The medial entorhinal cortex (MEC) is a high-level cortical structure that generates a neural code for location, similar to a GPS. Individual neurons in the MEC 1) create a grid of repeating spatial fields (grid cells), 2) signal the proximity to borders of the environment (boundary vector cells), or 3) respond to a particular direction in space (head direction cells). Together these cells create a rich and detailed representation of space important for navigation and spatial memory. I will discuss our latest work that is beginning to reveal how these cell types contribute to spatial representations found downstream in the hippocampus and how these neuronal codes undergo systematic degeneration in a mouse model of Alzheimer’s disease.