Nancy Krucher, PhD
Department of Biology, Dyson College of Arts and Sciences

Introduction to Cancer Research – Cell and Molecular Biology Laboratory

The course I plan to revise into a **CURE- Classroom-Based Undergraduate Research Experience** is the laboratory portion of a sophomore level required course in the Biology major: Bio 335: Cell and Molecular Biology. I have taught this class for over twenty years, which consists of three hours of lecture and three hours of laboratory per week. Approximately twenty six students take this course every Spring. They have previously taken a year of freshman Biology (Bio 101/Bio 102) and Genetics (Bio 327). By this point they have sufficient background knowledge from these classes to be able to appreciate an in-depth inquiry-based investigation using state of the art techniques, equipment and analysis as described below.

This class will multiply by approximately 5 fold the number of Pace Biology students who will be able to participate in cancer research. Although Pace Biology students are required to participate in a capstone course consisting of either research with a faculty member or an outside internship (in medicine or other clinical fields), which usually occurs in junior or senior year, I can only mentor 3-4 students per year on my cancer research projects. Therefore, only a subset of students who wish to participate in cancer research at Pace have the opportunity to do so, and those tend to be the students who benefit from either academic, social or other advantages (for example, students who can afford to do research during the semester or over the summer rather than working a higher-paying job). This class will reach many more Pace students and involve them in a mentored research process earlier in their education, and expose a larger and diverse group of students to experiential learning. I plan to offer this laboratory portion of Bio 335 as a CURE research course every Spring.

Most students have an interest in medically related research, and many have family members or know people who have been diagnosed with cancer. This course is designed for students to generate novel findings, to make discoveries, that could be relevant in the cancer research field. The findings from the course could be built upon in later work the students could perform in my research laboratory, and the knowledge students gain can support their understanding in future coursework such as the Advanced Cell Biology elective (BIO 375) which is based on recent primary literature in cancer research. Each module of the course will also integrate valuable quantitative methods for data analysis, a broadly applicable set of skills. In addition to the capstone course, Juniors and Seniors who I mentor in my laboratory often generate data for their Honors thesis, participate in the Undergraduate Research program, or may be paid for research work using my NIH grant funding.

In this research course, we will focus on **processes** in cancer research, with respect to three integral activities in tumorigenesis: Proliferation, Apoptosis and Invasion. Each of these activities are important in cancer research and thus the course will be broken up into three modules, each of which will be our topic for four weeks. Each semester, we

will use a different set of drugs called targeted therapies. Targeted therapies are medicines developed to target a specific mutation or genetic abnormality in cancer cells and there are new drugs developed daily. Many of these are in phase I, II, or III clinical trials for a specific kind of cancer, but may not have been tested in other cancer cell types. The first semester we will use a cohort of AKT inhibitors such as Periforsine, Rigersotib, Ipatersitib, Capivasertib and test them in assays designed to measure proliferation, apoptosis and invasion. We will use breast cancer cells but in future semesters could use other cell types such as colon, pancreatic and skin cancer cells. Each group of 2-4 students will have their own drug to analyze.