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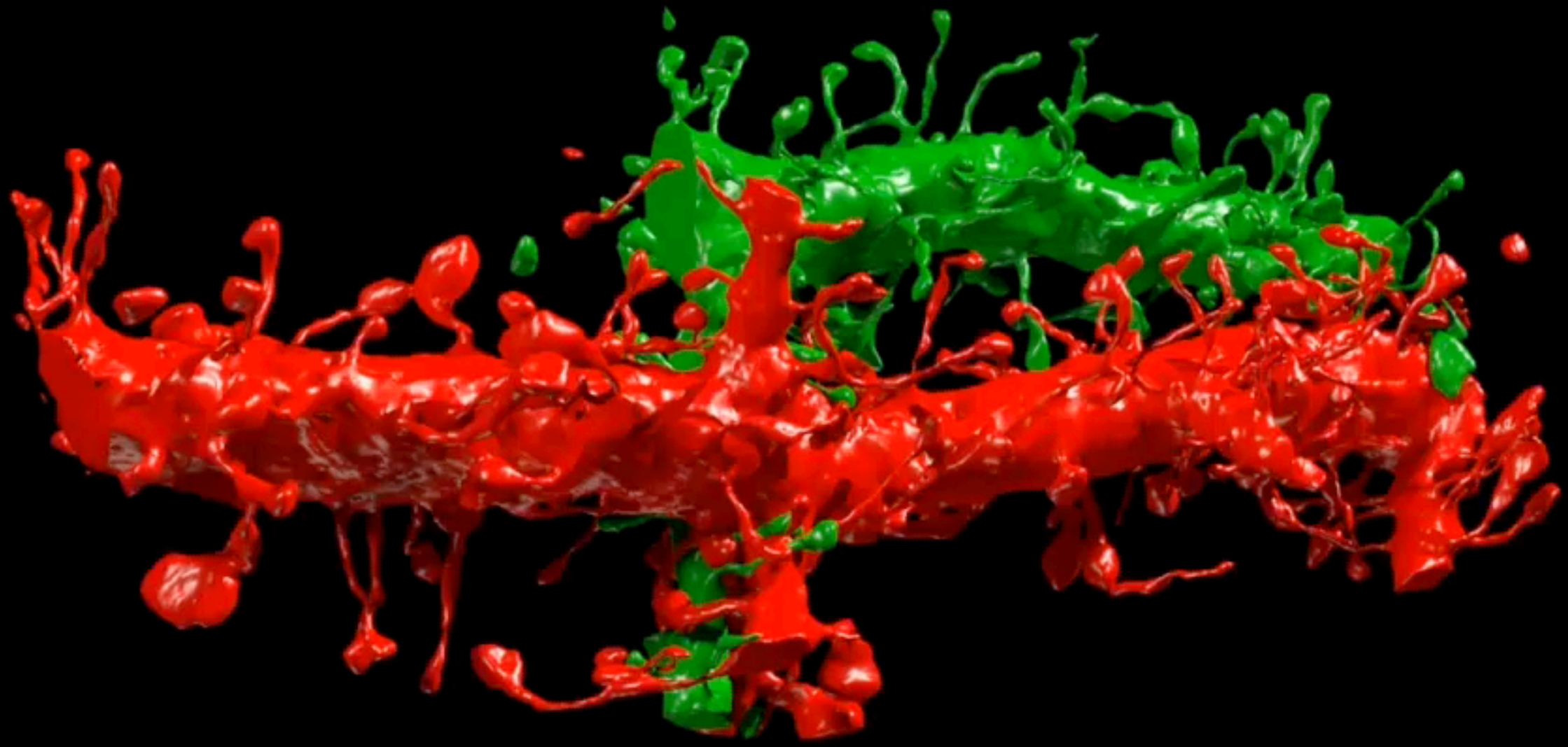
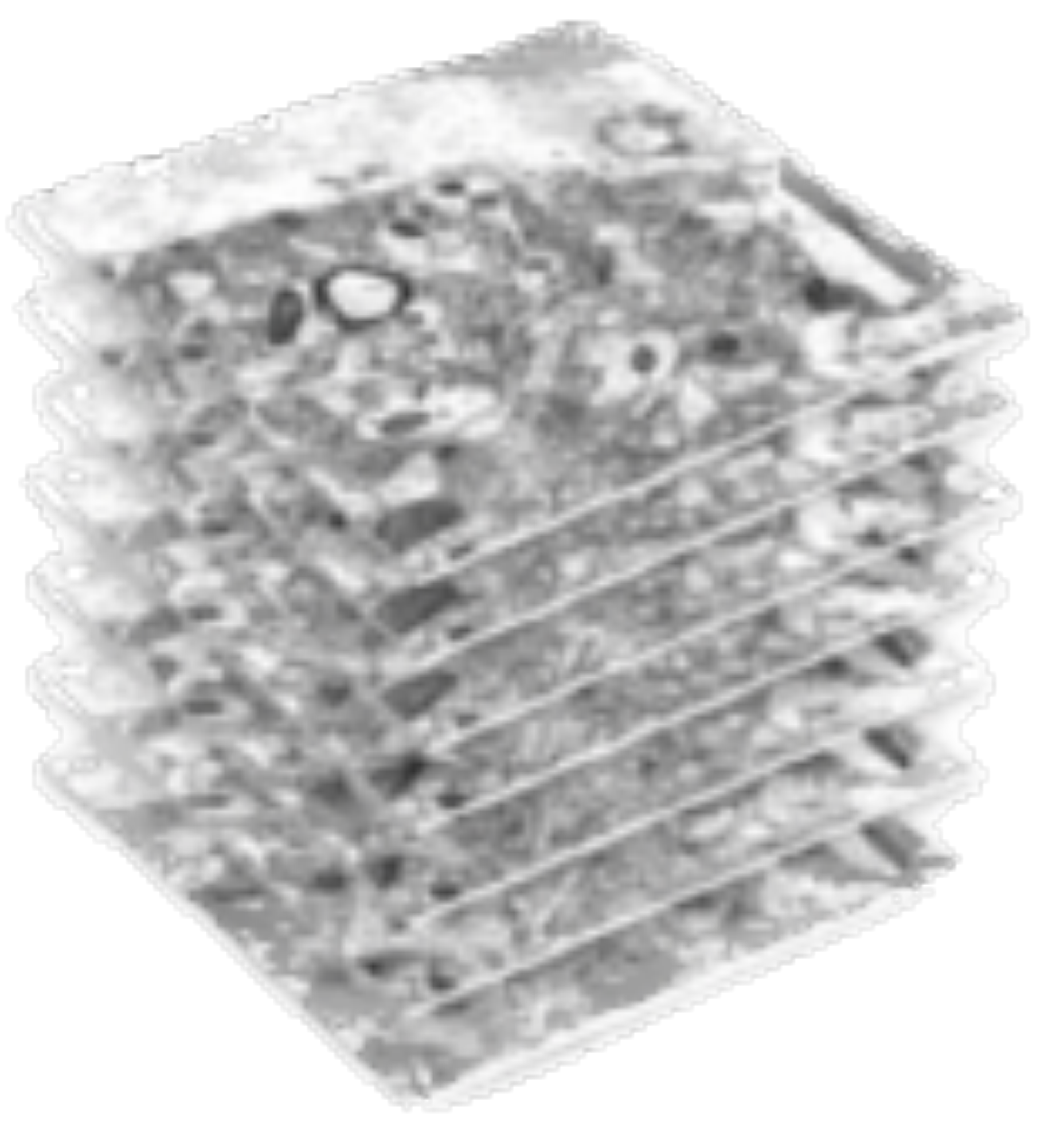
