

## RESEARCH IN BIOTECHNOLOGY



### **General information:**

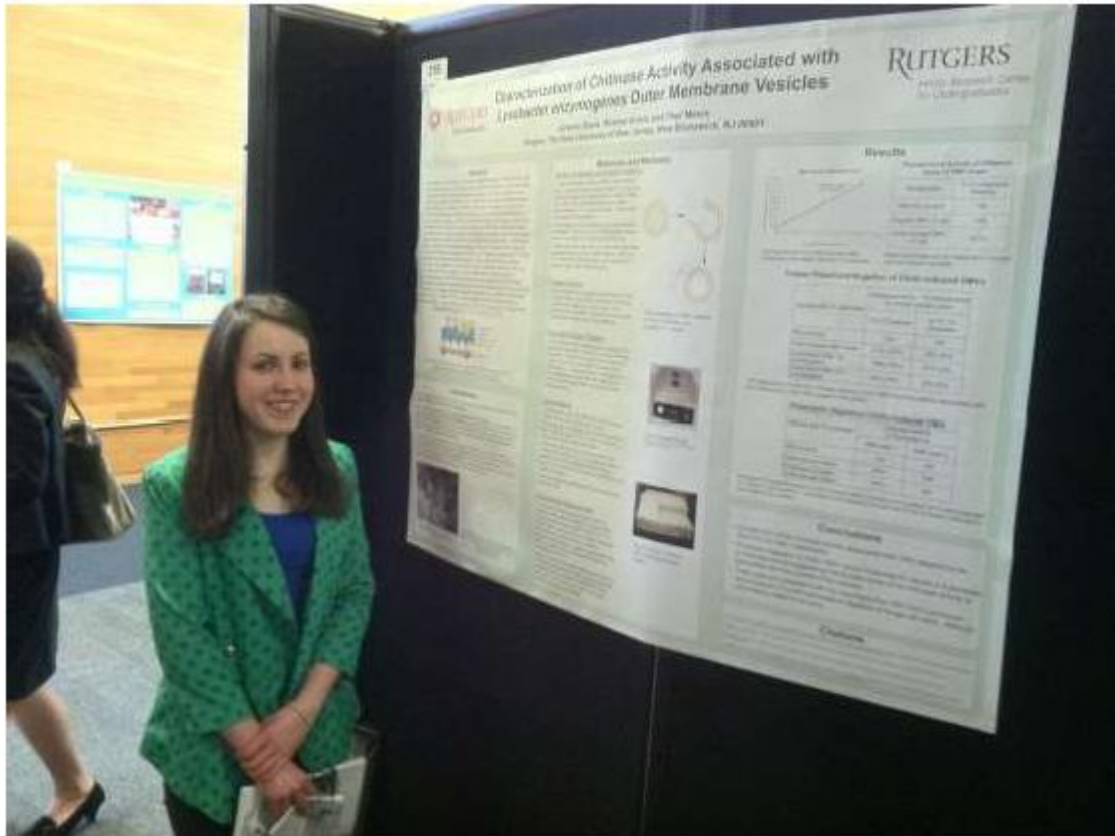
The exciting new world of Biotechnology in the 21st century has developed as a result of the convergence of biological, physical and mathematical sciences to solve problems in ways never before imagined. The breathtaking advance of DNA sequencing is one example of the power of this approach. In Biotechnology, students are trained in a broad range of basic sciences as a foundation for many important real-world applications.

A major part of this training is participation in research. All Biotechnology majors participate in at least 3 credit hours of research. Students have a large number of research laboratories across all the Rutgers campuses from which to choose research projects when positions are available (<https://sebs.rutgers.edu/faculty/> OR complete list of SEBS laboratories are near the end of this document below OR for non-SEBS labs - <http://lifesci.rutgers.edu/people/faculty-staff-directory>). More details on registering for credit for research under “How do I find a lab?” below.

Students gain a truly complete understanding of what they have learned in their courses when that knowledge is applied in research. Why is it important to know how to calculate molarities? Why is the relative solubility of hydrophilic and hydrophobic molecules important? Why do I need to know about pKa? Why is it important to know how to keep samples sterile? You will learn in research. You may make exciting new discoveries, but more importantly you will learn to plan an efficient day of research and how to accurately document and interpret your results. Understanding “how research works” is a very important skill whether you become an academic principal investigator or a business development executive of a biotechnology company. Planning and assessing feasibility comes from your direct experience in doing research.

