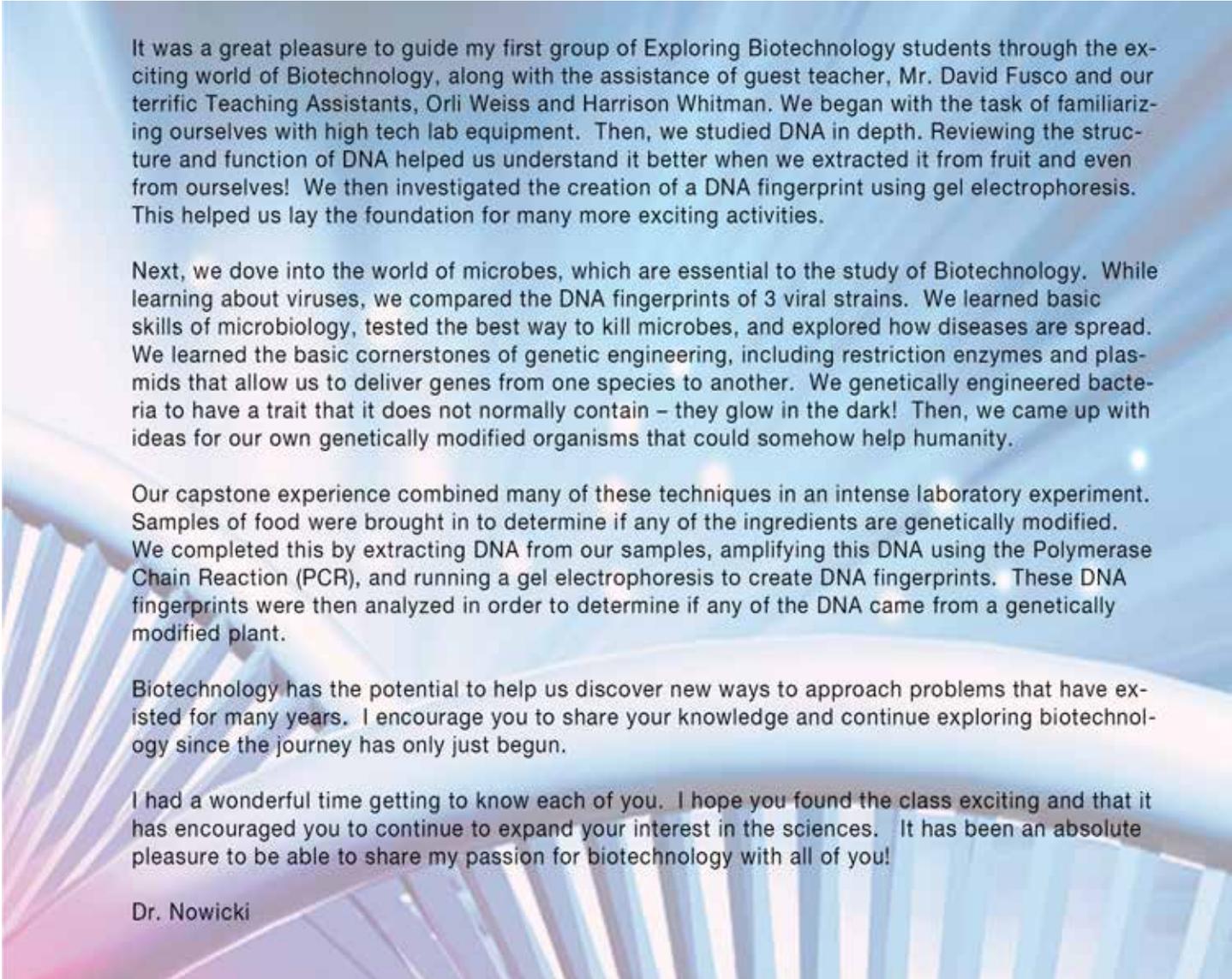




the stars  
challenge

Explore  
**Biotechnology**  
Fall 2016





It was a great pleasure to guide my first group of Exploring Biotechnology students through the exciting world of Biotechnology, along with the assistance of guest teacher, Mr. David Fusco and our terrific Teaching Assistants, Orli Weiss and Harrison Whitman. We 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 from ourselves! We then investigated the creation of a DNA fingerprint using gel electrophoresis. This helped us lay the foundation for many more exciting activities.

