President and Mrs. Oxtoby, trustees, faculty and staff colleagues, returning students and most especially our incoming students, the class of 2009. It is an honor to speak to you today at this convocation.

This morning we celebrated the construction of two new buildings on our campus with the ground breaking of the Lincoln Building and the Edmunds Building on Sixth Street and College Way. These magnificent adjoining buildings will together constitute the largest academic building on campus. They represent the College’s recognition of an exciting development in research methodology and in the organization of knowledge at colleges and universities. That development is the increase in interdisciplinary approaches to the discovery of new knowledge. Interdisciplinary approaches are motivated by the belief that the best way to answer complex questions is to select multiple methodologies and theoretical frameworks from different disciplines and meld them into an effective tool for gathering and interpreting new information. Most of the departments and programs in these two new buildings are inherently interdisciplinary in their approach, namely, Linguistics and Cognitive Science, Computer Science, Neuroscience, Environmental Analysis, Chicano Studies, Black Studies, and Asian-American Studies. The two other departments in these buildings are significantly involved in interdisciplinary programs, namely, Psychology and Geology.

My talk today focuses on a set of related questions that truly belong to multiple disciplines; in fact, many of the departments and programs that will reside in the Lincoln and Edmunds buildings address these questions. These questions concern the human mind. What is the nature and origin of the human mind? How does the mind work? In some cases, why and when does the mind not work? How does the mind develop in the child? How is it affected by culture? By education? How is it related to the brain? Is the mind part of the body, or is it nonmaterial, spirit?

These questions about the nature of mind are not new. Philosophers have addressed them for centuries. But recently the multidisciplinary approach of cognitive science has delivered extraordinary new knowledge about how the mind works and this knowledge is likely to alter some of our most fundamental beliefs about human behavior. After all, it is the human mind that conceives of love, of religion, of friendship and of hate and terrorism. The new knowledge about the mind, emanating from the joint work of philosophers, biologists, computer scientists, psychologists, physicists, linguists and anthropologists demonstrates the extraordinary fertility of interdisciplinary approaches.

I am focusing my talk on this new knowledge about the mind because it represents the richness, complexity and importance of the kind of issue that we hope you, our students, will think about and investigate at Pomona College. But we hope for even more. We hope that you
will move beyond thinking and investigating and that you will develop a passion for such questions that will lead you to an area of intellectual endeavor that will engage you throughout your life. Your four years here are a unique opportunity to discover questions that fascinate you and to immerse yourself in the pursuit of answers. Your instructors will do everything in their power to help you understand the relevant intellectual issues, old and new issues, big and small issues; and they will help you to develop and refine your own questions. When you discover a question that you find yourself thinking about in the shower, that is more engaging than video games or facebook.com, a question that makes you lose track of time in the library or the lab, then you will be on your way to feeling the intense pleasure of an intellectual passion. In this passion you will discover the satisfaction and the excitement that comes from acquiring, applying, and creating new knowledge. We hope this passion will guide you after Pomona in developing your field of work and will make it deeply satisfying and enjoyable. Questions about the nature of mind have been my passion for many years, have motivated both my research and my teaching and have made my work a pleasure. Let me illustrate some of these questions about the mind.

One of the most fascinating, and challenging questions about the mind concerns the nature of consciousness. As you sit here in Little Bridges, I hope in a conscious state, you are aware of a variety of sensations, ideas and feelings. The new students may be aware of aching muscles from their OA adventure, hunger pains in anticipation of lunch, feelings of hope and excitement about new friends and the beginning of classes. And, I hope that everyone is also aware of some thoughts about what they are listening to. This is consciousness. What is its nature? What is its function? How is consciousness caused by the gooey 3 pound organ under your skull?

Most people believe that an important function of consciousness is to direct and control their behavior. We consciously and purposefully evaluate evidence, make decisions and initiate a course of action. As a student you made a conscious decision to apply to Pomona College. You decide every day when and how much to study, to exercise, to shop, to obey the law and so on. Indeed, our legal system uses a component of consciousness, namely intention, as a fundamental principle for deciding the legality and appropriate penalties for an action. For example, in the eyes of the law it is very different if you accidentally and unintentionally hit a person with your car versus deliberately hitting a person with intent to harm. The exercise of intention or free will requires consciousness, but therein lies the problem. Consider how Bill Banks, Professor of psychology at Pomona College, expresses this problem in his new book, provocatively titled, “Does Consciousness Cause Behavior?” Professor Banks asks, “How does an idea move a muscle?” We know that at any moment we could decide to lift an arm, shift our weight, even stand up, or in my case sit down. What is the mechanism whereby our thoughts cause an action? And perhaps equally mystifying, how do we investigate this question scientifically?

Let me give you an example of a scientific study addressing this question. Benjamin Libet gave research participants the following task while he recorded the electrical activity of their brains: They were to make a voluntary movement, namely to bend their wrist, whenever they wanted to, and they were to report exactly when they first decided to initiate each movement. Previous research had shown that voluntary movement was preceded by a specific change in electrical brain activity, and this change was named the “readiness potential”. Libet found, however, that the "readiness potential" for the wrist movement occurred about 1/3 of a second BEFORE the participants reported deciding to initiate the movement. Thus before a person is aware of
making a conscious decision to move, the brain registers a non-conscious decision to move. This finding was explosive. Does this mean that for simple actions, free will is an illusion? Is conscious free will just a feeling, caused by non-conscious processes that trigger both the readiness potential and the subsequent movement? These deeply disconcerting implications are being argued in an ongoing and heated debate in my field.

