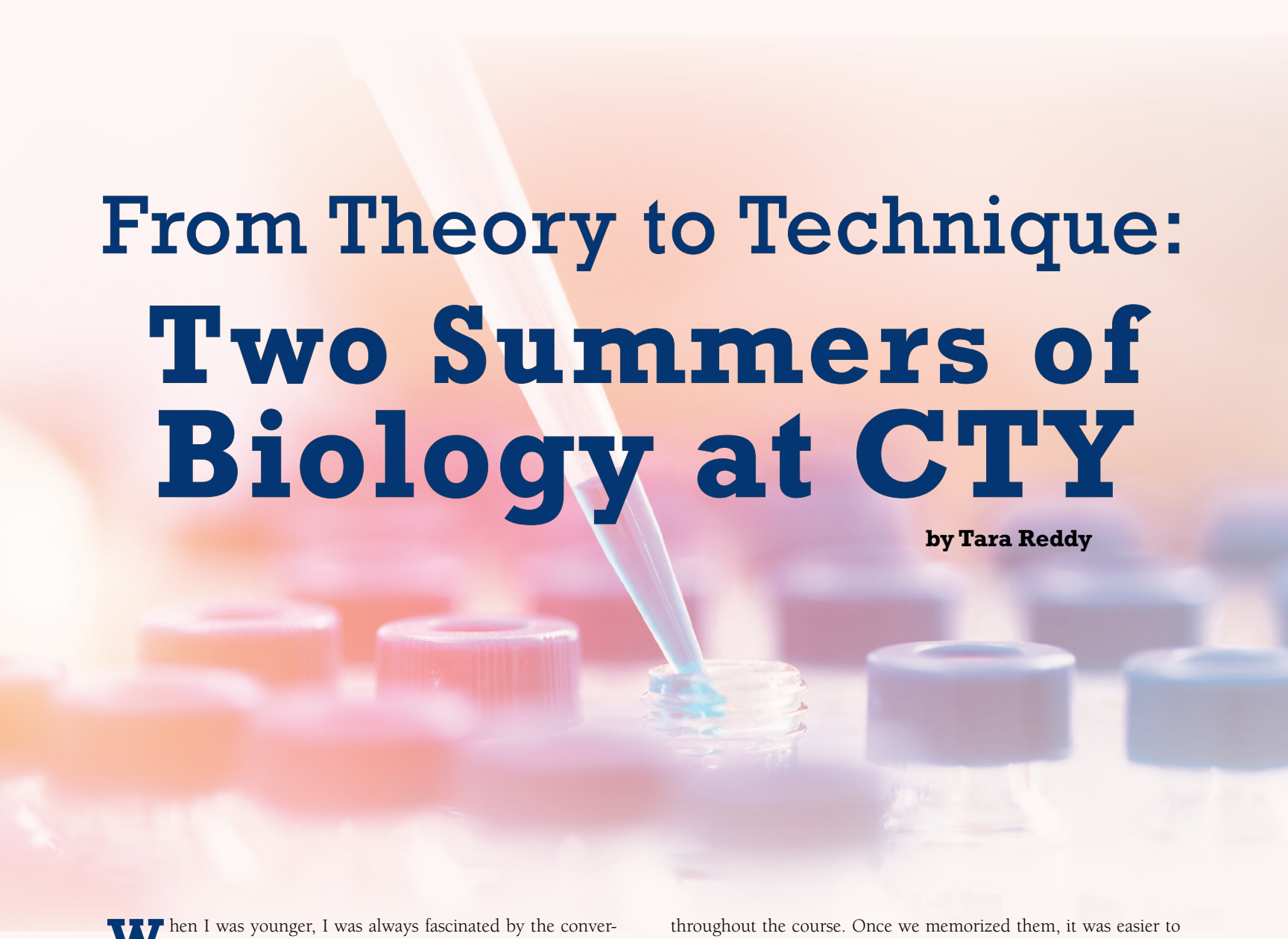

From Theory to Technique: Two Summers of Biology at CTY

by Tara Reddy

When I was younger, I was always fascinated by the conversations I overheard between my uncles, who were doctors, as they animatedly discussed various operations or diagnoses. So in seventh grade, when I read the summaries of the various classes that were offered at CTY, I was excited at the prospect of studying topics such as pathology and the spread of infectious diseases. Over the next two summers, I took two CTY biology-related courses. Each offered different insights into various aspects of biology and exposed me to more sophisticated concepts than I would encounter in a typical biology class at school. Collectively, they also deepened my interest in medicine.

Exploring Biomedical Science

The first course, which I took during the summer of 2015, was Introduction to the Biomedical Sciences. The course focused on the study of the human body and advances in the field of medicine. We began by learning basic medical root words and suffixes, a tool that would help us understand the terminology we would encounter throughout the course. Once we memorized them, it was easier to break down complex medical terms in order to analyze how ailments and treatments affect the human body.

