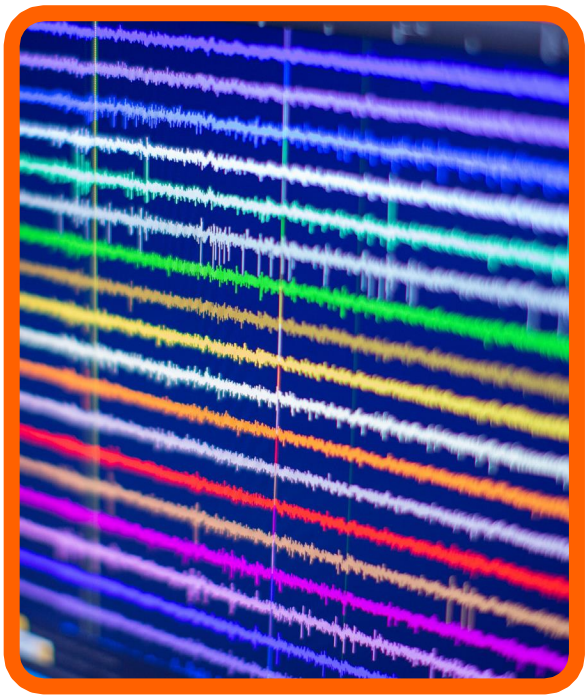
Spying on Neurons/

In this lab, students learn how and why scientists in this lab, students learn about the branch of neuroscience known as **electrophysiology**—the study of electrical activity in the body. This lesson introduces students to the topic of action potentials and overviews how neurons send signals to "talk" to one another and to other cells within the body. In this activity, students "spy" on their own nerves talking to their muscle cells by using an **electromyograph (EMG).** After observing their own electrophysiology, students are then introduced to other methods scientists use to spy on neurons, including a technology that was developed in part at the Allen Institute called **"Neuropixels" probes,** which allow scientists to observe the electrical activity of hundreds of neurons at once within a living organism.

This activity uses an electromyograph developed by Backyard Brains.



Electrophysiology data from Neuropixels probes at the Allen Institute

Grade levels/ 9th - 12th grade

Total field trip time/ 2 hours and 30 minutes

Recommended pre-lab teaching/

- Basic overview of action potentials

Learning Objectives/

- **Define** electrophysiology as the study of the electrical activity of the body
- **Practice** measuring the body's electrical activity using an electromyograph (EMG)
- **Reflect** on the bioethical considerations of using Neuropixels probes within living organisms

Lab Skills/

- **Operate** an electromyograph (EMG)
- **Interpret** visualizations of data collected from an EMG

Next Generation Science Standards (NGSS)

Science and Engineering Practices/	**Developing and Using Models** Develop and use model based on evidence to illustrate the relationships between systems or between components of a system. **Scientific Investigations Use a Variety of Methods** Scientific inquiry is characterized by a common set of values that include: logical thinking, precision, open-mindedness, objectivity, skepticism, replicability of results, and honest and ethical reporting of findings.
Disciplinary Core Ideas/	**LS1.A: Structure and Function** Systems of specialized cells within organisms help them perform the essential functions of life. (HS-LS1 – 1) Multicellular organisms have a hierarchical structural organization, in which any one system is made up of numerous parts and is itself a component of the next level. (HS-LS1 – 2)
Cross Cutting Concepts/	**Systems and System Models** Models (e.g., physical, mathematical, computer models) can be used to simulate systems and interactions—including energy, matter, and information flows—within and between systems at different scales. **Structure and Function** Investigating or designing new systems or structures requires a detailed examination of the properties of different materials, the structures of different components, and connections of components to reveal its function and/or solve a problem **Connections to Nature of Science: Science is a Human Endeavor** Technological advances have influenced the progress of science and science has influenced advances in technology.