WormGUIDES: an Interactive Informatic Developmental Atlas at Subcellular Resolution

Anthony Santella[1], Daniel Colón Ramos[2], Hari Shroff[3], Zhirong Bao[1], William A. Mohler[4]

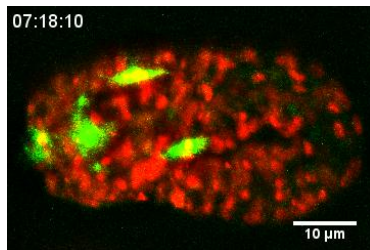1 Developmental Biology Program, Sloan Kettering Institute, 1275 York Avenue, New York, New York
2 Dept. of Cell Biology, Yale University, New Haven, CT
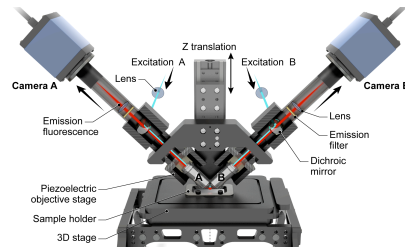3 NIBIB, NIH, Bethesda, MD.
4 Dept. of Genetics & Dev Biology & Ctr. For Cell Analysis and Modeling, UConn Health Ctr., Farmington, CT
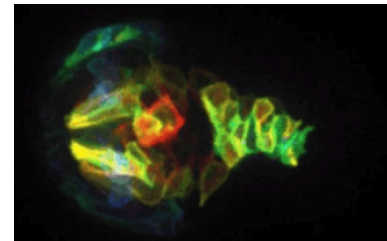
WormGUIDES Team

Neuro Development

Microscopy

Dev. Bio Computational Bio. Computer Vision

Dev. Bio Computational Bio.
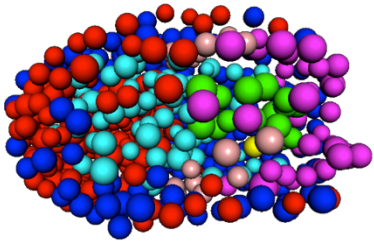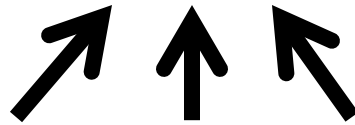

Daniel Colón Ramos
Yale Medical School

Hari Shroff
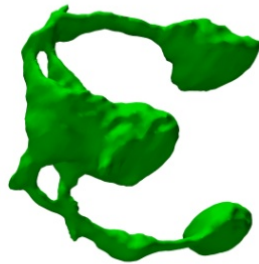*NIBIB*

Zhirong Bao
Sloan Kettering Inst.

Bill Mohler
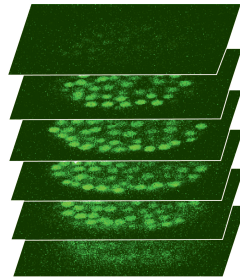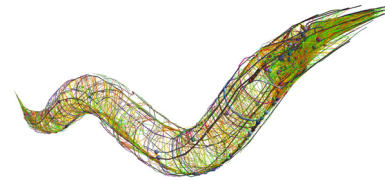*UConn Health Ctr.*
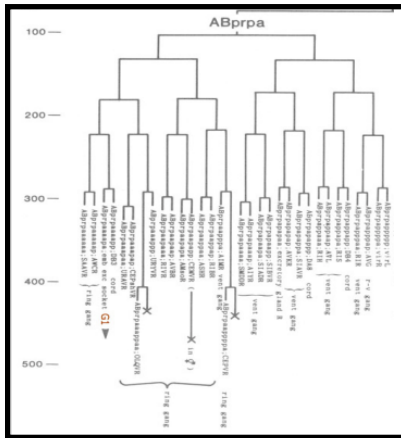
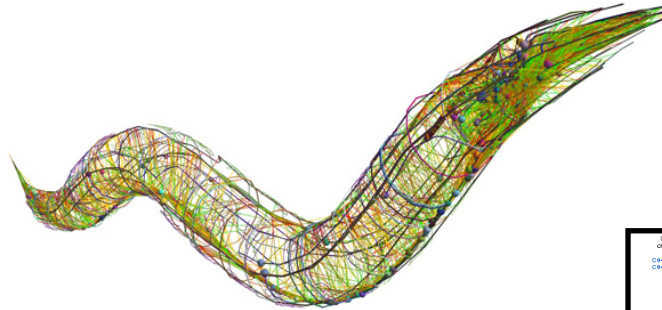Nuclear positions   neural morphology   image data   wiring diagram   annotation
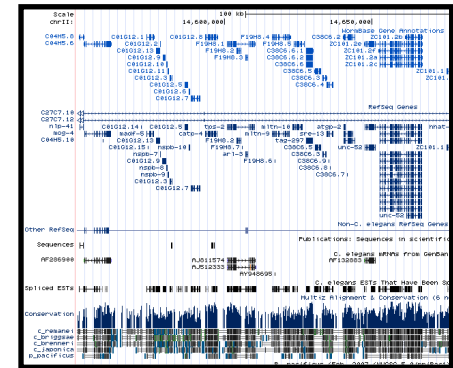
Motivation

