Dr. Jeffrey Edwards: So, My name is Jeff Edwards, and I've been a professor here for 14 years. I came here by way of doing a post-doctoral fellowship at Brown University, once with seminar, when I was at the University of Utah and saw a seminar there that was very interesting and that was talking about silent synapses, so synapses, or connections between brain cells that are silent, and I was very intrigued about that and how these synapses could be modified and reawakened. The research work that I do is called synaptic plasticity. So, we're really interested in understanding how synapses are modified and what modifies those synapses. And this is essential to all life, is being able to adapt our brain in response to information, and we call this use-dependent plasticity and that occurs for example in our memory centers, known as the Hippocampus, when we remember things we are experiencing. The reason we can actually remember them is because synaptic plasticity is occurring in this brain area that's needed for memory formation to occur. We really first need to know how the hippocampus, which is our memory center, works, in order to then understand how it might apply to something like Alzheimer's disease. And so we've studied some mechanisms to enhance LTP and thus potentially enhance learning and memory, and somebody that might be going through dementia. We then want to see how we can apply some of the things we are learning to help people that might have dementia or even let's say Alzheimer's. While we don't study Alzheimer's patients here directly because we're not working on humans, we're working on rodent models so we can learn how learning and memory mechanisms work. The other area that we do a lot in the lab is addiction research, and so interestingly our reward centers also have plasticity and that's to help us to remember events, or experiences, or things that were pleasant versus unpleasant so when you think about, you know how you felt as a kid eating broccoli, that was probably aversive and you hated it, and so our brain actually remembers that by modifying the circuits through synaptic plasticity, and then eating chocolate cake is the opposite where we feel were very rewarding so we remember, that's rewarding. So, it turns out that drugs of abuse do that exact same thing. Where if you take cocaine or something else, not only do you get an immediate sense of euphoria, right, kind of this hedonic pleasure because of the cocaine, but also there's left behind synaptic alterations and so we call these kind of drug induced maladaptations or changes in synaptic plasticity that aren't normal we think can lead to the addictions. And so, we are really interested in kinda understanding how the brain modifies itself. A lot of the projects we do focus on things that are of interest or relevance and so we've worked on marijuana now that it's being legalized throughout the US and Canada for recreational medicinal purposes. We've done work on understanding how long-term use of it actually affects plasticity and thus potentially addiction and could cause something like cannabis use disorder. Some other things that we're interested in on memory is stress and exercise, and how exercise can help overcome the negative effects of stress on memory and also PTSD looking at a prophylactic

treatment. So, really things that are relevant to what's going on in our society and how we can study what's going on in the brain, how synapses are modified so that then we could potentially look at helping people who have issues like PTSD and you have these maladaptive strong memories, or something like an addiction which, again, we think is caused by changes in normal synaptic plasticity in the brain.

Text: BYU College of Life Sciences