FULL SPEAKER BIOGRAPHY and ABSTRACT

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Dr. Barres is Professor of Neurobiology, Developmental Biology, and Neurology at Stanford University School of Medicine. He did his B.S. degree at MIT, M.D. degree at Dartmouth Medical School, his internship and residency in neurology at the Cornell Cooperating Hospitals Program, his Ph.D. with David Corey at Harvard Medical School, and his postdoctoral fellowship with Martin Raff at University College London. Dr. Barres presently serves as Chair of the Department of Neurobiology at Stanford University, and serves on many editorial boards including Neuron, Science, Development, and the Journal of Cell Biology. He has won many teaching awards at Stanford including the Kaiser Award for Excellence in Preclinical teaching and the Kaiser Award for Outstanding Contributions to Medical Education. Dr. Barres is the creator and director of the Masters of Science in Medicine Program (msm.stanford.edu), a new program at Stanford University to train Ph.D. students about human biology and disease. He is a founding member of the Myelin Repair Foundation which focuses on translational research to develop new drugs for Multiple Sclerosis. Dr. Barres is transgendered, an Elected Fellow of American Women in Science, and an activist for the rights of women and minorities. His lab focuses on the role of neuron-glial interactions in the CNS, with present emphasis on understanding the basis of CNS regenerative and remyelinative failure, the blood-brain barrier, and the role of astrocytes at synapses.

How do Astrocytes Promote CNS Synaptogenesis?

Astrocytes are a major cell type in the brain. Until recently they were believed to have only passive, supporting roles. In this talk, I will summarize recent studies demonstrating that astrocytes powerfully stimulate the formation and function of synapses. I will then describe our efforts to identify the glial-secreted proteins that induce excitatory synapse formation and postsynaptic glutamate receptivity, as well as the neuronal receptors through which these proteins act.

What is the central hypothesis of your presentation?
That astrocytes actively participate in inducing synapse formation in the developing central nervous system (CNS).

What is the most important observation that you will discuss?
I will describe our recent discovery that astrocytes induce synapse formation by secreting the protein thrombospondin which binds to the gabapentin receptor, cacna2d1, on neurons thereby signaling synapse formation.

What is the translational significance?
The mechanism of action of gabapentin (Neurontin) in treating epilepsy and chronic pain has long been mysterious. Our findings demonstrate that gabapentin powerfully blocks new excitatory synapse formation by antagonizing the binding of thrombospondin to cacna2d1 exactly at its therapeutic concentration. These findings have important implications for the cause of epilepsy and pain, as well as for the development of improved drugs to treat these conditions.