

ldea

Building a scalable, accessible tool that enables visualization, retrieval, and comparative analysis of petabyte-scale neuroscience data and annotations

Objectives

- Facilitate research in connectomics (mapping neural connectivity) to accelerate advancements in health and computation
- Establish a novel, open tool for use in neuroscience research
- **Democratize access** to publicly-available neuroimaging data

Opportunity & Challenge

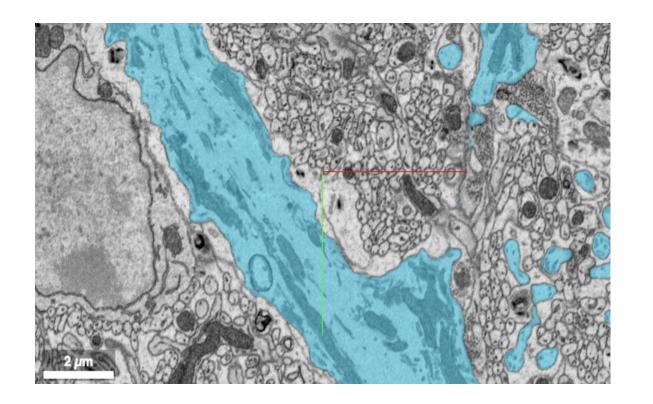
- There exists a **demand** to provide the community with an atlas illustrating datasets available across the brain by species
- Current datasets exist in **isolation** with little information about relative spatial location, which makes comparison difficult
- The issue is significant with available data growing in scale [1]

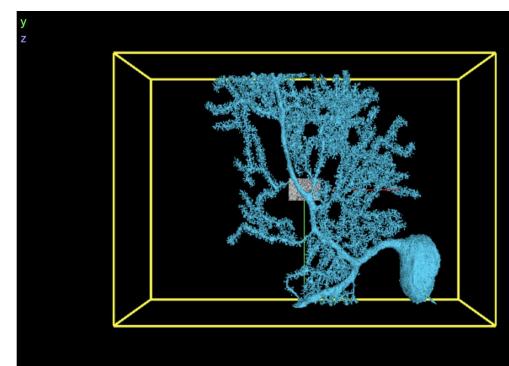
Impact & Future Directions

- With burgeoning information, it is imperative that scientists have integrated access points for comparative connectomics
- As algorithms are developed to "snap" imaging volumes onto reference models, a visual atlas will allow for co-registration
- Secondary analysis of overlapping studies will help quantify the extent of individual variation in brain connectivity, reveal patterns that underly cognition, behavior, and disease, and inform neural networks

Case Study

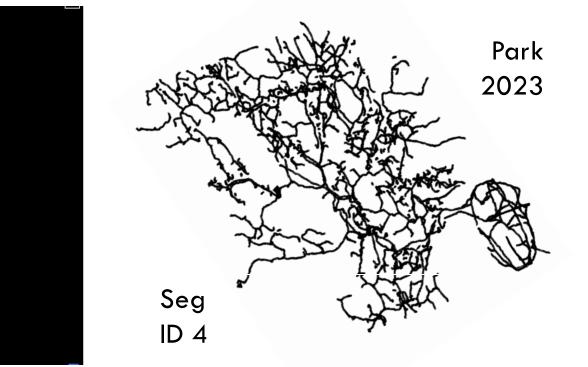
- C-MAP enabled the identification of three datasets from the mouse cerebellum; we propose a case study on neuron development through an analysis of Purkinje Cells in this region
- Pipeline: Segmentation \rightarrow Neuron meshes \rightarrow Skeletons \rightarrow Statistics





Connectomics Multimodal Atlas Project

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C-MAP

Home

About

Now viewing:

Cerebellum (3)

<u>Clear selection</u>

Nguyen, Thomas et al. 2022

A large-scale transmission electron microscopy dataset of an adult mouse cerebellum

Park et al. 2023

Serial blockface scanning electron microscopy, segmentation and meshes of reconstructed neurons within the mouse cerebellum

