

Dr Greg Gage – “A first principles engineering approach to designing high-tech neuroscience laboratory equipment”

**Abstract.** At the dawn of neuroscience investigations, researchers themselves built tools to investigate the brain. Hodgkin and Huxley’s famous discoveries were based on their invention of the voltage clamp applied to neuroscience. Lord Adrian and Matthews built their own amplifiers and oscilloscopes using the recently invented vacuum tube in order to record the first action potential in 1928. David Hubel invented the microelectrode and the hydraulic microdrive that he would later use with Torsten Wiesel to greatly expand our knowledge of the sensory processing. To advance any field of science, new tools are invented.

The “maker movement” has seen the birth of new consumer technologies (e.g. 3d-printers, CNC laser cutters, low volume PCB) which enable labs to quickly build tools to further scientific investigation. Our organization (Backyard Brains) develops open-source DIY neuroscience tools which are appropriate for the benchtop of both research and instructional teaching labs. During the talk, I will focus on hands-on demonstrations of maker versions of advanced electrophysiology experiments: neurophysiology, functional electrical stimulation, micro-stimulation effect on animal behavior, neuropharmacology, even neuroprosthesis and optogenetics!

Finally, with faculty academic position becoming harder to obtain, I will discuss an alternative academic career path: entrepreneurship. It is possible to be an academic and do research, publish papers, and train students all outside the traditional university setting.