Biotechnology students have distinguished themselves in several research programs. For instance, in a recent Aresty Undergraduate Research Symposium, Biotechnology students received a Best Poster Award (Daniel

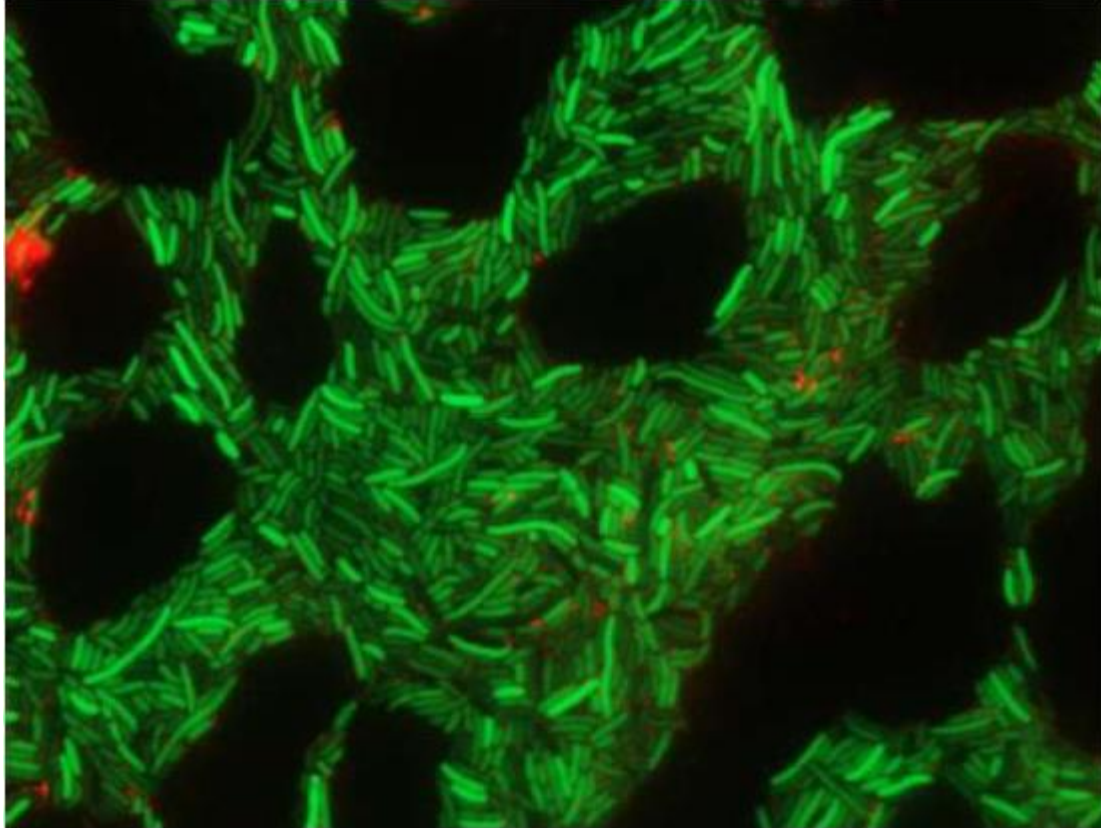
Hollerbach) and two Honorable Mentions (Katie Fullerton and Connor Lamontagne). Some students have even presented research at national meetings of large professional scientific societies (e.g. Biophysical Society).



### Getting credit for research:

Experience-based Education is required for all students at SEBS. Most Biotechnology students register in Research in Biotechnology to get credits for Experience-based Education (see below). Students can also register to perform research projects in the SEBS Honors program and George H. Cook Scholars program (links below) at the School of Environmental and Biological Sciences ([http://sebshonors.rutgers.edu/general\\_honors\\_program/](http://sebshonors.rutgers.edu/general_honors_program/)).

In addition, students can do Biotechnology research in the university-wide Aresty program (<https://aresty.rutgers.edu/>). An internship or paid work in Biotechnology at a company outside Rutgers can also qualify for research credit through the Rutgers SPIN program (<http://sebsspin.rutgers.edu/>).



