



# TOPOLOGICAL ADVENTURES IN NEUROSCIENCE

A TALK BY  
**KATHRYN HESS BELLWALD**

**ÉCOLE POLYTECHNIQUE  
FÉDÉRALE DE LAUSANNE**

**16**  
**MAGGIO**  
**15:30**  
AULA SEMINARI VIMM  
FONDAZIONE RICERCA  
BIOMEDICA AVANZATA  
**VIA ORUS, 2**  
**PADOVA**

Over the past decade, and particularly over the past five years, research at the interface of topology and neuroscience has grown remarkably fast. Topology has, for example, been successfully applied to objective classification of neuron morphologies and to automatic detection of network dynamics. In this talk I will focus on the algebraic topology of brain structure and function, describing results obtained in collaboration with the Blue Brain Project on digitally reconstructed microcircuits of neurons in the rat cortex. I will also describe our on-going work on the topology of synaptic plasticity. The talk will include an overview of the Blue Brain Project and a brief introduction to the topological tools that we use.



**Kathryn Hess Bellwald** obtained her PhD in Mathematics from the Massachusetts Institute of Technology and did her postdoctoral training in the University of Stockholm before joining the École Polytechnique Fédérale de Lausanne where she is now Associate Professor and director of the laboratory for topology and neuroscience. She has worked and written extensively on topics in algebraic topology including homotopy theory, model categories and algebraic K-theory. She has more recently used algebraic topology to understand structures in neurology and Neuroscience. She received the Polysphere d'Or Teaching Award for her teaching at EPFL in 2013. In 2017, she was named a fellow of the American Mathematical Society for "contributions to homotopy theory, applications of topology to the analysis of biological data, and service to the mathematical community". In 2017, she received an award as a distinguished speaker of the European Mathematical Society.



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