Next, we dove into the world of microbes, which are essential to the study of Biotechnology. While learning about viruses, we compared the DNA fingerprints of 3 viral strains. We learned basic skills of microbiology, tested the best way to kill microbes, and explored how diseases are spread. We learned the basic cornerstones of genetic engineering, including restriction enzymes and plasmids that allow us to deliver genes from one species to another. We genetically engineered bacteria to have a trait that it does not normally contain – they glow in the dark! Then, we came up with ideas for our own genetically modified organisms that could somehow help humanity.

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 are genetically modified. We completed this by extracting DNA from our samples, amplifying this DNA using the Polymerase Chain Reaction (PCR), and running a 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.

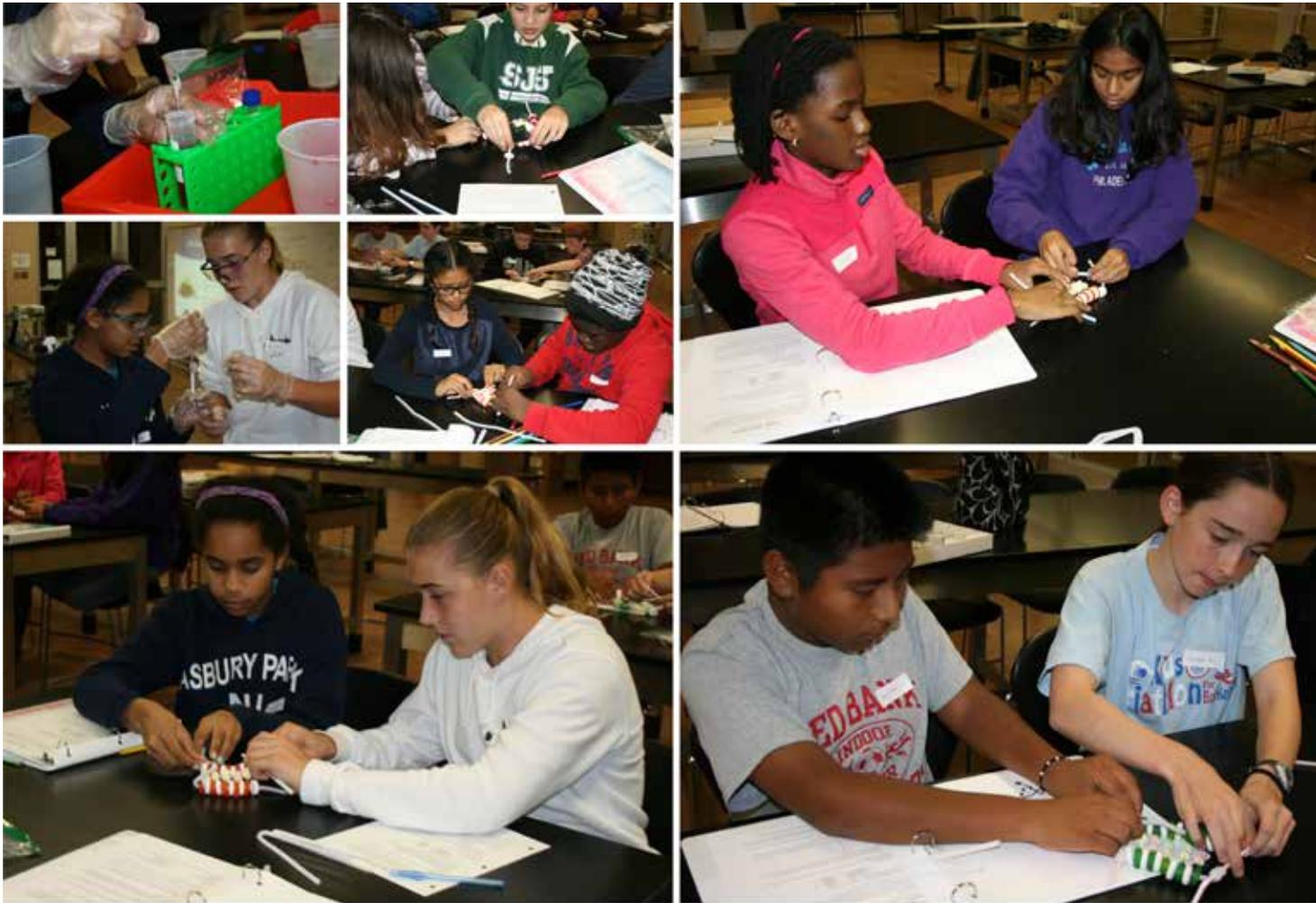
I had a wonderful time getting to know each of you. I hope you found the class exciting and that it has encouraged you to continue to expand your interest in the sciences. It has been an absolute pleasure to be able to share my passion for biotechnology with all of you!