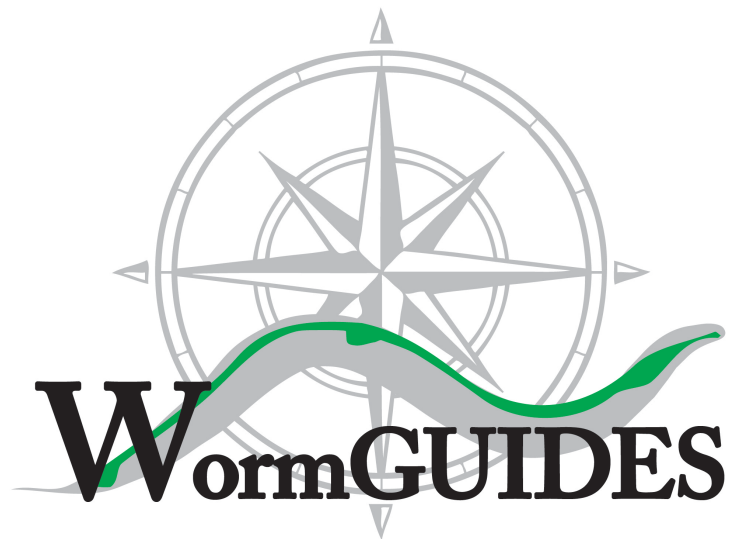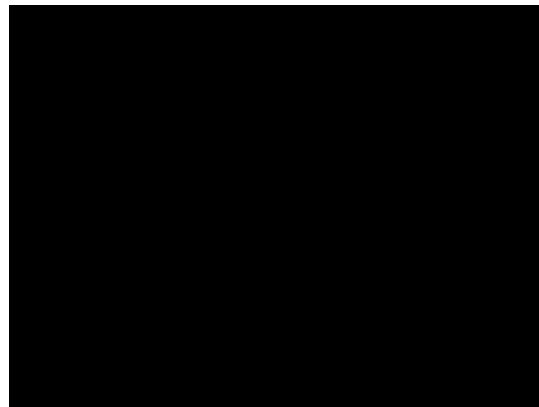*Cornerstones of*
C. elegans Research:
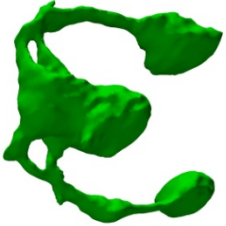

LINEAGE

ANATOMY/
WIRING

GENOME

OBSERVABLE DEVELOPMENT

WormGUIDES

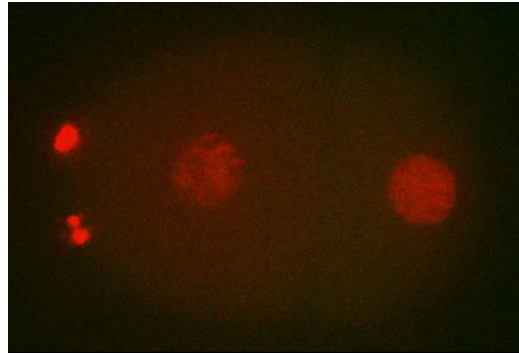Starrynite
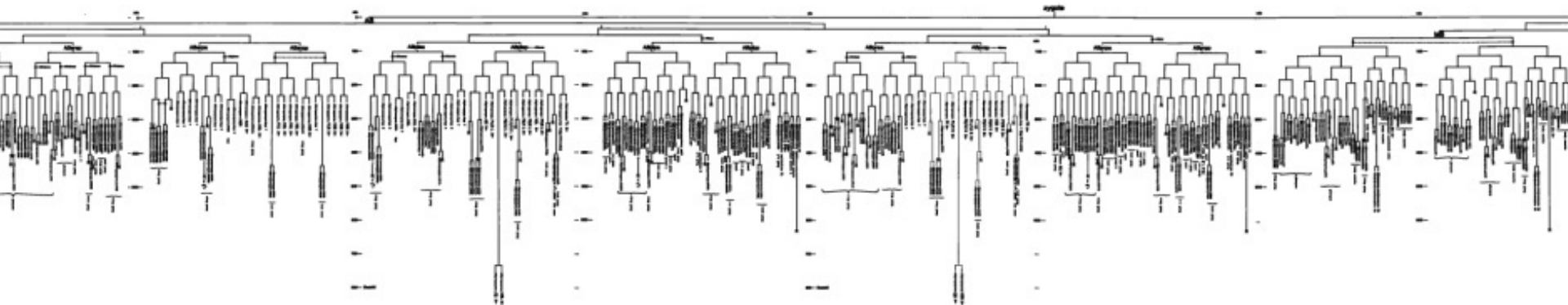Cell tracking

