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Developing Small Molecule Ribosome Sensors

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Dr. Cruz-Vera has participated in the past 10 years as a faculty mentor for five RCEU projects.

Project Summary- *Developing small molecule ribosome sensors.* Bacteria have developed genes that can detect small molecules. Such genes drive the machinery that produces proteins, named ribosome, to sense several biomolecules. The sensed biomolecules change the expression of genes and therefore the behaviour of bacteria, allowing cell survival. Dr Cruz-Vera has studied for more than ten years one of these genes, named *tnaC*, that drives the ribosome to sense the amino acid tryptophan, which is used as a source of energy. The current project would use such previous information to develop alternative *tnaC* genes that would sense other amino acids than tryptophan. Using classical mutagenesis and methods of selection, the project would isolate bacteria that would growth under different substrates. The results obtained in this project would set the foundations for developing bacterial sensors of public interest. The results would also introduce the student in the academic life trough the publication and/or presentation of his/her results in a scientific meeting.

Student Prerequisites- The student should:

Hold any academic standing, however had previous courses related with genetics.

Student Duties-The student would:

- 1) Learn basic microbiological and genetics lab procedures and how to elaborate a professional lab-procedures book. He/she would set-up a lab procedure to detect mutant bacteria that grow under several conditions.
- 2) Produce with the help of a graduate student, bacteria that would host the reporter gene for the experiments.
- 3) Set up the mutagenesis method to be used in generating the sensor bacteria.
- 4) Determine the ability of the mutant bacteria to grow in several substrate concentrations. The student would use several conditions, such as changes in food and usage of antibiotics, to analyze the success of the mutagenesis experiments.
- 5) Establish logical explanations about the results using established bibliography and determine the future experiments to demonstrate such explanations
- 6) Write a publication draft with the obtained results.

Faculty Supervision and Mentoring- Dr. Cruz-Vera would:

- 1) Guide the student during the first two weeks to recognize the correct bibliography to be used in the elaboration of the experimental procedures.
- 2) Everyday, closely supervise and direct the student during the hands-on work in the lab.
- 3) Have one meeting per week with the student to discuss his/her results. The lab book would be used to evaluate the student's performance.
- 4) Guide the student during the elaboration of the publication draft and his/her conference or poster presentation(s).