

SEMESTER AT SEA COURSE SYLLABUS

Summer 2013

Discipline: Biology/Chemistry
BIOL 3559-101: Illuminating Diseases of the Mediterranean
Division: Upper
Faculty Name: [Marc Zimmer](#)

Pre-requisites: At least one year of introductory college biology

COURSE DESCRIPTION AND OBJECTIVES

This class uses the lights and colors of bioluminescent proteins as a thread to tie together a narrative about disease and modern medical research. It examines the use of molecular methods to study gene expression and its critical role in researching health and disease. Fluorescent proteins are commonly used in biomedical applications. We will discuss how they can be used in neurological disease, cancer, heart disease, malaria, AIDS and dengue fever research. At the same time we will see how the countries we visit deal/t with these diseases and control their spread. The fundamental principles involved in genetic bioengineering will be presented.

REQUIRED TEXTBOOKS

None

ELECTRONIC COURSE MATERIALS

PDF files of all articles associated with this course will be available on the ship's intranet.

TOPICAL OUTLINE OF COURSE

Dates	Topic	Associated Readings
June 19 C1	Introduction, DNA & Proteins	
June 20 C2	DNA & Proteins	
June 21 C3	Fluorescent Proteins	Shimomura, O. (2009) Discovery of Green Fluorescent Protein (GFP) (Nobel Lecture), <i>Angewandte Chemie-International Edition</i> 48, 5590-5602.
June 22 C4	Action Potentials, Aequorin	Ridgway, E.B.; Ashley, C.C. (1967) Calcium Transients in Single Muscle Fibers, <i>BBRC</i> 29, 229-234.

Port	Casablanca	
June 27 C5	Fluorescent Proteins	Prasher, D. C., Eckenrode, V. K., Ward, W. W., Pendergast, F. G., and Cormier, M. J. (1992) Primary Structure of the Aequorea victoria Green Fluorescent Protein, <i>Gene</i> 111, 229-233. Chalfie, M., Tu, Y., Euskirchen, G., Ward, W. W., and Prasher, D. C. (1994) Green Fluorescent Protein as a Marker for Gene Expression, <i>Science</i> 263, 802-805.
June 28 C6	Heart Disease; Ultradian Rhythms	Norman, K. R., Fazzio, R. T., Mellem, J. E., Espelt, M. V., Strange, K., Beckerle, M. C., and Maricq, A. V. (2005) The Rho/Rac-family Guanine Nucleotide Exchange Factor VAV-1 Regulates Rhythmic Behaviors in C-elegans, <i>Cell</i> 123, 119-132.
June 29 C7	In-vivo Calcium Indicators	
July 1 C8	Myocardial Regeneration, Photoactive FPs	Itou, J., Oishi, I., Kawakami, H., Glass, T. J., Richter, J., Johnson, A., Lund, T. C., and Kawakami, Y. (2012) Migration Of Cardiomyocytes Is Essential For Heart Regeneration In Zebrafish, <i>Development</i> 139, 4133-4142.
July 2 C9	Myocardial Regeneration	Kara, R. J. et Al. (2011) Fetal Cells Traffic to Injured Maternal Myocardium and Undergo Cardiac Differentiation, <i>Circ Res</i> 110, 82-93.
PORT	Antalya	
July 6 C10	Dengue	Hoffmann, A. A. et Al (2011) Successful Establishment Of Wolbachia In Aedes Populations To Suppress Dengue Transmission, <i>Nature</i> 476, 454. Walker, T. et Al (2011) The Wmel Wolbachia Strain Blocks Dengue And Invades Caged Aedes Aegypti Populations, <i>Nature</i> 476, 450.
July 7 C11	Dengue	Harris, A. F., Nimmo, D.,