Neural segmentation

Computer Vision

CytoSHOW

AceTree

Visualization

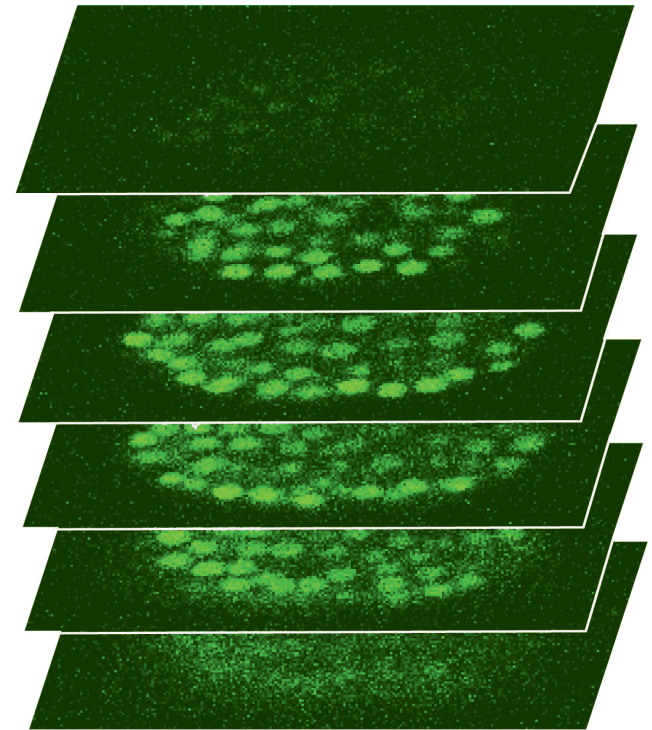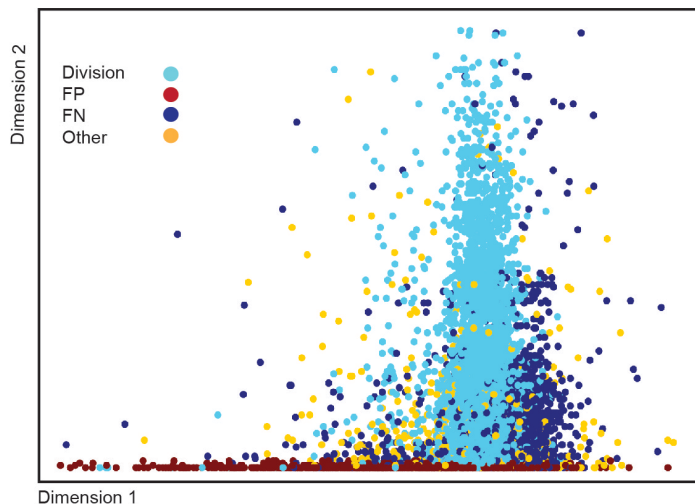# Cell Tracking

Starrynite

Bao Lab

Starrynite: Cell Tracking

Algorithmically

– Supervised learning approach to segmentation and tracking.

– Used in a dozen+ labs worldwide

– ~35k lines Matlab

http://starrynite.sourceforge.net/

A semi-local neighborhood-based framework for probabilistic cell lineage tracing
Anthony Santella, Zhuo Du and Zhirong Bao
BMC Bioinformatics 2014, 15:217

AceTree: Single Cell Analysis

- Edit
- View
  - Tracks
  - image data
  - Lineage view
  - Gene expression
- Data analysis
- Stand alone app
 - ~60k lines Java
  - Built on ImageJ, Java3D

