Background
The hippocampus is responsible for auto-biographical memory and also for spatial navigation ability. Studies have demonstrated that the hippocampus also plays a role in one's ability to plan and visualize the future. People with hippocampal damage are not able to imagine the future or visualize scenes in their mind’s eye. The purpose of this study was to gain insight into the most important genes in the hippocampus and what their role is.

Results
Hippocampal Gene Expression Profiles

Methods
The Allen Brain atlas (http://www.brain-map.org) was used to profile the gene expression pattern of the hippocampus in 6 different human donors (H0351.2001, H0351.2002, H0351.1009, H0351.1012, H0351.1015, H0351.1016). A differential search of the hippocampus with a contrast of gray matter was used to find the data. A fold change cut off of 2 was set and all data for each donor that was above the cutoff was downloaded and organized into excel sheets.

Venn diagrams were used to determine which genes donors had in common and which were unique to them. Clustering and enrichment analyses were used to determine the function of both common and uncommon genes in donors. DAVID genes were scored using the ortholog gene symbol under homosapiens. KEGG pathways and functional annotation results were analyzed. Using GOfrilla, Function, Process, and Component charts were all analyzed. Potentially interesting genes were researched on NCBI to get a summary of their function. Genes of interest with high fold change and functions related to memory were entered into String to identify potential interacting partners and pathways (http://string-db.org). The networks are based on experimentally validated interactions.

Discussion
Gene expression patterns i.e. hot spots and under represented areas in the hippocampus are highly similar in all 6 donors.

The common genes between donors that had the highest fold change in expression are GABRA5, NEUROD2, and GRIA1. NEUROD2 is a transcription regulator for neuron differentiation. GABRA5 is a subunit of a GABA receptor which are the major inhibitory receptors in the mammalian brain while GRIA1 encodes a Glutamate receptor which are the predominant excitatory neurotransmitter receptors in mammals.

Many of the common genes among donors are involved in the KEGG pathway (map 04080) Neuronal ligand-receptor interaction (P-value of 1.33E-10) which links G-protein coupled receptors and neurotransmitter pathways.

The common genes clustered weakly which is perhaps due to the somewhat small number of genes in the dataset. Still, the enrichment categories give insight into the types of genes that underlie hippocampal function.