



the stars  
challenge

Explore  
**Biotechnology**  
Winter 2015



Our voyage around the laboratory allowed us to experience many aspects of biotechnology. It began with the task of familiarizing ourselves with high tech lab equipment. Then, we studied DNA in depth. Reviewing the structure and function of DNA helped us understand it better when we extracted it from fruit and even ourselves! We then investigated the creation of a DNA fingerprint using gel electrophoresis. However, our expedition was just beginning.

We began applying these techniques and technologies to our microbial studies. While learning about viruses, we compared the DNA fingerprints of 3 viral strains. We genetically engineered bacteria to have a trait that it didn't normally contain. Then, we came up with ideas for our own genetically modified organisms that could somehow help humanity. Finally, we hunted for microbes and explored how diseases spread.

Ultimately, our capstone experience combined many of these techniques in an intense laboratory experiment. Samples of food were brought in to determine if any of the ingredients (namely corn or soy) were genetically modified. We completed this by extracting DNA from our samples, amplifying this DNA using a technique called Polymerase Chain Reaction (PCR), and using gel electrophoresis to create DNA fingerprints. These DNA fingerprints were then analyzed in order to determine if any of the DNA came from a genetically modified plant.

Biotechnology has the potential to help us discover new ways to approach problems that have existed for many years. I encourage you to share your knowledge and continue exploring biotechnology since the journey has only just begun.

This was an unbelievably enthusiastic group of talented individuals! I can only wish for future classes like this one. It has been an absolute pleasure to be able to share my passion for biotechnology with all of you!

Mr. Fusco





Our exploration of biotechnology began with identifying lab equipment that we would be using throughout the course (using an interactive Bingo game), with a focus and emphasis on the proper use of the micropipette.



Our entire group, including course teaching assistants, Joe (our TA from BTHS) and Kevin (our TA from Monmouth U).





Learning about DNA was fun as we made candy models of the double helix. But it was more exciting to extract DNA from bananas and strawberries.



With some time and patience, many extracted DNA! We extracted more from bananas than strawberries.





Now we were ready to extract our own DNA! Rinse those cheeks to get some cheek cells then use the microcentrifuge to collect our cells as a pellet in the microtube.



DNA extraction made use of micropipetting skills, along with use of the vortex.



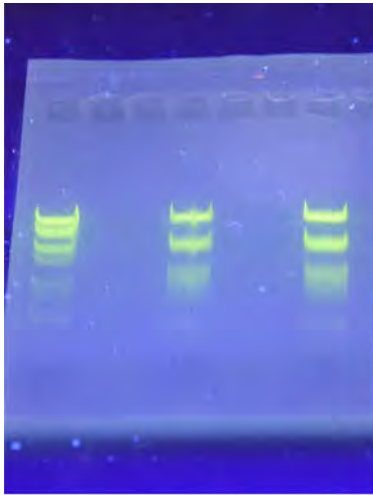


Our journey next took us to the land of gel electrophoresis!



Using colored dyes, we learned how molecules may be separated by size and charge.





Alabama - deadly  
Pennsylvania - non deadly  
Missouri - ?  
- Alabama  
- Pennsylvania  
- New



The next week, we applied this technique to our study of viruses. We compared the DNA fingerprints of 3 different viral strains through gel electrophoresis. Also, we made some 3D models of different types of viruses.



It is important to protect our eyes with UV shields around UV light (needed to see results from our viral DNA study).





The next stop on this voyage taught us how to work with bacteria! Students swabbed various places, searching for microbial growth.



In our transformation experiment, we attempted to genetically engineer bacteria.

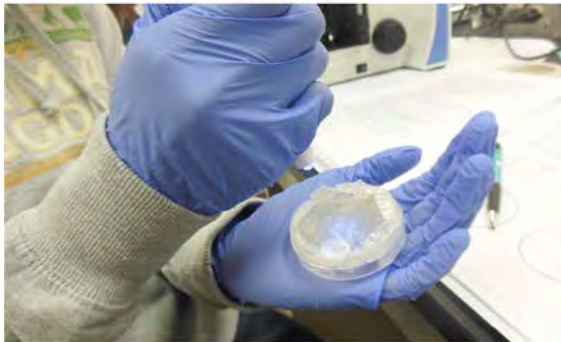




We worked hard in order to make E. coli express a gene that would make it glow green under UV light! Also, we experimented on which method of hand cleaning was better – using hand sanitizer or antibacterial soap.

1	11	10	10	Yes
2	9	11	11	No
3	(7)	(11)	22	No
4	12	9	14	Yes
5	10	10	8	No
6	(4)	(8)	(15)	Yes
7	1	10	6	No
8	3	5	12	No
9	6	(7)	(1)	Yes
10	2	(4)	(3)	Yes
11	5	3	9	No
12	10	15	3	No
13	15	2	5	No
14	2	13	(1)	Yes
15	14	8	(7)	Yes
16	13	8	(7)	Yes

7 11 \$



SUCCESS! After successfully genetically engineering bacteria, we explored epidemiology and how diseases spread.





We then came up with our own ideas for genetically modified organisms (GMOs) that would help solve either an agricultural or medical problem.



Students had great ideas to help use biotechnology to solve problems!