http://starrynite.sourceforge.net/
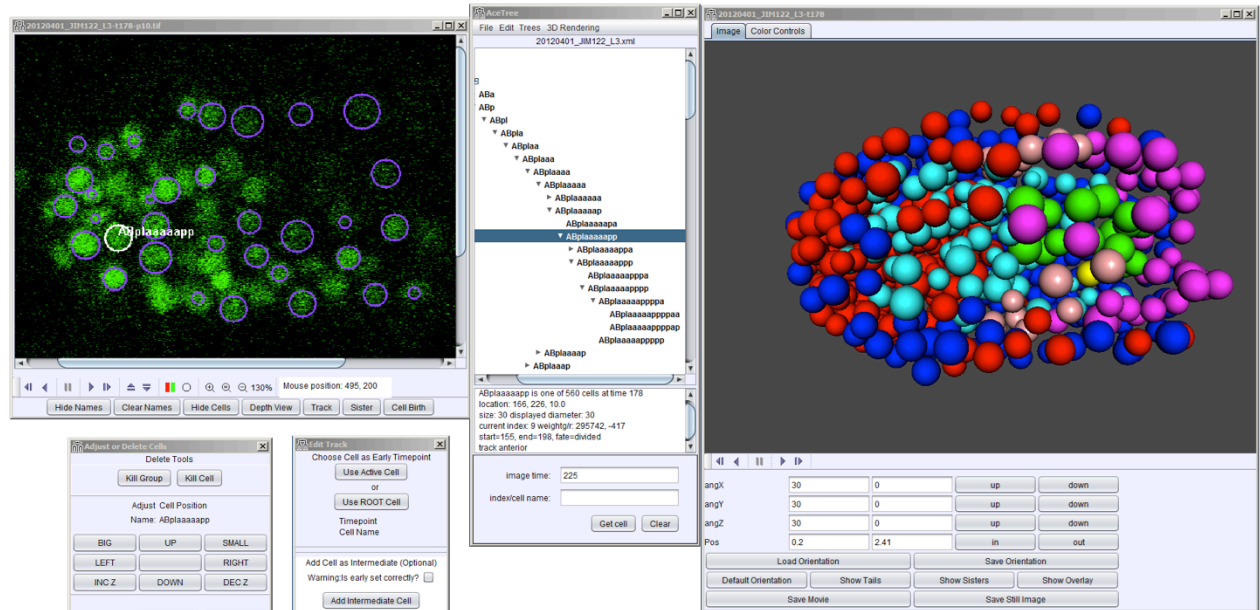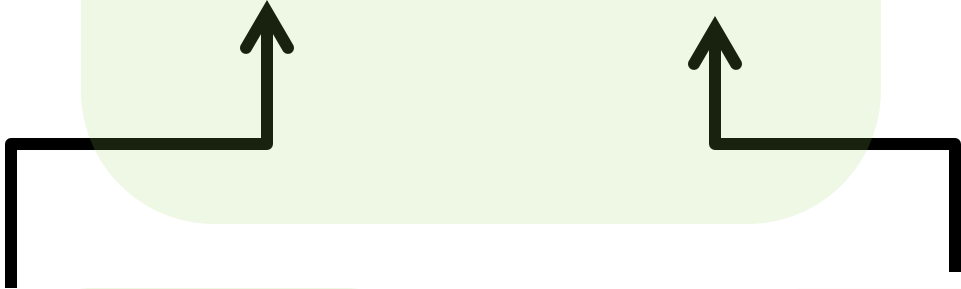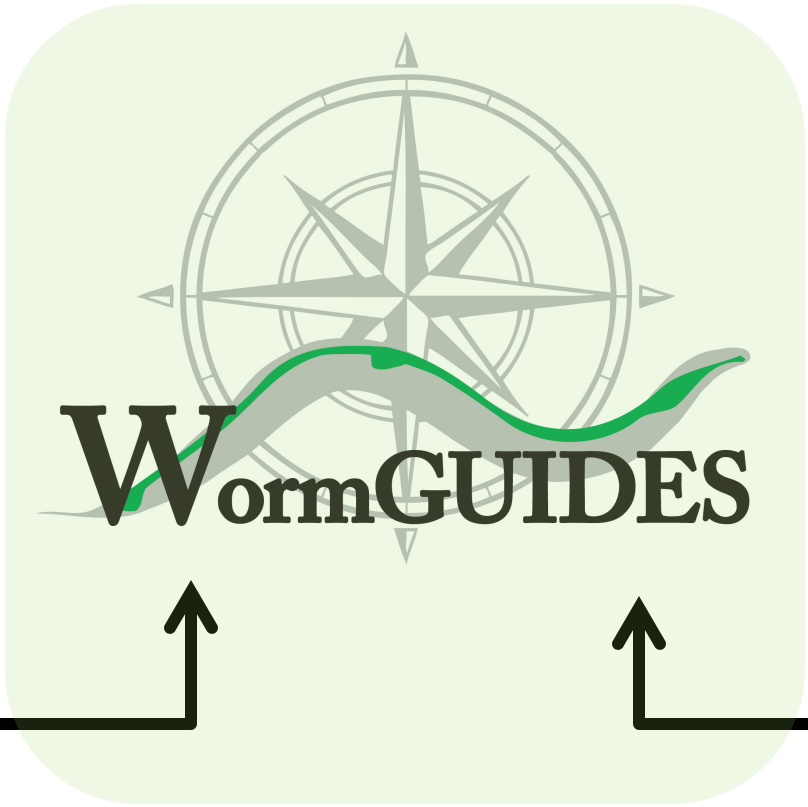
AceTree: a tool for visual analysis of Caenorhabditis elegans embryogenesis
Thomas J Boyle, Zhirong Bao, John I Murray, Carlos L Araya and Robert H Waterston*
BMC Bioinformatics 2006, 7:275
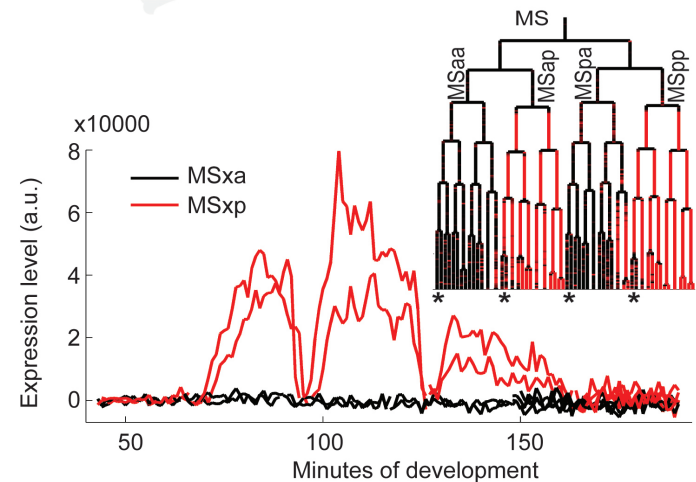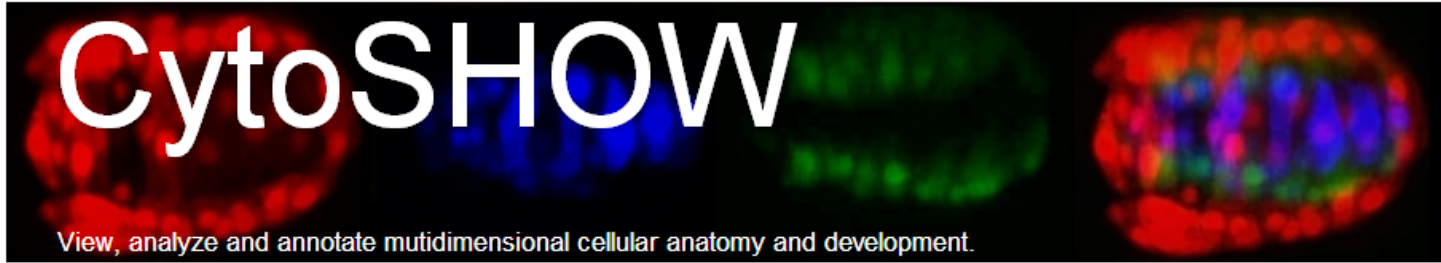
- Web launch Java app, built on top of ImageJ
www.cytoshow.org

