

# Movies of Crayfish Abdominal Ganglia

by

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These three movies can be viewed using QuickTime. They are set to loop continually front-to-back-to-front, but the viewer (you) can interrupt this flow at any point to use the pointer at the bottom of the Quicktime screen to move to a particular section or to move at a controlled rate through any series of sections. We suggest that you maximize the Quicktime screen (click □ in the upper right corner) so that the images will fit on your screen. Slow computers with restricted memory may not display every image when the movies first are loading; in that case, pause the movie and use the pointer at the bottom to move through the images.

These movies were made from three sets of serial sections of ganglia from the crayfish *Pacifastacus leniusculus*. These sections were cut at 10 μm thickness from ganglia that had been stained with osmium ethylgallate and then embedded in plastic (Leise and Mulloney, 1986). Each section was photographed using a Nikon Eclipse microscope equipped with a 10x / 0.30 NA planapochromatic objective and a Quantix Eurocam 6301 digital camera. This camera produced a 3072 × 2048 pixel 16 bit image of each section. Each image was then processed in Photoshop to correct irregularities in illumination and to improve contrast (details below).

The sections in these movies were cut in each of the three cardinal planes: frontal (from dorsal to ventral), sagittal (from left to right), and transverse (from anterior to posterior).

Name	Size	Date
frontal2003.mov	13,493,616 kB	07-Apr-2003
sagittal2003.mov	14,054,951 kB	03-Apr-2003
transverse2003.mov	16,281,377 kB	02-Apr-2003

In each movie, each section has been oriented, aligned, and numbered in the order in which it was cut so the viewer can keep track of the spatial relations of structures. There are some gaps in the lists of number; these gaps occur whenever a section was lost in the original series. Some sections are folded; there is nothing we can do about these folds. Some sections are incomplete; these occur where the block or the knife was reoriented during sectioning.

In each movie, the major tracts, commissures, and neuropils of these ganglia have been labeled with the nomenclature introduced by Skinner (1985ab). These features are homologous with those in segmental ganglia of insects (Mulloney et al. 2003).

Digital processing of individual images: Each section was mounted in order in one cell of an array on a standard glass microscope slide; 21 sections per slide. The microscope was tuned for Koehler illumination, the exposure times were about 0.4 sec, and each series was taken in one session.

In addition to the 21 images of sections from each slide, a 22<sup>nd</sup> image of a blank field was taken for each slide. To eliminate irregularities in illumination, this blank image was digitally inverted (pixel by pixel), then added to each of the images from that slide using the “Images/Calculations/Add” function in Photoshop. Finally, the contrast of each of these images was increased to the same extent.

Once the stack of images was ready, the largest section was aligned in Photoshop, and its neighbors were then aligned by eye using it as a reference. Each aligned section then acted as the reference for its neighbor as we worked through the stack. Each aligned image was cropped to the dimensions of the largest image, and remaining junk outside the section was removed. At this point, we added labels to selected sections. The aligned and labeled stack was then animated using PhotoShop 6.0 ImageReady, and saved as a QuickTime movie.

#### References:

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- Mulloney B, Tschuluun N, Hall WM (2003) Architectonics of crayfish ganglia. *Microscopy Res and Tech* 60: 253-265.
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I. Tracts in the ganglionic core. *J Comp Neurol* 234: 168-181.
- Skinner K (1985) The structure of the fourth abdominal ganglion of the crayfish, *Procambarus clarkii*  
II. Synaptic neuropils. *J Comp Neurol* 234: 182-191.

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