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WORMATLAS

A database featuring behavioral and structural anatomy of *Caenorhabditis elegans*

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Adult ALM touch dendrite (tomography)

3D model produced from a dual-axis electron tomogram of a high pressure frozen adult nematode (wild type). Large caliber microtubules are marked in purple, ribosomes in red, smooth ER in yellow, vesicles in blue, ALM plasma membrane in green, and hypodermal membrane in brown. The movie shows the annotated objects (in color) while panning through 753 steps in the z-dimension of the calculated tomogram (cf. O'Toole and Muller-Reichert, 2009). The total depth in z is about one micron. No microtubules reach an endpoint within the stack. This is perhaps the first demonstration of ribosomes within an ALM dendrite (cf. Rolls et al., 2002). Electron microscopy by KD Derr, using Technai 20 TEM at NYSBC. Tomogram production using ProtoMo by Bill Rice. Annotation by Kristin A. Politi, using IMOD. Rendering and animation by Chris Crocker and Kevin Fisher, using Amira.



MVB in *C. elegans* (tomography)

3D model produced from a dual-axis electron tomogram of a high pressure frozen adult nematode (wild type). The multivesicular body in lateral hyp7 shows internal vesicles in pink, outer membrane shell in orange, ribosomes in red, microtubules in green, and hypodermal plasma membrane in yellow. The movie combines the annotated objects (in color) with several pans through about 100 steps in the z-dimension of the calculated tomogram (cf. O'Toole and Muller-Reichert, 2009). The total depth in z is about 100 nm. Electron microscopy by KD Derr, using Technai 20 TEM at NYSBC. Tomogram production using ProtoMo by Bill Rice. Annotation by Kristin A. Politi, using IMOD. Rendering and animation by Chris Crocker and Kevin Fisher, using Amira.



Serial block-face imaging of *C. elegans* midbody

Serial block-face imaging using the "3View" ultramicrotome inside a scanning electron microscope chamber (SBFSEM) has been used to produce a movie travelling through the midbody of an adult *C. elegans*. We thank Joel Mancuso at Gatan for providing this movie to WormAtlas. On the WormAtlas [methods](#) pages, we offer advice on how to best prepare nematode tissues for [block-face imaging](#).



FIB/SEM movie of L1 nerve ring

Wild type L1 head was milled in 10 nm steps through a portion of the nerve ring. The animal is rotated so that ventral axis is to the upper left corner. The first image begins in the retrovesicular ganglion, and the movie proceeds anteriorly through the entire nerve ring. Tissue was fixed using an OTO protocol by Ken Nguyen, and images were acquired on the FEI Helios FIB/SEM microscope at the New York Structural Biology Center by Dr. William Rice. For more details see [FIB/SEM methods](#) page.



Bird's eye view of *C. elegans*

Scanning EM movie showing the outside of the hermaphrodite body. Movie by Adam Hartley and Carolyn Marks. See [Hermaphrodite Introduction](#).



3-D reconstruction of pharyngeal gland cells

3-D movie was created from confocal images of a strain expressing the GFP marker linked to the promoter for [B0260.7](#) using Zeiss LSM 5 Pascal software v. 3.2. (Image source: R. Newbury and D. Moerman.) See [Alimentary System - Pharynx](#).



3-D reconstruction of how VPI cells stack

Three-dimensional rendition of the VPI cells based on tracings from serial TEMs. (Image source: B. Henick and A. Hartley, based on MRC series.) Each cell is given a unique color. Colors do not follow the [WormAtlas color code](#). See [Alimentary System - Pharynx](#).



3-D reconstruction of head muscles and muscle arms

P3-D movie was created from confocal images of a strain expressing the GFP marker linked to the promoter for [W05E10.4](#) using Zeiss LSM 5 Pascal software v. 3.2. (Image source: R. Newbury and D. Moerman.) See [Muscle System - Introduction](#).



Interdigitation of neck muscle arms

Illustrations are reconstructions made from tracings of serial section TEMs (by Tylon Stephey) of neck muscles (based on [MRC] N2U series) (Liu et al., 2007). Reconstruction was created by Huawei Weng using Imaris software. See [Muscle System - Introduction](#).



3-D reconstruction of (L) stomatointestinal muscle cell

3-D movie was created from confocal images of a strain expressing the GFP marker linked to the promoter for [D1081.2](#) using Zeiss LSM 5 Pascal software v. 3. (Image source: R. Newbury and D. Moerman.) See [Muscle System - Nonstriated](#).



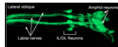
3-D reconstruction of posterior arcade cells

3-D movie was created from confocal images of a strain expressing the GFP marker linked to the promoter for [C08C3.2](#) using Zeiss LSM 5 Pascal software v. 3.2. (Image source: R. Newbury and D. Moerman.) See [Epithelial System - Interfacial Cells](#).



3-D reconstruction of excretory gland cells

3-D movie was created from confocal images of a strain expressing the GFP marker linked to the promoter for [B0403.4 \[dpy-5\(e907\) X:sis 13607 \[rCes B0403.4::GFP + pCeh361\]\]](#), using Zeiss LSM 5 Pascal software v. 3.2. (Image source: R. Newbury and D. Moerman.) See [Excretory System](#).



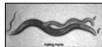
3-D reconstruction of amphid and labial nerves

(Imaging by R. Newbury and Moerman lab.) See [Neuronal Support Cells](#).



Animation of hermaphrodite gonadogenesis

Click on animation to open movie. Press "Play" to start, "Pause" to stop or click boxes to view specific stages. Yellow, germ nuclei; Red, DTC nuclei; Purple, other early somatic cell nuclei. As germline development proceeds, mitotic nuclei remain yellow, while green represents meiotic stages (light green for early stages (leptotene and zygotene) and darker for later stages (pachytene)). Blue, spermatocytes; Dark Blue, mature sperm; Pink, oocytes. (note: one gonad arm is depicted but the other develops in the same way). (Image source: E. J. Hubbard, Animation by Rob Stupay © 2003.) See [Hermaphrodite Reproductive System - Germline](#).



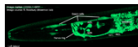
Male copulating with a hermaphrodite

Light microscopy image of a male copulating with a hermaphrodite. See [Male Introduction](#) and [Male Muscle Overview](#).



Movie of spicule muscle contraction

Periodic vs Prolonged Spicule Muscle Contraction (Image source: L. Rene Garcia.) See [Male-Specific Muscle System and Spicules](#).



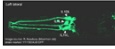
3-D reconstruction of AIZ neuron

See [Individual Neurons - AIZ](#).



3-D reconstruction of ASE neuron

See [Individual Neurons - ASE](#).



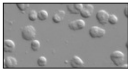
3-D reconstruction of IL1 neuron

See [Individual Neurons - IL1](#).



Crawling sperm

Video shows *C. elegans* sperm crawling via its pseudopod. Note that the pseudopod, on the right, moves forward bringing the cell body of the sperm with it.



Many crawling sperm

Video shows many *C. elegans* sperm crawling around.



Treadmilling sperm

Video shows how unlike most sperm cells, which swim with a flagellum, nematode sperm crawl with a pseudopod.



Spermiogenesis

Video shows spermatids undergoing spermiogenesis on a microscope slide in response to a chemical that was added to them.



Dividing spermatocytes

Video shows two secondary spermatocytes video undergo the second meiotic division to form four haploid (i.e. having only one copy of each chromosome) spermatids.

More Movies:

[Goldstein Lab](#)

[Mohler Lab](#)

[Chin-Sang Lab](#)