WormGUIDES

Starrynite
Cell tracking

Neural segmentation
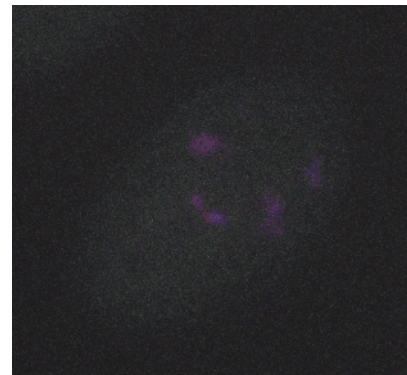
Computer Vision

CytoSHOW
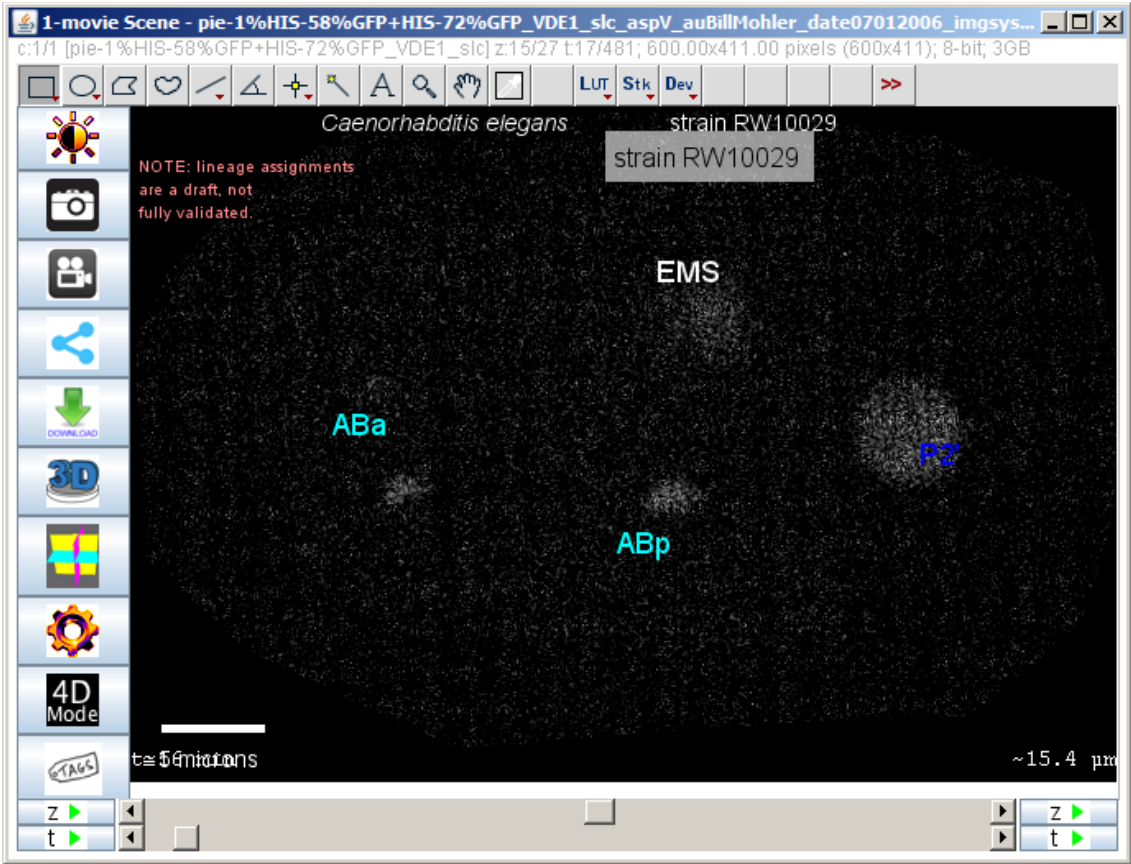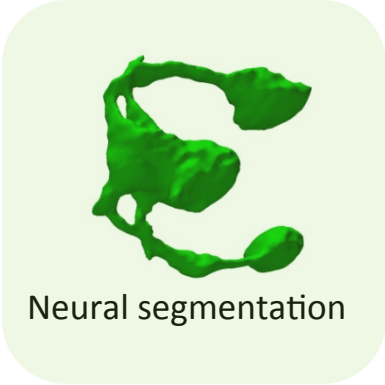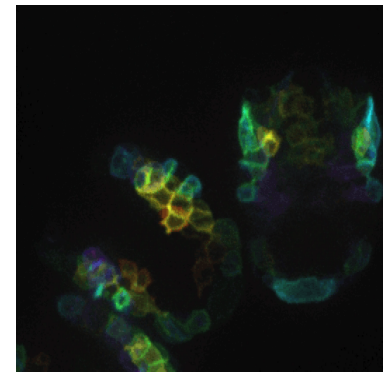
AceTree