Other intriguing research on the mind tells us that despite the feeling of control, many cognitive functions work beneath conscious awareness. Consider how we speak. Words that express our thoughts usually spring to our lips with little conscious effort. You can produce well-formed speech at very fast rates, especially if you, like me, are from New York. But this process of quickly finding the appropriate words is not under conscious control, as becomes painfully clear whenever a well-known word such as a friend’s name eludes us and does not spring to our lips. This temporary inability to bring a word to mind that we know we know is called the tip-of-the-tongue experience; it has been likened to being on the brink of a sneeze because of the strong feeling that the word is almost within reach. The tip-of-the-tongue phenomenon is a frustrating reminder that language is controlled by processes that we are not aware of and that we cannot control. We are at their mercy when these non-conscious processes fail. We do, however, know how to enhance the performance of these non-conscious processes - through practice. For example, frequent production of a word reduces the frequency of glitches such as tip-of-the-tongue experiences. Let’s consider this fact in relation to remembering and learning more generally.

Learning and remembering, like language, are functions of the mind that you will be exercising rather vigorously during the next few years, and we hope for the rest of your life. Students have long been interested in the extent to which learning requires consciousness - students in my classes frequently ask if they can play a tape of a class lecture or of an assigned reading while they sleep and then wake up having learned the material. If some learning and remembering is non-conscious, do we actually have to be conscious to acquire the memory? Research on the mind gives us a clear but unhappy answer: You have to be conscious to learn; if you fall asleep in a lecture, you will not learn the material, a fact that perhaps one or two people in the audience may have learned firsthand.

You are, however, influenced by knowledge that you are unaware of knowing. One compelling source of evidence for this comes from the behavior of people who have suffered damage to specific brain regions involved in learning new information, a disability called amnesia. Amnesics test normal on intelligence tests but they are unable to learn anything new. One of the most famous amnesics is a patient known by his initials HM. In 1953, a neurosurgeon removed from HM’s brain a region called the hippocampus in order to cure intractable and life threatening epilepsy. After the surgery HM’s memory for facts that he had learned or events he had experienced before his surgery was good, but he was unable to remember any events or new information that occurred after his surgery. For example, he could not learn new vocabulary words that came into the language after his 1953 surgery; words like shuttle, computer, hippie, were unknown to him. He could not remember for more than a minute or 2 anything he read in the newspaper. As HM grew older, he could not recognize himself in the mirror because his memory was of his 27-year-old face just before his surgery. Those of you who saw the movie “Memento” will recognize that the memory deficits of the main character, Leonard, AKA Lennie, were strikingly similar to HM’s. HM’s deficits made clear the function of the brain region he had lost: learning new information.
However, research showed that certain kinds of experiences that followed HM’s surgery had lasting effects on him. Memory for these experiences was only revealed in tests that did not require that HM be conscious of the experiences. For example, HM was given practice on a tracking task that required difficult coordination between vision and hand. His performance improved with practice over days - a benefit that indicated memory for the recent experience. However, on each day of practice he denied that he had ever performed the task before. He had no memory of the experience that could enter conscious awareness, even though his performance showed benefit from the repeated experience.

People with normal memories are also unconsciously influenced by previous experiences that they do not consciously remember. If I give you a list of 15 words to alphabetize and then an hour later ask you to generate the first word that comes to mind to complete unfinished sentences, you will unconsciously select appropriate words from that list, even if you cannot consciously recall the original list. This rather mundane example from the laboratory demonstrates the basic principle of memory without awareness which explains some puzzling and sometimes pernicious human behaviors. When people are asked to proof read stories about a rude and inconsiderate character, they are more likely to act rudely themselves in a seemingly unrelated incident after they leave the laboratory.

Related work of Claude Steele and his colleagues at Stanford has demonstrated the destructive and non-conscious impact of negative racial stereotypes on behavior. Steele and colleagues compared performance of African American and white students on a difficult verbal test similar to the SAT. African Americans performed worse than whites when the test was preceded by a task that activated, without the students' awareness, negative stereotypes about African Americans. The differences between the two groups of students disappeared when no implicit reminder of negative stereotypes preceded the test. Negative stereotypes are learned by all of us without awareness and in many cases against our will. Even people who are the targets of these negative stereotypes, for example, women and people in certain ethnic groups, absorb these stereotypes without awareness. Unless we actively and consciously counteract them they will limit and bias our behavior.

Much of the factual material that you consciously remember for an exam will be forgotten within 36 hours of the exam, unless you continue to think about and use this material, which we hope you will. Remarkably, what persists in memory for many years are the concepts and intellectual skills that you will develop here that are used, for example, in writing a paper, designing an experiment, analyzing a problem and evaluating and creating art. These skills are acquired through lots of practice and hands-on experience in the studio, in the laboratory, in the library and in talking to your professors and fellow students. As you develop this expertise it will become a habit of mind that will serve you throughout your adult life. Like HM, you may forget the facts of how you learned these skills, or even that you did learn them, but the knowledge underlying these abilities will continue to influence how you think and act.

I have given you just a glimpse of the kinds of questions and new findings that arouse my passion for understanding how the mind works. I urge you to use the extraordinary opportunity that Pomona offers for discovering and developing your own intellectual passion. Pomona faculty members have been selected for their creativity and productivity in research, but also because of their effectiveness and passion for sharing their expertise with their students. Take advantage of them. The experiences that Pomona graduates mention in looking back over their years here often involve interactions with their professors outside the classroom.
research settings, in conversations over lunch, and in discussions of senior thesis projects during office hours. Talk about your new ideas with your advisor, your instructors, your roommates, your team mates. Remember the importance of non-conscious influences on your behavior. Use Pomona to develop your mind's passion and let this passion guide you through a life of pursuit and discovery.