

POSTER PRESENTATION

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Integration of predictive-corrective incompressible SPH and Hodgkin-Huxley based models in the OpenWorm in silico model of *C. elegans*

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OpenWorm is an international collaboration with the aim of producing an integrative computational model of *Caenorhabditis elegans* to further the understanding of how macroscopic behaviour of the organism emerges from aggregated biophysical processes. A core component of the project involves the integration of electrophysiological modelling and predictive-corrective incompressible smoothed particle hydrodynamics (PCISPH) to model how neuronal and muscle dynamics effect the nematode's behaviour. Several tools are being utilised and developed in the course of the project:

- Electrophysiological model parameters are constrained to reproduce experimental measurements using the Optimal Neuron toolkit [1]
- A PCISPH solver is under development [2] - a combination of general PCISPH algorithms proposed by [3], boundary-handling algorithms proposed by [4], a surface tension model based on [5] and our own implementation of elastic matter and biophysics-specific features, as well as parallelization, optimization and tuning. It is the first open source, parallel OpenCL/C++ PCISPH high-performance implementation.
- A generic model integration framework (Gepetto [6]) will be used to integrate electrophysiology and body-wall interactions
- All electrophysiological models are NeuroML-compatible [7].

- The Open Worm Browser provides a powerful way to visualise *C. Elegans* anatomy [8]

All of the above mentioned applications are open source, freely available and can be used for modelling other neuronal systems.

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