

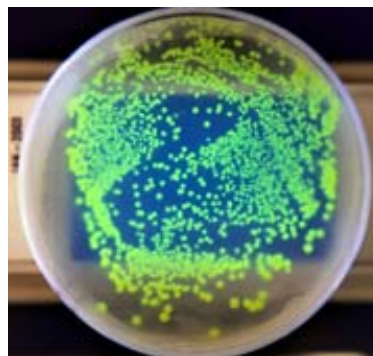
## RUTGERS SUMMER SESSION COURSE (3-CREDITS) FOR GIFTED GRADE SCHOOL KIDS

**THE OVERVIEW:** This Summer, Professor Bill Ward begins his 4<sup>th</sup> year of teaching “Experiments with GFP: The Art and the Science” to gifted and talented youngsters from area middle schools and high schools. This hands-on biochemistry lab course, held in Lipman Hall on the Cook Campus of Rutgers University, New Brunswick, NJ., runs from July 7 to July 25, 2014. Two sections are available, one in the morning from 9 am to noon and one in the afternoon from 2 pm to 5 pm. “Experiments with GFP---,” a Rutgers Summer Session course that offers 3 college credits, has grown to be the largest of its kind at Rutgers University. It may also be one of few university courses that integrates the arts with the sciences. Registration for each section is limited to 24 students. The class is divided into 4 groups, each with a well-trained instructor who enjoys working with bright youngsters. The same instructor stays with his/her group throughout the three weeks—whether they are working in the lab or engaging in discussions in the adjoining lecture room.

**THE ART:** Conducting biochemical experiments with the amazingly brilliant green-fluorescent protein is an aesthetic experience all by itself. But, viewing live comb jellies (ctenophores) glowing in the dark, and then later, seeing their 8 rows of fused cilia diffracting daylight into a rainbow of colors is an incredible spectacle. Artistic aspects of the course are not confined to viewing bioluminescence. Each student, individually, will be given an opportunity to design, on paper, an aquarium system suitable for maintaining comb jellies in an artificial sea water environment. Later, they will create beautiful wall hangings directly from dried comb jellies that were collected off the coast of NJ. On the last day of the course, the kids, and sometimes the instructors, participate in an optional talent show. The most memorable show of talent was performed, in the inaugural course, by a 10-year-old boy who did 15 minutes of non-stop impromptu stand-up comedy. Move over Jerry Seinfeld!



**THE SCIENCE:** In a fully equipped university teaching lab, we begin the lab exercises by extracting recombinant GFP from genetically transformed, non-pathogenic bacteria (*E. coli*). Safety is stressed in the lab, as each student wears goggles, lab coats, and gloves. Lab exercises with GFP include: high speed centrifuging to remove particles from the extract, ammonium sulfate precipitation to collect the protein fraction, three-phase partitioning (a seldom used, but spectacular method for purifying proteins), hydrophobic interaction column chromatography, and then a final “polishing” step by gel filtration. Throughout the process we monitor GFP purity by UV-Vis spectrophotometry and fluorometry. Students will experiment with ion exchange separations on membrane adsorbers, they will test pH sensitivity of GFP, and they will estimate the isoelectric point of the protein. Final purity will be judged by high performance size-exclusion liquid chromatography. Every method used in the lab will be carefully explained by the instructors in their small clusters. Questions are always welcomed. After registration is complete, a 40-page course, called “Introduction to Chemistry and Biochemistry,” will be emailed to each student. Students with limited exposure to chemistry, but who study this material before classes begin, should be able to follow nearly all of the chemistry introduced in the lab and in group discussions.



**THE FIELD TRIP:** The scientific component of the course is not limited to work with GFP. On July 21, there is an all-day bus trip (8 am to 5:30 pm) to south Jersey (Stone Harbor), where naturalists will take everyone on a flat-bottom boat cruise (on the Skimmer) through the salt marsh and then guide the group on a walk through sand dunes leading to the ocean beach. We will pull a large plankton net through the bay, hoping to collect some jellyfish or other marine creatures. Back in the lab, students will do simple colorimetric tests for peroxidase extracted from soybean hulls and from root vegetables like sweet potatoes, white potatoes, and celery roots. The colored product of this reaction (a teal blue solution) is then used to test for BPA (bis-phenol-A) in ordinary store receipts. Students will be given prototype BPA test kits to take home to their parents and teachers to show them how to detect BPA in store receipts, on their own. Students keep notebooks, write a final lab report, take one quiz a week, and take a final exam on July 24. If departmental toxicologist, Professor Cooper, is available, we will ask him to talk about his research on the development of fish embryos exposed to BPA.

**THE REGISTRATION:** Further information is available on the departmental website <http://dbm.rutgers.edu> and the course website <http://dbm.rutgers.edu/11115433specialtopicsbiochem.html> . Formal registration information is at <http://summer.rutgers.edu>