Through case studies, projects, group discussions, and lectures, we studied the 11 systems of the body, as well as diseases and their treatments. For one project, we were paired off and told to choose a disease to research. Because my partner and I shared a mutual interest in ailments that primarily affected developing countries, we decided to focus on a neurological disease called neurocysticercosis. This parasitic disease, commonly found in areas that include Latin America, West Africa, and Southeast Asia, can lead to epilepsy. We were required to use medical journals and data and to think beyond the facts as we explored the relationship between the disease and human-generated factors such as unsanitary food and water sources. The project allowed us to experience the process of researching a real medical issue. It also helped us understand how medical treatments are discovered and implemented, which was a point of emphasis throughout the course.

Hands-on activities kept the class interesting and helped reinforce the material we were covering. When learning about Alzheimer's disease, for example, we were first introduced to the concept of associative memory, which we defined as the capacity to discern and recall a relationship between two independent factors. As a class, we then applied this concept to create a study aid: We each took a scented soap and sniffed it while studying material we had been previously tested on, thereby creating a link between the facts we were reading and the scent of our given soap. We were later re-tested, this time with our given soaps, and found that it was easier to recall the facts we had memorized. Although we didn't conduct causality experiments to isolate the scent as the sole reason for the better recall, it was an interesting lesson in associative memory.

MEETING SO MANY EXCEPTIONALLY BRIGHT PEERS FROM AROUND THE WORLD WAS A HUMBLING AND ENERGIZING EXPERIENCE THAT MADE FOR A UNIQUE AND STIMULATING LEARNING ENVIRONMENT.

Our final activity was a fetal pig dissection, which allowed us to see a physical representation of the systems of the body we had learned about throughout the course. The diaphragm is a thin muscle that facilitates the inhalation and exhalation of air by increasing and then decreasing the volume of the thoracic cavity. Using a probe, we moved the diaphragm of the fetal pig to imitate its intended function. Seeing physical demonstrations of the biological processes we had previously learned theoretically helped me truly appreciate the human body as an efficient machine.

Fast-Paced High School Biology

The following summer, I stepped away from specifically focusing on medicine to taking the more general Fast-Paced High School Biology course. This class expanded on the study of the human body to encompass all living organisms and their origins.

We began by learning about the scientific method, a systematic process of observations and recordings that is used to reach a conclusion based on the original hypothesis. We looked at an experiment done by the 17th-century Italian scientist Francesco Redi, which disproved a previously accepted theory that living organisms could be spontaneously generated from non-living matter. Redi placed two slabs of meat inside identical jars, leaving one covered and the other open to swarming flies. After some time had passed, he found larva on the piece of meat that had been exposed to the flies, but none on the meat in the covered jar. Through his observations, Redi concluded that the maggots didn't spontaneously appear, but were a result of the flies that had access to the meat. Redi's experiment, using the scientific method, was a model for the labs we conducted throughout the class.

One of our first labs was on osmosis, a form of passive diffusion in which a fluid such as water moves through a semipermeable membrane (such as that of a cell) into an area of higher concentration, equalizing the concentrations. In our experiment, four dialysis bags representing semipermeable membranes were filled with sucrose solutions of various concentrations. We weighed each bag before placing it in an individual beaker of water. A little while later, we removed the bags and weighed them again. Using our collective class data, we created a graph that demonstrated the change of weight in terms of concentration of the sucrose solution. As the percent concentration of sucrose in the bag increased, the weight of the bag increased proportionately.

Following the experiment, we wrote our first formal lab report. We learned how to identify the controlled, manipulated, and responding variables and then created a corresponding data table to record observations and quantitative data. We concluded that the more hypertonic (higher concentration) the sucrose solution, the more water would travel through the bag, or "cell." It was invaluable to write a formal lab report, as it is a fundamental exercise in science research.

Preparation for my Future

While the academic focus of both courses was on scientific methods and practices, CTY also taught us to embrace individuality within a group by exchanging perspectives during respectful discussions on topics that ranged from human evolution to major international health crises. Meeting so many exceptionally bright peers from around the world was a humbling and energizing experience that made for a unique and stimulating learning environment.

CTY gave me confidence as a student and a sense of independence as a young adult. Early exposure to biology and the medical field not only helped prepare me for high school science courses, but it strengthened my desire to pursue a future career in medicine. ■

Tara Reddy is a freshman at Harvard-Westlake School in Los Angeles, CA, where she plays soccer and swims for the school teams. In addition, she plays the flute in the symphony, and she also plays the piano. Tara, who has a passion for the arts, won a national Gold Key for painting in the Scholastic Art & Writing Awards. She has attended CTY since the fourth grade and hopes to pursue a career in oncology.