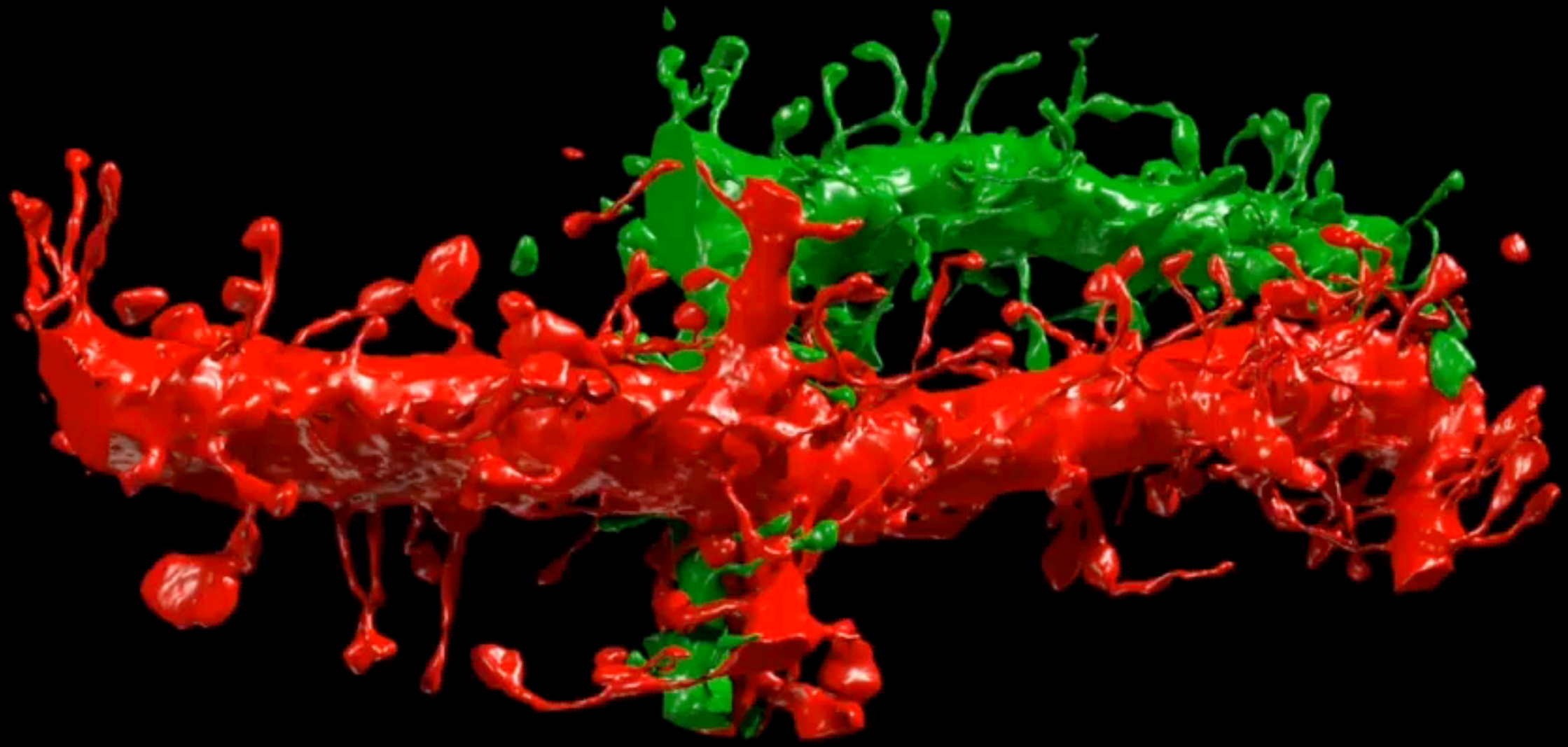