Visualization

Long-Term Project Goal

Alignment and integration of multiple data sets in unified multi-layer virtual environment.
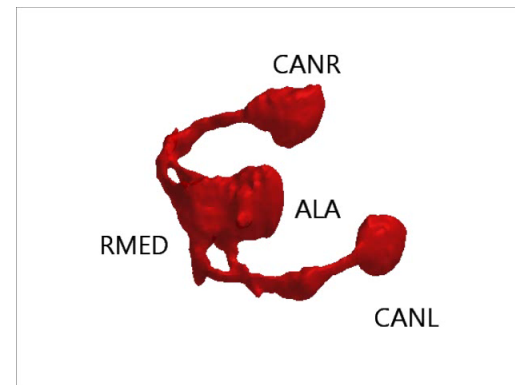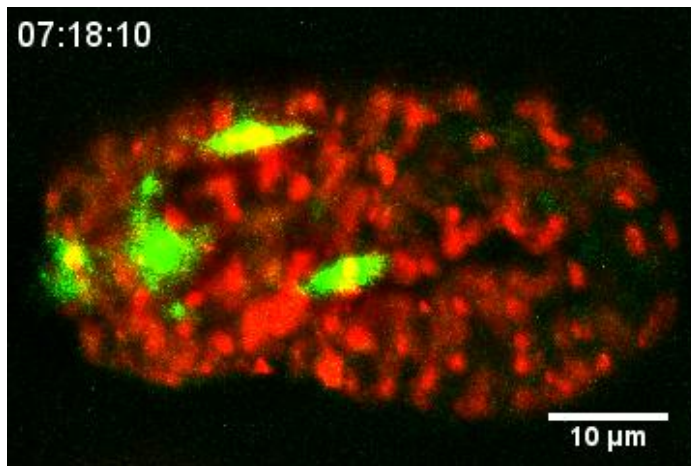
– Neurons from different strains