Dr. Nowicki



We started our journey learning about lab equipment and safety. We got to try micropipets for the first time. These tools allow researchers to accurately transfer tiny amounts of a solution during experimentation.





We learned about the structure of the DNA molecule and got to build a DNA Double Helix using candy, straws and peppermints!



Though it was a little messy, we had fun extracting DNA from bananas and strawberries using common household items. We even compared which group extracted more DNA from their fruit



We had the chance to extract our own DNA using real laboratory equipment found in the Biotechnology lab, like microcentrifuges and micropipets.



We are proud that EVERY student was successful at DNA extraction!



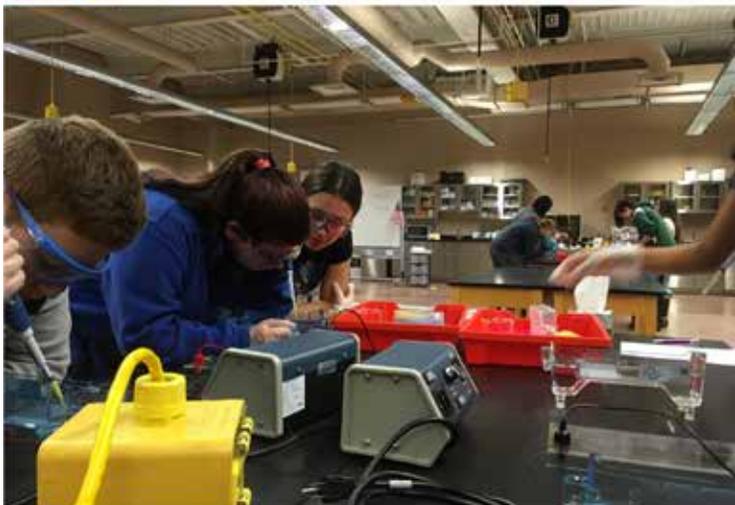
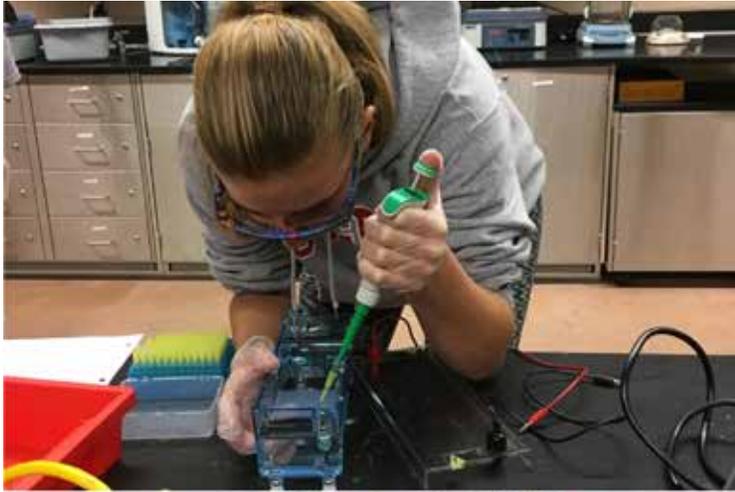
Next, we learned the theory behind using gel electrophoresis to separate molecules of different sizes and why this technique is important in DNA analysis.



We ran our first gel electrophoresis. We successfully separated the colored dyes using an electric field to sort the dyes by charge and molecular weight. This group did a terrific job of learning to load their gels!



I'm impressed at how quickly all students caught on to the technique of loading gels. Way to go!



Next, we learned about Viruses and their importance in Biotech, and employed gel electrophoresis to compare DNA of simulated viral samples. Harrison helped us interpret the results. Nice job!



We moved on to exploring other microbes, and got to use compound microscopes to compare two strains of bacteria, *E. coli* and *B. subtilis*.



We learned to use sterile technique and basic microbiology to culture bacteria. Then we tested the ability of disinfectants to kill microbes. We loved using parafilm to seal our culture dishes.



We put into practice many of the skills we have learned so far to follow the intricate steps involved in creating a Genetically Modified bacteria using a Recombinant DNA technique called Transformation.



Our transformed bacteria are able to glow in the dark with the help of a piece of jellyfish DNA. Every group was successful in engineering their Glow-In-The-Dark bacteria! Great work!



Our transformed bacteria are able to glow in the dark with the help of a piece of jellyfish DNA. Every group was successful in engineering their Glow-In-The-Dark bacteria! Great work!



We used many of the techniques we have learned during the Exploring Biotechnology course to extract DNA from the foods, amplify the DNA using a reaction called PCR and analyze the bands using gel electrophoresis.



