As a scientist, I plan to tackle some of the most fundamental questions in neuroscience by building bridges across scientific disciplines. Such a prospect speaks to both Picower Institute’s unique initiative as well as my interdisciplinary research goals as a neuroscience graduate student.  With a career in Academia, I hope to understand the molecular and neural networks that lead to memory formation.
 During my freshman year, I attended a seminar series on psycholinguistics and emotion led by Professor Catherine Caldwell-Harris. Throughout numerous dialogues, Professor Harris and I found that we shared a sense of fascination with regards to neuroscience, after which she invited me to work in her lab. Using autonomic measures as indirect representations of neural activity, we found data to suggest that putting feelings into words is a useful mechanism for coping with negative emotions.  Our experiment worked after nearly a year of trial-and-error, and neuroscience research had me hooked.
 The following year, I enrolled in an advanced seminar course on neural models of memory, which ultimately left me eager to research memory’s neural mechanisms. I pursued my interest in memory by researching the biochemical nature of its degradation. I spent my sophomore and junior years working with Professor Lee E. Goldstein at BU's School of Medicine, under whose supervision I was awarded my first research grant through BU’s Undergraduate Research Opportunities Program (UROP). We discovered a novel pathological interaction between two proteins involved in Alzheimer’s disease formation.  Our abstract was submitted to *Alzheimer’s and Dementia*.
 My first real insight in the Goldstein lab was that no one is born a good researcher. Research takes a high level of commitment and time.  Successfully completing some projects can take months or years, as does the growth and maturation required to become a scientist.  While working with Dr. Goldstein, I was impressed by the power of immunohistochemistry as a window into memory’s molecular underpinnings, but I sought to work on the level of systems neuroscience. Like Professors Matt Wilson and Susumu Tonegawa, I wanted to investigate memory by combining the study of molecules, circuits and behavior.
 Subsequently, I met Professor Howard Eichenbaum, whose systems-level memory research inspired my interest in the Picower Institute. Under his supervision, I wrote and earned my second and third grants from UROP. After familiarizing myself with the techniques of in vivo electrophysiology and single unit recordings, I approached Dr. Eichenbaum with an idea for a ‘Senior Work for Distinction’ thesis project meant to measure hippocampal and orbitofrontal cortex interactions during memory acquisition. Thus far, I have learned how to perform stereotaxic surgery, do data analysis using Plexon software, and construct 96-channel microdrive arrays. More fundamentally, I have learned that research is fulfilling but challenging. Wires will unexpectedly kink and rodents will behave as they please, but in the end the joy of seeing a hypothesis verified has no rival.
 While working under the guidance of Professor Eichenbaum, I have become familiar with the exceptionally vibrant neuroscience community here in Boston, specifically at MIT. Should I be accepted into MIT, I would like to rotate through the labs of Professors Matt Wilson and Susumu Tonegawa.  To this end, I have already had extensive interactions and communication with Prof. Tonegawa regarding our mutual research interests. At his request, should I be granted an interview, I would like to have him on the committee of interviewers so that I might further discuss the molecular neurobiology track at MIT and the memory research in his lab.
 As a student in these labs I will integrate the key components of all my experiences in neuroscience by utilizing a molecular biological approach to study learning and memory within the framework of in vivo electrophysiology. Admittedly, I still have much to learn in order to properly perform such theory-driven experiments. My biochemistry research experience, as well as BCS’s core courses and elective courses, especially Genetic Neurobiology, will help me to learn the techniques necessary to manipulate genes and proteins, such as through the Cre/loxP system utilized in the Tonegawa Lab, and the phenotypic consequences at the neuronal and behavioral levels. My electrophysiology research experience, coupled with the elective course in Neural Plasticity in Learning and Development, will also help me to measure these manipulations and how they influence memory representations in cortico-hippocampal neural ensembles.
 The projects I find most exciting involve generating genetically engineered NMDA-receptor (NMDAR) knockout mice to investigate the types of memory for which NMDARs are crucial. While a host of lesion studies suggest distinct functional roles for various cortico-hippocampal subregions, these studies lack the spatial and temporal precision that conditional genetics confers to restrict NMDAR blockade to a particular brain system. For example, it is unlikely that a neurotoxin lesion in the hippocampus selectively acts at CA1 without the artifact of at least partly compromising the structural and functional integrity of CA3. That said, I hope to learn the powerful methods of conditional transgenic technology and apply my experience with in vivo single-unit recordings to selectively manipulate genes, consequently affect proteins, and ultimately measure behavior. By working on such projects, I will build causal bridges between molecular biology and psychology in order to gain a more faithful understanding of how hippocampal-dependent memory works.
 Finally, I also look forward to developing as a teacher.  In both my teaching assistantships and presentations at annual neuroscience meetings, I will strive to improve my ability to present information in a compelling and effective manner.  At BU, I have tutored students in biology for three years, an act that has offered me a stimulating platform to practice communicating ideas effectively and enthusiastically, and I approach the teaching assistantship at MIT with equal ardor. Indeed, I aspire to become a university professor because it combines my two passions: research and teaching.
 MIT’s BCS program uniquely addresses my goal to research the biological substrates of memory formation, and also to sharpen my teaching abilities. I see the years ahead as a journey across various levels of neural organization in the cortico-hippocampal system in search of deep laws to unite memory. The mind is not just orderly, but intelligible.