Building Brain Power through
The International Brain Bee

When I was in eighth grade, I read a snippet in the local newspaper about a student who had placed third in the regional Brain Bee. The Brain Bee is a neuroscience-based competition in which high school students demonstrate how much they know about the brain. Having always been a math and science person, I thought the competition presented an opportunity to motivate myself to learn and study even more. When it came time for the following year's competition, I signed up.

The regional contest in my area is held at the University of Scranton. It involves answering questions—orally, elimination style—on general neuroscience, from brain development to the effects of drugs on the brain. The winner of the regional Brain Bee advances to the national competition, held at the University of Maryland, Baltimore. I participated in the regional competition in ninth, tenth, and eleventh grades. I finished in the top 10 in ninth and tenth grades, and in second place my junior year. Then, in my senior year, I finally captured first place at the regional competition.

There wasn't much time to rest on my laurels, though. The national competition, less than a month away, required a much broader range of knowledge than the regional competition. The 45 participants would complete practicals in neuroanatomy and neurohistology, diagnose neurological diseases, analyze MRI films, and take both a written and an oral test. I spent countless hours in the library preparing.

Immersed in Brain Science
For the first part of the competition, the neuroanatomy practical, we studied real human brains in a cadaver lab. At each of 25 stations, we each had one minute to identify an area of the brain and its primary function. In textbooks, parts of the brain are usually depicted in color for emphasis, but in reality, the
brain is almost monochromatic and—to the untrained eyenondescript. I was lucky that the anatomy book I’d studied from was so old that it was printed in black and white!

Moving on to an auditorium-like lecture hall, we each had three minutes to interview each of 15 “patients” in order to diagnose diseases of the brain, ranging from the more common (epilepsy) to the relatively rare (Guillain-Barré syndrome). The patients were actually trained nurses who acted out and recounted case histories. We were permitted to ask three yes or no questions and order two tests—such as MRIs, EKGs, or PET scans—that might provide us with diagnostic feedback. Just as in real medicine, those results could be inconclusive. An MRI scan, for instance, might show that a particular patient has enlarged ventricles, which is indicative of dementia—and schizophrenia. Determining a diagnosis also depended on how well one had mastered the terminology. For example, at the last minute, I asked one patient if he had areflexia (a complete loss of tendon reflexes) as opposed to the opposite condition, hyperreflexia.

The neurohistology portion of the competition took place in a classroom, the perimeter of which was lined with microscopes and printouts of slides. We had one minute to view each of 40 slides and identify the part of the nervous system depicted. This portion of the competition was very challenging: Many of the slides contained what looked like collections of tiny particles, with few clues as to their origins.

Where in the Brain Am I?

Afterward, we gathered in yet another lecture hall, this time to identify what each of 40 slides of MRI images depicted. MRI, or magnetic resonance imaging, is a medical imaging technique used to visualize the body’s internal structures in great detail. It provides good contrast between the different soft tissues of the body, making it especially useful in imaging the brain.

Reading MRIs requires a good spatial memory of the brain. In order to understand what it is you’re seeing, you have to know “where” in the brain you are. You also have to be able to visualize normal, healthy anatomy so you can appreciate any abnormal areas. Some anatomy was obvious, like the corpus callosum (the large fiber tract that connects the two hemispheres of the brain), but others were tiny and indistinct, such as the fornix (a bundle of axons that carries signals from the hippocampus to the hypothalamus).

The written and oral tests consisted of 20 questions each that together spanned the entire spectrum of neuroscience. Although I earned a perfect 20 on the written exam, I was still nervous heading into the oral exam. A tally of scores from the previous five portions of the competition revealed that while I was in the lead, it wasn’t by much: One competitor was only a half-point behind me; two others were three-quarters of a point behind. And while questions in the previous rounds had been worth a quarter- to a half-point each, questions in this last round were each worth one point, meaning that one question could easily make the difference between first and fourth place!

On Closer Examination...

For the written exam, contestants were asked to provide more detailed information on topics we had touched on earlier in the competition, such as the mechanism by which fMRIs work. Although a few questions provided obvious hints, most required the ability to distinguish between concepts that sound similar but are very different, such as synaptic transmission (passage of a neural impulse across a synapse from one nerve fiber to another) and inhibitory postsynaptic potential (a change in the membrane of a neuron in response to an inhibitory impulse).

My head was spinning trying to decide how many I got right, so I wasn’t sure where I stood when they called out the names of the top five competitors. Not only was I among the top five, but I ended up in first place! I received a trophy, a $1,500 cash prize, and a summer internship.

I completed my internship this summer at Columbia University’s Taub Institute for Alzheimer’s Disease and the Aging Brain, where I worked with a scientist who is investigating the effects of proteins in the brain. In July, I was honored to represent the United States at the International Brain Bee in Cape Town, South Africa, where I placed fourth among 14 competitors.

Participating in the Brain Bee has definitely inspired me to pursue science much more vigorously than I had in the past. Before, I couldn’t decide whether to pursue physics or biology in college, and wondered how applied mathematics—one of my favorite subjects—might fit in. As it turns out, neuroscience encompasses all of them, and I plan to major in it in college this fall.

Aidan Crank graduated from Stroudsburg High School in Pennsylvania, where he competed in Scholastic Scrimmage, Science Olympiad, and Future Business Leaders of America. In his free time, he plays trumpet in a jazz band founded by saxophone great Phil Woods. Aidan is now a freshman at Johns Hopkins University.

Learn more about the International Brain Bee at www.internationalbrainbee.com.

The top five in the 2012 National Brain Bee: Carly O’Connor, Sidharth Chand, Aidan Crank, Shivangi Goel, and Darling Chen.