– Aligned using nuclei

lim-4

irx-1

WormGUIDES Mobile app
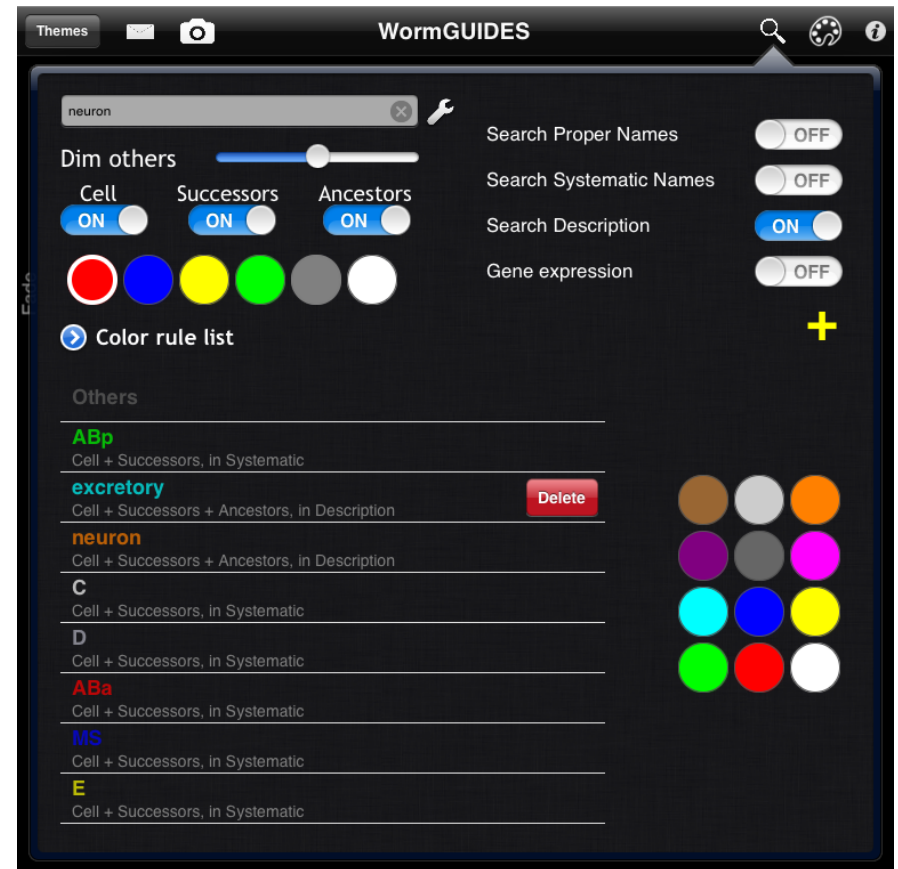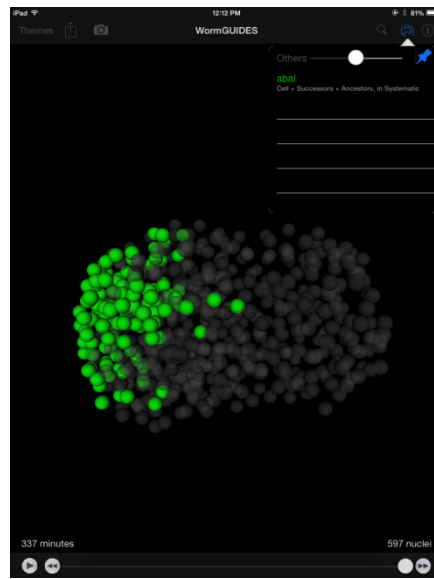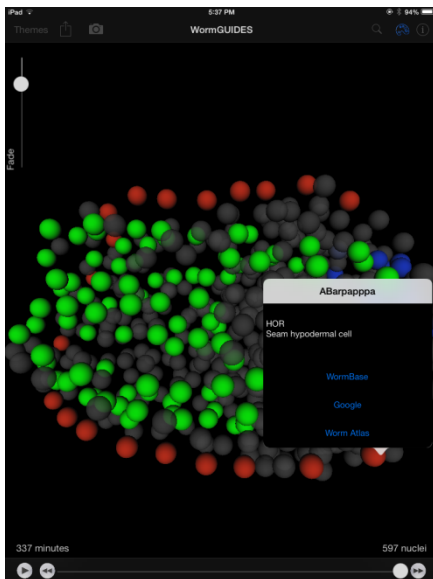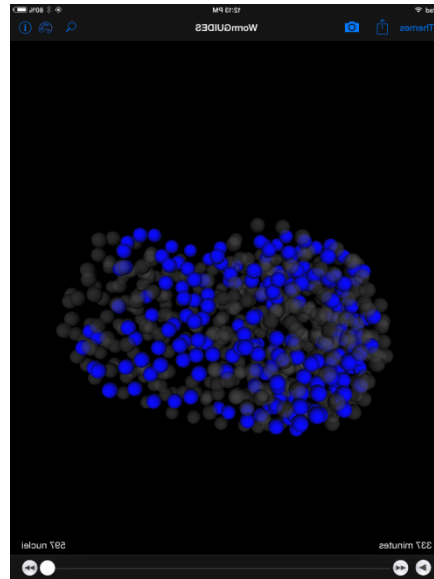
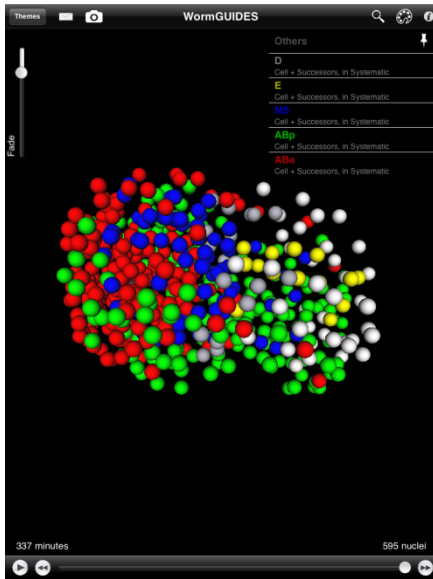C. elegans anatomy nuclear positions

