

## Erik J. Peterson, PhD

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### ABOUT ME

I study curiosity as a mathematical idea, for use in machine learning, and to predict and influence human behavior. I am interested in physical applications as well, using curiosity and reinforcement learning in robots, drones, and design. Academically I study computation in the brain's other electrically active cells, astrocytes.

I am looking for a leadership role – in industry or academia.

### RECENT EXPERIENCE

**Carnegie Mellon University** - Pittsburgh, PA

*Research Fellow (Research Scientist)*

**2018 - Present**

I developed a theoretical account of curiosity, and applied it to both machine learning applications ([Github](#)), and used it to predict human (and other animal's) behavior. This work has applications in aiding human-agent teams, multi-agent systems ([Github](#)), robotics, automated drone flight, and in automated design, and extends into game theory, and developmental neuroscience.

**Kernel, LLC** - Los Angeles, CA

*Senior Research Scientist*

**2017 - 2018**

I was the technical lead building a *real-time* system for complex spatio-temporal field shaping, in deep brain stimulation. This project blended biophysical modelling with deep neural networks and led to 400,000 fold speed up – a key requirement for *real-time* use.

**U.C. San Diego** - San Diego, CA

*Postdoctoral Fellow*

**2014 - 2017**

I conducted theoretical research on the coding properties of neural oscillations. I verified theoretical predictions using biophysical modelling, and experimental data. This project required extensive use of information and compression theory. I also co-lead development of a python tool to analyze electrophysiological data, which has found widespread use in the neuroscience community.

### EDUCATION

**Colorado State University**, Fort Collins, CO

Ph.D, Psychology

**2012**

**California Polytechnic State University**, San Luis Obispo, CA

B.S., Chemistry and Biochemistry; Minor, Philosophy

**May 2004**

### PROGRAMMING

**Python**

Core ML - {*pytorch*, *ray*, *sklearn*}

**Expert**

**R**

Core DS - {*tidyverse*}

**Expert**

### PROJECTS

**The Exploration Book** ([Github](#))

Authoring a book on exploration in biology, ranging from random search, to reinforcement learning, to curiosity, imagination, to reasoning. I developed a python package ([Github](#)) to make it easy to explore exploration.

### PRESS & PUBLIC TALKS

Brain's 'Background Noise' May Hold Clues to Persistent Mysteries, *Quanta Magazine*, 2021.

Build Your Own Brainwaves, *Nerd Nite*, Los Angeles, Feb 2018.

Conflicted Data Science, *Open San Diego*, San Diego, Feb, 2016.

In Theory You're Paying Attention, *Ignite*, San Diego, Nov 2016.

### SELECT PUBLICATIONS

Donoghue T\*, Haller M\*, **Peterson EJ\***, et al, Parameterizing Neural Power Spectra into Periodic and Aperiodic Components, *Nature Neuroscience* 23 1655-1665 (2020). [\*]: Co-first.

**Peterson EJ** & Verstynen T, Curiosity eliminates the exploration-exploitation dilemma, *bioRxiv* 671362v8 (2020).