## **Research in Biotechnology 11:126:497 or 11:126:498**

Fall Term (as 11:126:497) and Spring Term and Summer (as 11:126:498). Any faculty member at Rutgers University, Robert Wood Johnson Medical School, or the Cancer Institute of New Jersey who does research in biotechnology, biochemistry, molecular biology, genetics or related areas may supervise student research projects (see below for links to find some relevant laboratories).

### **Pre-requisites and other registration restrictions:**

Open to biotechnology and life science majors by special permission from the Biotechnology Curriculum Coordinator. Requires approval of the faculty member who will supervise the research project. Once approval is acquired, a special permission number may be obtained from the Biotechnology Undergraduate Program Director.

### **Format:**

The student carries out an independent research project under the supervision of the research advisor. A minimum of 3 hrs/wk in the laboratory per credit over a 14 week semester is expected. A final report similar to a scientific paper is required. Research director must submit a suggested grade and assessment to the Biotechnology program director.

### **Description:**

The student, under the guidance of a faculty member, carries out a research project. Most often, a faculty member may engage the student in some aspect of a research

project that the faculty member is pursuing. However, the student may also identify her/his own project in consultation with the research advisor.

**Learning Goals:**

Upon completing the course, the student will have –

1. Gained background knowledge of the field of the project and the specific problem(s) to be addressed using the public literature and coursework and appropriately summarized it..
2. Appropriately stated the hypothesis or hypotheses to be tested and explained the experiments devised to test it.
3. Gained proficiency in the laboratory techniques and scientific approaches used in biotechnology to address the specific hypothesis (es) at hand.
4. Appropriately documented (e.g. notebook) and analyzed data.
5. Learned to interpret data and draw appropriate conclusions and future possible directions of the work.

**Assessment Measures**

**Assessment Rubric:**

Rubrics	RankingScale	RankingScale	RankingScale	RankingScale
	1 Unsatisfactory	2 Satisfactory	3 Good	4 Outstanding
Learning Goal 1: Knowledge of the field –factual and conceptual				
Learning Goal 2:. Statement and Justification of hypothesis				
Learning Goal 3: Laboratory techniques proficiency				
Learning Goal 4: Analysis, presentation And interpretation of data.				
Learning Goal 5: Drawing appropriate conclusions and identifying and interpreting implications.				

**Other requirements:**

All students are expected to write a paper describing the research project at the end of the semester in journal article format. Copies are submitted to the research advisor and the Biotechnology Undergraduate Program Director.

## Grading

The research advisor is responsible for grading the student and reporting the suggested grade to the Curriculum Coordinator using the rubric above as an assessment report. The grade reflects overall performance in the laboratory, including the final report.

## How do I find lab?

Look at two sources:

- 1) the list of faculty on SEBS campus; <https://sebs.rutgers.edu/faculty/> and
- 2) <http://lifesci.rutgers.edu/people/faculty-staff-directory> (for faculty who do research in "biotech" at Rutgers and UMDNJ and affiliated hospitals – note that this is a contact list. You need to look up what research directors (i.e professors) do on their individual department websites. You can find them by simply searching the main RU website.

Then make a short list (~10) of faculty that most interest you. After doing a little more searching on the web about the research conducted in each of these faculty labs, carefully compose a brief email that 1) tells the prospective mentor about yourself (major, year, college, interests, etc.); 2) states why you are interested in the research of the faculty mentor; and 3) asking for an appointment to meet the faculty member to talk about the research and possibly working in that faculty member's lab in the coming (semester). To get credit, enroll in Research in Biotechnology 11:126:497 or 498 when you have enough time in your schedule to do three credits (minimum of nine hr/wk in the lab for the entire semester). If you have less time, you should volunteer (or get their feet wet by working with a grad student) or enroll for fewer than three credits. To enroll, fill out the following form ([biotech.rutgers.edu/Request Form.docx](http://biotech.rutgers.edu/Request%20Form.docx)) and send it to Dr. Meers, the program coordinator who will give you a special permission number to register for Research in Biotechnology. In terms of paid internships, you should visit the SPIN Office in Martin Hall. They should also visit the Career Services Office with help to prepare a resume. If you desire additional information, speak with the Biotechnology Undergraduate Program Director.