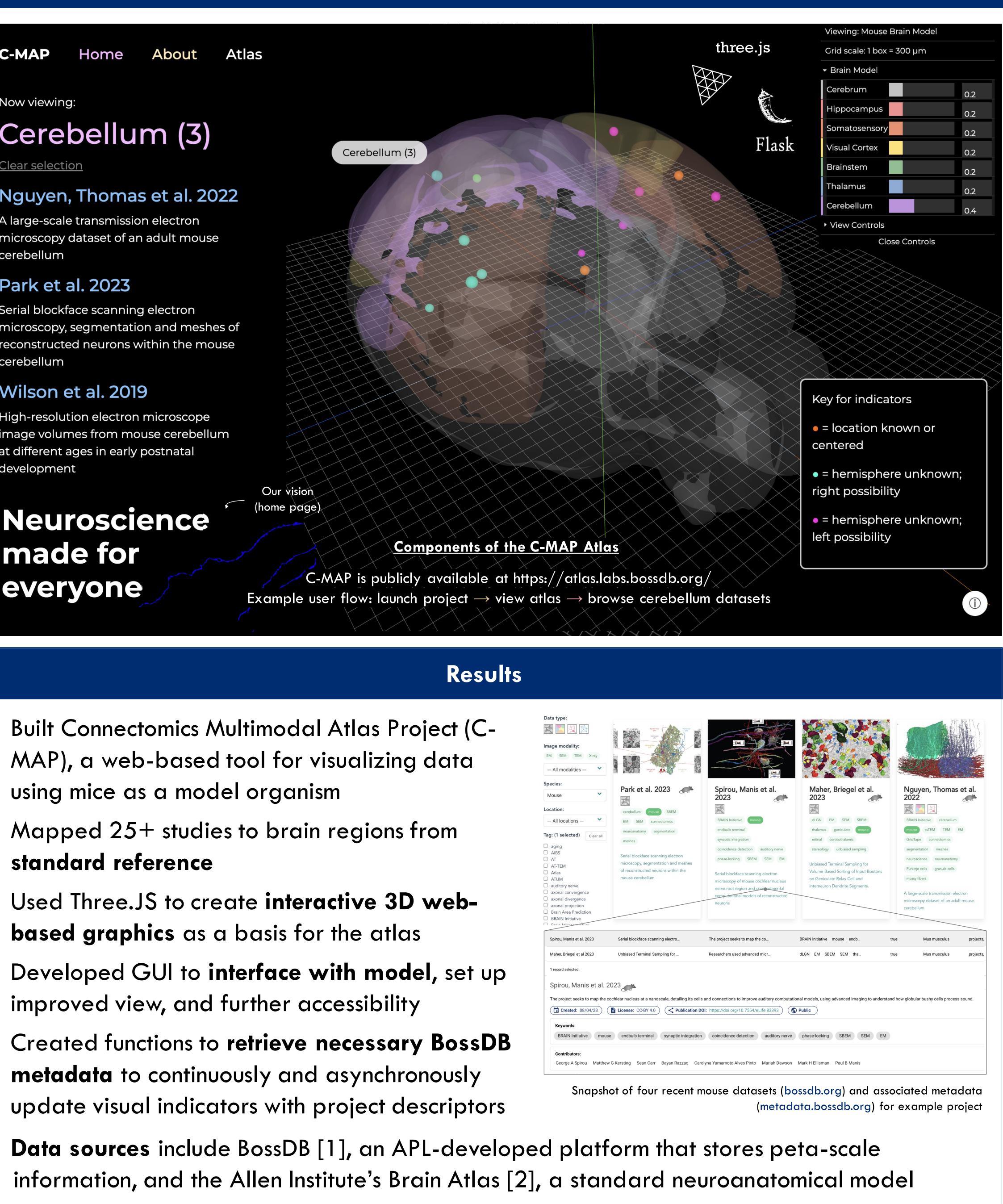
Wilson et al. 2019

High-resolution electron microscope image volumes from mouse cerebellum at different ages in early postnatal development

Neuroscience made for everyone

- using mice as a model organism
- standard reference

This work was completed with the support of NIH grants 1R24MH114785 (PI: Brock Wester) and R01MH126684 (PI: William Gray-Roncal) [1] R. Hider Jr, D. Kleissas, T. Gion, D. Xenes, J. Matelsky, D. Pryor, ... and B. Wester, "The Brain Observatory Storage Service and Database (BossDB): a cloud-native approach for petascale neuroscience discovery," p. 828787, Feb. 2022, doi: https://doi.org/10.3389/fninf.2022.828787. [2] M. Hawrylycz, L. Ng, D. Feng, S. M. Sunkin, A. Szafer, and C. Dang, "The Allen Brain Atlas," pp. 1111–1126, Jan. 2014, doi: doi.org/10.1007/978-3-642-30574-0_62. Our work on C-MAP builds on the 2021-2022 CON CIRCUIT cohort: Julie Burroughs, Wendy Chen, Folahan Koleosho, and Toni-Ann Pearson



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axonal projection		neurons
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References & Acknowledgments