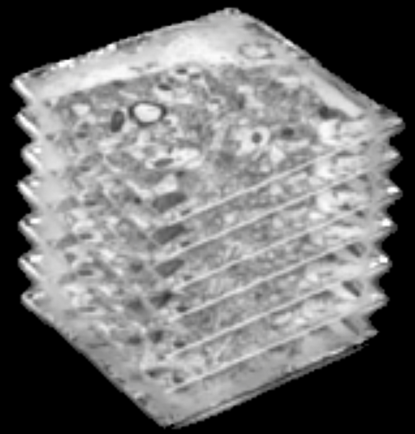
Kasthuri et al, Cell 2015



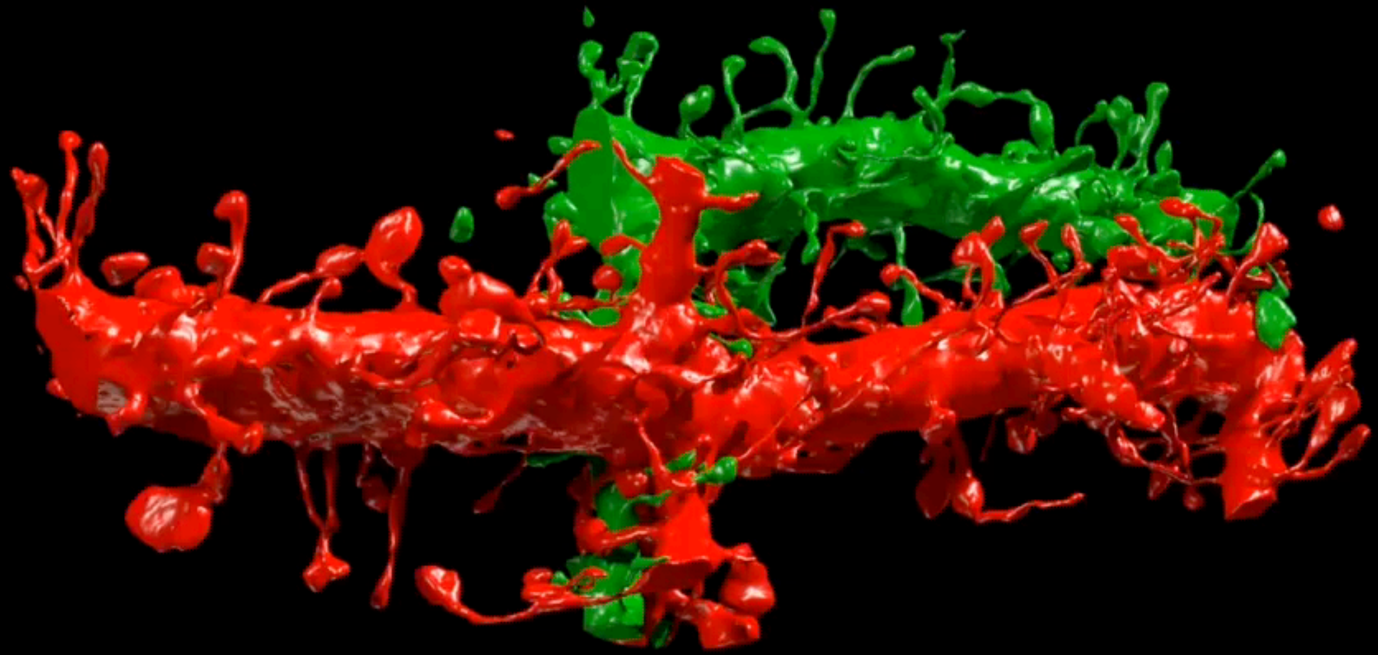


Reconstructing the Brain Connectivity

Kasthuri et al, Cell 2015

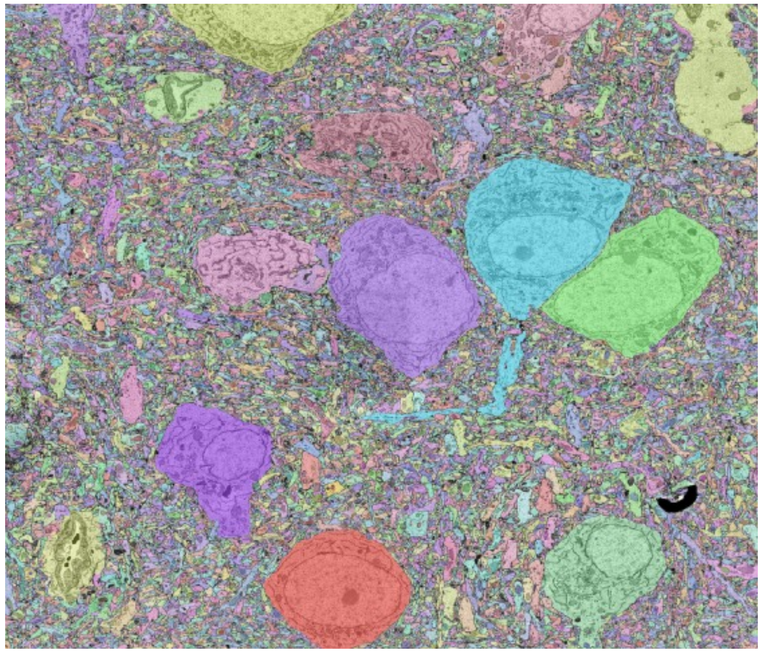


EM Images



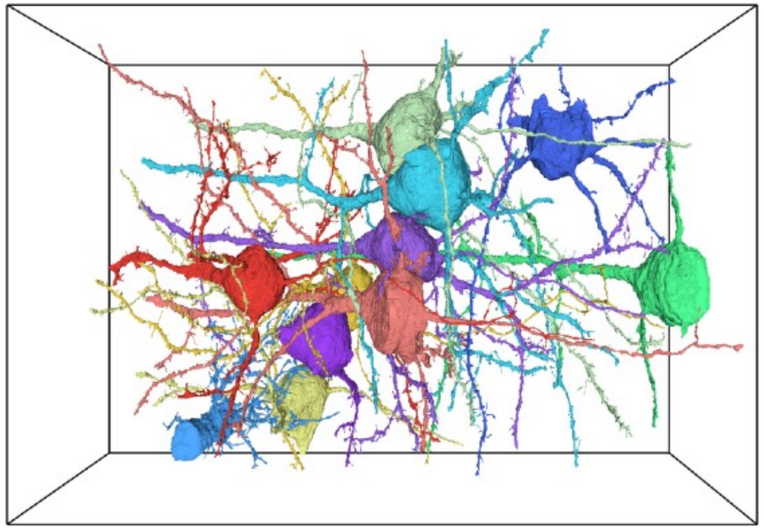
Large-Scale Reconstruction

- Inference (and training) has scaled on CPU-based and GPU-based supercomputers (parallel granularity: overlapping subvolumes)
  - –Achieved million-way concurrency on Theta supercomputer
- Image stitching and alignment components are being scaled as well to ensure a scalable end-to-end pipeline



Exascale Inference Problem:

- On a single GPU (A100), we achieve ~80 MegaVoxels/hour using 32-bit (There is still room for improvement here)
- In reduced precision (8-16 bits), we expect ~1 GigaVoxel/hour per GPU
- 1 PetaVoxel (1mm^3) will take ~1M GPU node hours
- Approximately, **24 hours on a system with 50K GPUs** (considering overlapping sub-volumes)
- For a mouse brain (1cm^3), 1 ExaVoxel, we would need **~3 years on an exascale system**



Dong, et al, “Scaling Distributed Training of Flood-Filling Networks on HPC Infrastructure for Brain Mapping”, 2019 IEEE/ACM Third Workshop on Deep Learning on Supercomputers (DLS) at SC19

Vescovi, et al, “Toward an Automated HPC Pipeline for Processing Large Scale Electron Microscopy Data”, 2020 IEEE/ACM 2nd Annual Workshop on Extreme-scale Experiment-in-the-Loop Computing (XLOOP) at SC19