sep	Brian Parr	Mouse Genomic Resources and Disease Models	
Monday	5-Oct	Thomas Begley	Test 1	
Wednesday	7-Oct	No Class	BMS Research Conference	
Monday	12-Oct	Thomas Begley	Personalized Genomics	Reading assignment #3
Wednesday	14-Oct	David Carpenter	Environmental Exposure and Cancer Onset	Reading assignment #4
Monday	19-Oct	Thomas Begley	Oral Outline of Student NRSA Proposal and Critique I	
Wednesday	21-Oct	Thomas Begley	Oral Outline of Student NRSA Proposal and Critique I	
Monday	26-Oct	Doug Conklin	Genome-Scale Study of Cancer I	Reading assignment #5-6
Wednesday	28-Oct	Doug Conklin	Genome-Scale Study of Cancer II	
Monday	2-Nov	Doug Conklin	Genome Scale Study of Cancer III	
Wednesday	4-Nov	Thomas Begley	Inflamation and Disease	Reading assignment #7
Monday	9-Nov	Thomas Begley	Biomarkers of Disease	Reading assignment #8
Wednesday	11-Nov	William Wolfgang	Human Microbiome and Disease	
Monday	16-Nov	Thomas Begley	Exam 2	
Wednesday	18-Nov	Thomas Begley	Public perception of genes and genomics; part 1	Current Events Write up due (Homework 2)
Monday	23-Nov	Thomas Begley	Public perception of genes and genomics; part 2	
Wednesday	25-Nov	Thomas Begley	Student Presentations and Critiques	
Monday	30-Nov	Thomas Begley	Student Presentations and Critiques	
Wednesday	2-Dec	Thomas Begley	Student Presentations and Critiques	
Monday	7-Dec	Thomas Begley	Student Presentations and Critiques	Final Draft of Grant Due

GRANT DUE DATES

- September 23: Administrative forms from grant are due (must be typed)
- October 19: Oral outline (10 minutes) and class discussion of grant
- November 4: Rough draft that includes 1-page specific aims and 4-pages of background information due (must be typed, 11 pt Arial font, single spaced)
- November 16: First draft of completed grant due (Plus two copies)
- Nov 19 – Dec. 8: Powerpoint presentation of grant (10 - 15 slides, 20 minute talk)
- December 7: Final grants are due (plus two copies, remember to include administrative forms)

Reading List

Assignment 1:

Lum et al (2004) Discovering Modes of Action for Therapeutic Compounds Using a Genome Wide Screen of Yeast Heterozygotes. *Cell* 116:121-137

Program Announcement for the Ruth L. Kirschstein National Research Service Awards (NRSA) for Individual Postdoctoral Fellows (F32) (**See eres site**)

Ruth L. Kirschstein National Research Service Award Individual Fellowship Application Instructions and forms (**See eres site**)

Assignment 2:

A. P. Jonsson, Mass spectrometry for protein and peptide characterization. *CMLS, Cell. Mol. Life Sci.* 58 (2001) 868–884

Görg et al., (2004) Current two-dimensional electrophoresis technology for proteomics. *Proteomics* 4, 3665–3685

J. Kathleen Lewis, Jing Wei, and Gary Siuzdak, *Encyclopedia of Analytical Chemistry, Matrix-assisted Laser Desorption/Ionization Mass Spectrometry in Peptide and Protein Analysis*, R.A. Meyers (Ed.), pp. 5880–5894, John Wiley & Sons Ltd, Chichester, 2000

Assignment 3:

TBD

Assignment 4:

Lichtenstein et al., (2000) Environmental and Heritable Factors in the Causation of Cancer: Analyses of Cohorts of Twins from Sweden, Denmark, and Finland, *The New England Journal of Medicine*, 343, 73 - 84

Assignment 5:

Hannon and Conklin, (2003) RNAi by short hairpin RNAs expressed in vertebrate cells. *Methods Mol Biol.* 257:255-66

Paddison et al., (2003) A resource for large-scale RNAi based screens in mammals. *Nature* 428, 427 - 431

Assignment 6:

Blume-Jensen and Hunter (2001) Oncogenic kinase signaling. *Nature* 17; 411(6835):355-65.

Brummelkamp et al. (2002) A System for Stable Expression of Short Interfering RNAs in Mammalian Cells. *Science* 19 296: 550 - 553

Assignment 7- 8:

TBD