*Over two summers, Ariel Uy explored human cognition through two different lenses. After studying the mind from a philosophical perspective, she turned her focus to the physical brain and its functions. As she explains here, doing both gave her a deeper understanding of how we think, perceive, and remember.*

# Mind + Brain

## Philosophy and Neuroscience at CTY

by Ariel Uy

I didn't know what to expect when I signed up for Philosophy of Mind at CTY, as philosophy wasn't a topic I had ever encountered in school. But I was drawn to philosophy because it seemed to question everything we assume to be true—including the existence of other people and even ourselves. As it turned out, questioning everything was a major feature of the course.

### Ways to Think about Thinking

We started by studying the fundamentals of logic and reasoning to learn how to write a proof—a series of statements leading from a premise to a conclusion—a skill that would be necessary throughout the rest of the course. We learned how to represent statements using symbolic logic, a system in which logical expressions are represented by symbols. For example, ∧ represents "and," ∨ represents "or," and → represents "if/then." Once we knew the symbols, we could write proofs more quickly, and more easily identify logical fallacies in our own or others' arguments.

We read works by important philosophers including Descartes, Hobbes, and Nietzsche, and analyzed writing such as Plato's Allegory of the Cave. These works led us to examine interesting arguments such as the mind-body problem: Are the mind and the brain the same thing, or are they distinct? To think about the answer, we explored different theories of the mind. Dualism, for example, is the view that both physical and immaterial phenomena exist, and that the mind is immaterial. Before I took this class, I believed that all phenomena were physical and that the mind was the same as the brain. Now, I was beginning to wonder whether mental phenomena—beliefs, sensations, desires—existed as more than brain states.

Throughout the course, we worked on our writing skills, which culminated in a three- to five-page essay on a topic of our choice. I'm interested in artificial intelligence, so I chose to write about the Chinese Room argument, which attempts to disprove computationalism, the view that cognition is nothing more than information processing. The American philosopher John Searle proposed this thought experiment: He imagined himself sitting in a room, where he is passed slips of paper on which questions are written in Chinese. He does not know Chinese, but using a very detailed set of rules on how to respond to inputs in Chinese, he writes Chinese characters in response and passes the paper outside the room. To the Chinese speaker reading the responses, it seems that the person in the room understands Chinese.

Similarly, if a computer can take Chinese inputs and use a program to produce appropriate responses, indistinguishable from those of a native Chinese speaker, does the computer truly under-

stand Chinese? If computationalism were correct, the answer would be yes. But the Chinese Room argument shows that a person given sufficiently detailed instructions could do the same thing as the computer. A computer, Searle argues, doesn't understand Chinese any more than the man in the room does. True understanding requires more than inputs and outputs.

The Chinese Room argument, like many topics we discussed, is far from settled in the field of philosophy. My class kept a tally of how many times our instructor mentioned that something was controversial, which reached 72 by the end of the course. This class certainly asked more questions than it answered, and it opened my mind to different ways of thinking.

NOT ONLY HAVE I GOTTEN MUCH BETTER AT WRITING, ANALYSIS, AND RESEARCH, BUT STUDYING THE MIND ON BOTH A PHILOSOPHICAL AND A SCIENTIFIC LEVEL HAS GIVEN ME A BROADER UNDERSTANDING OF HUMAN THOUGHT AND EXPERIENCE.

### Journey into the Brain

The following summer, I decided to learn about the brain from a scientific viewpoint by taking CTY's Neuroscience course. I had just finished taking biology in school, and I was excited to apply my knowledge of cells to the brain and its interactions with other parts of the body.

The first few days of class, we talked about neurons and how they fire. We simulated a few neurons with the people in the class acting as axons and dendrites, with beanbags as neurotransmitters and ions. Our teacher played the "Neurotransmitter Song" to the tune of "Let It Go," and we never forgot what the different neurotransmitters did.

One of our required textbooks was a coloring book of the brain that is used in college neuroscience classes—and is surprisingly difficult to complete due to the intricate details and many sections of the diagrams. As we learned about the different parts of the brain (the frontal lobe, parietal lobe, cerebellum, etc.), we mapped them onto shower caps into their approximate positions on our heads. Learning what happens in these different areas of the brain was fascinating. My class was especially interested in two areas involved with aphasia, a disorder in which a person has trouble producing or understanding language. Different types of aphasia result from damage to different parts of the brain. People with Broca's aphasia can generally understand what is being said, but have a hard time speaking or writing. People with Wernicke's aphasia, on the other hand, believe and sound as if they are speaking fluently, but the sentences make no sense. Both disorders showed us how damage to even a small area of the brain could have a significant impact on someone's life.

We spent several days on the different types of memory: procedural memory, which allows you to remember how to do things like ride a bike; working memory, which is what you use to temporarily remember a phone number; and explicit memory, the memory of facts and events. To put all this in context, we learned about one of neuroscience's most famous subjects, H.M., who had part of his brain removed to alleviate seizures. The procedure left him with severe anterograde amnesia: His procedural memory and working memory were fine, but he could not add anything to his explicit memory. This case helped me understand how parts of the brain work together to store and access different types of memories.

While we were studying sensory pathways, our teacher mentioned synesthesia, a condition in which one sense triggers a perception of or association with another sense. To a person with synesthesia, the sound of a clarinet may be "blue" or have "the texture of wood." We discovered that several members of our class of 16 had experienced some form of synesthesia, compared to about one percent of the general population. The two most common types are grapheme-color, where text is associated with colors, and chromesthesia, where sounds are associated with colors. We had several discussions comparing how different people perceived different words or sounds. For instance, one classmate perceives the number five to be turquoise, while to another it is yellow. Due to the high prevalence at CTY, we wondered if age or intelligence had a correlation with synesthesia.

Our final activity was a sheep brain dissection. Although sheep brains differ in shape and size from human brains, we had a lot of fun seeing and touching the parts of the brain that we had been studying for three weeks: the brain stem, the lobes, the olfactory bulbs, and the optic nerves, to name a few. Cutting the brain open revealed a cross section of the corpus callosum, the nerve fibers that connect the two hemispheres of the brain, in addition to other features such as the hypothalamus.

I had a great time taking these two classes, exploring the mind and brain as well as enjoying myself at summer camp and making friends. Not only have I gotten much better at writing, analysis, and research, but studying the mind on both a philosophical and a scientific level has given me a broader understanding of human thought and experience. ■

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