		McKemey, A. R., Kelly, N., Scaife, S., Donnelly, C. A., Beech, C., Petrie, W. D., and Alphey, L. (2011) Field Performance Of Engineered Male Mosquitoes, <i>Nature Biotechnology</i> 29, 1034.
PORT	<i>Istanbul</i>	
July 12 C12	Malaria	<i>CDC –Malaria in Greece</i>
July 13 C13	Malaria	
PORT	<i>Piraeus(Athens)</i>	
July 18 C14	Malaria	
July 19 C15	Class Test	
July 20 C16	Cancer, Cell Cycle; FUCCI	Sakaue-Sawano, A., Kobayashi, T., Ohtawa, K., and Miyawaki, A. (2011) Drug-Induced Cell Cycle Modulation Leading To Cell-Cycle Arrest, Nuclear Mis-Segregation, Or Endoreplication, <i>BMC Cell Biol</i> 12.
PORT	<i>Livorno and Civitavecchia</i>	
July 27 C17	Cancer Stem Cells	Chen, J., Li, Y. J., Yu, T. S., McKay, R. M., Burns, D. K., Kernie, S. G., and Parada, L. F. (2012) A Restricted Cell Population Propagates Glioblastoma Growth After Chemotherapy, <i>Nature</i> 488, 522. Driessens, G., Beck, B., Caauwe, A., Simons, B. D., and Blanpain, C. (2012) Defining The Mode Of Tumour Growth By Clonal Analysis, <i>Nature</i> 488, 530.
July 28 C18	Bird Flu	Lyall, J., Irvine et Al (2011) Suppression of Avian Influenza Transmission in Genetically Modified Chickens, <i>Science</i> 331, 223-226.
PORT	<i>Malta</i>	
Aug 1 C19 Field Assignment I due	Bird Flu	Fouchier, R. A. M., Herfst, S., and Osterhaus, A. D. M. E. (2012) Restricted Data on Influenza H5N1 Virus Transmission, <i>Science</i> 335, 662-663. Imai, M. et Al(2012) Experimental Adaptation Of An Influenza H5 HA Confers

		Respiratory Droplet Transmission To A Reassortant H5 HA/H1N1 Virus In Ferrets, <i>Nature</i> 486, 420.
Aug 2 C20	Brainbow, GCaMP	
PORT	<i>Marseille and Barcelona</i>	
Aug 9 C21	Neuronal Dynamics	Ahrens MB, Li JM, Orger MB, Robson DN, Schier AF, Engert F, Portugues R. (2012) Brain-Wide Neuronal Dynamics During Motor Adaptation In Zebrafish. <i>Nature</i> 485, 471-477.
Aug 10 C22	Optogenetics	
PORT	<i>Cadiz and Lisbon</i>	
Aug 17 C23	Reflection on visit to Champalimaud Center for the Unknown	
Aug 18	<i>Study Day</i>	
Aug 19	Final Exam	

FIELD WORK

Field lab attendance is mandatory for all students enrolled in this course. Please do not book individual travel plans or a Semester at Sea sponsored trip on August 17, the day of our field lab.

FIELD LAB

We will visit the [Champalimaud Center for the Unknown](#). This high-tech center was opened in 2010. Here we will talk to researchers at the [Champalimaud Neuroscience Programme](#), see the equipment they use and hear a talk about the research being done. The center is an architectural masterpiece and it stands next to the Tower of Belem, which was the point of origin for the great Portuguese explorers of the 15th century. We will also visit the [Pharmacy Museum in Lisbon](#).

FIELD ASSIGNMENTS

You will be required to write two three-page field assignments.

Field Assignment I is due August 1 and it's a report of your voyage to date. Think about how the countries you have visited are affected by the diseases we are studying (AIDS, Malaria, Dengue Fever, cancer and neurological diseases) What are their attitudes and/or laws governing health care, genetic engineering and biotechnology?

Field Assignment II is due August 17 and it is a report on the field trip to the Champalimaud Neuroscience Program and the Lisbon Pharmacy Museum.

Both reports should answer the following three questions; a) What did you learn on your trip? (A summary of knowledge and insight acquired); b) How did you learn it? (A detailed description of what was accomplished); c) Why is this important? (An informed discussion about how this experience fits into the context of the course and any other courses you are taking this semester).

The reports will be evaluated according to the criteria given below

40% of the report grade will be based on the science in the report (is it correct and is there sufficient science in the report),

40% content/integration

10% grammar, spelling etc.

10% style and readability

METHODS OF EVALUATION

One class tests	20%
Two integrated field trip reports	20%
Class participation, Home works	30%
Final exam	30%

HONOR CODE

Semester at Sea students enroll in an academic program administered by the University of Virginia, and thus bind themselves to the University's honor code. The code prohibits all acts of lying, cheating, and stealing. Please consult the Voyager's Handbook for further explanation of what constitutes an honor offense.

Each written assignment for this course must be pledged by the student as follows: "On my honor as a student, I pledge that I have neither given nor received aid on this assignment." The pledge must be signed, or, in the case of an electronic file, signed "[signed]."

POLICIES AND EXPECTATIONS

Attendance: The success of your learning experience depends on the active contributions of all the students enrolled in the class. Therefore, your attendance is important and required. If you miss class or are absent due to an illness, you are responsible for the information covered during the missed class meeting. You can have no more than two unexcused absences.

Make-ups: No make-up exams or presentations will be given unless you have a verifiable excused absence. Without a verifiable excused absence, you will receive a score of zero for the test or assignment.

Extra Credit: No extra credit will be given in this course.

Academic Honesty: Academic dishonesty encompasses both cheating and plagiarism. You will be tested on all materials covered in the assigned readings, class lectures, and field trips.

Exams will be cumulative.