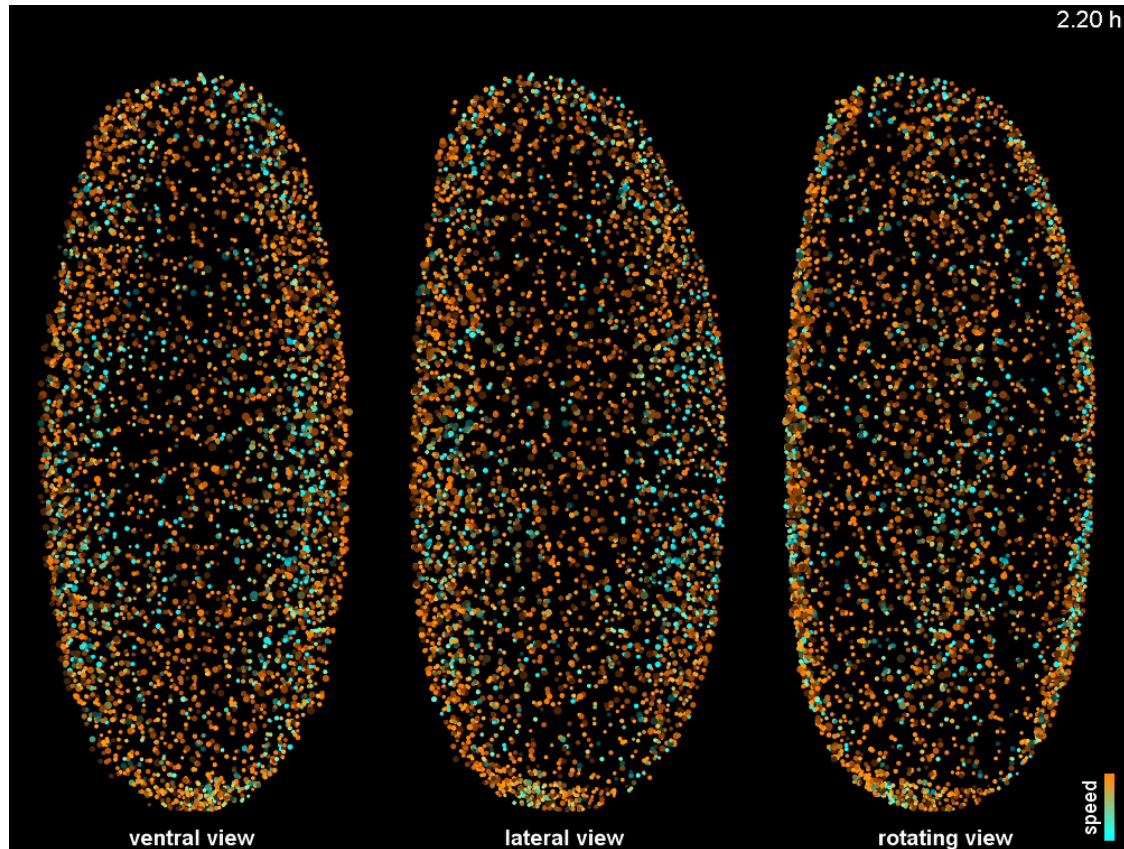Available for
- Android
- iOS
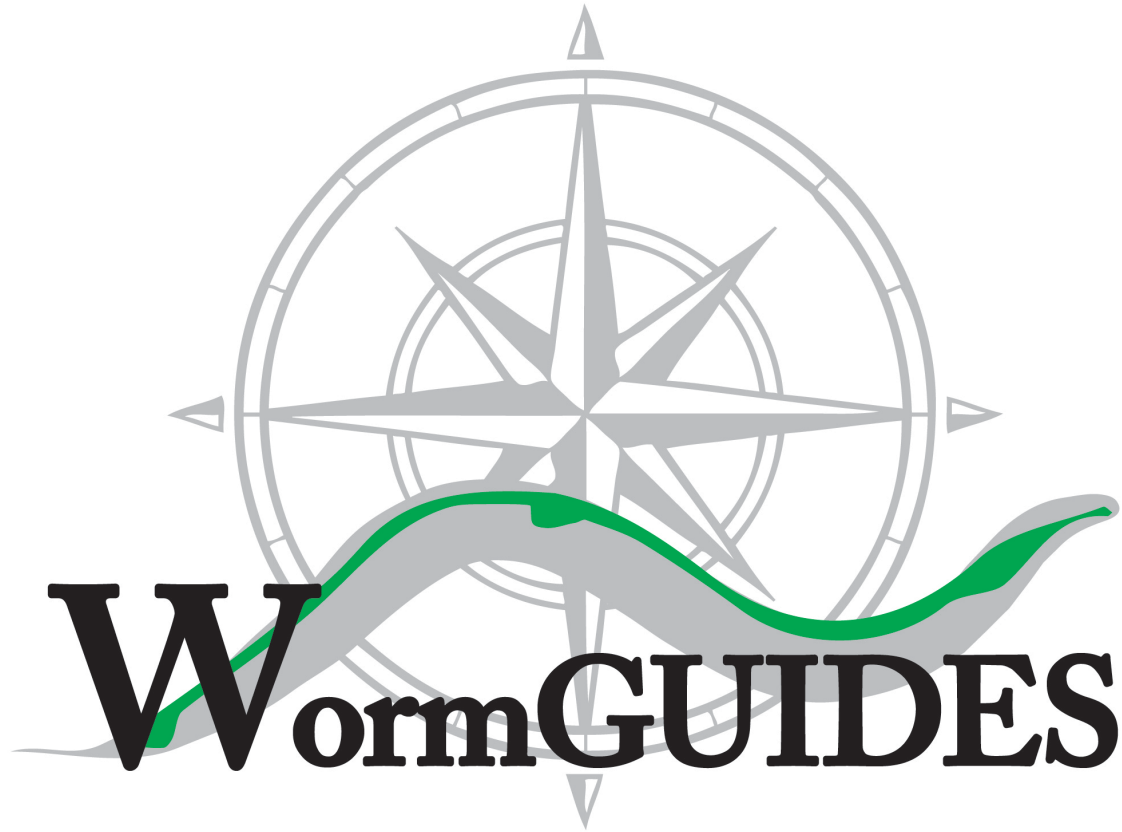
www.wormguides.org

WormGUIDES app

Futures

Starrynite reconstruction of drosophila development

P. J. Keller, A. D. Schmidt, A. Santella, K. Khairy, Z. Bao, J. Wittbrodt and E. H. K. Stelzer, "Fast, high-contrast imaging of animal development with scanned light sheet-based structured-illumination microscopy" Nature Methods 2010, 7, pp. 637-642

Input, collaboration, contributions welcome!

www.wormguides.org
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