A Mathematical Model for the Electrophysiology of Jellyfish

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Background and Aims

- Jellyfish have one of the simplest nervous systems
- Nervous system consists of nerve nets, which control the swimming muscles
- Symmetrically distributed pacemakers initiate signals in the nerve nets
- Pacemaker cells interact and tend to synchronize
- Equations that describe neurons and pacemakers are unified in this model to capture the principal features of jellyfish electrophysiology

Diagram of model with the motor nerve net as a circle interacting with 4 pacemakers
Results

With suitable parameters, pacemakers synchronize:

![Graphs showing travelling action potential and all pacemakers being synchronized at different time points.]

Travelling action potential

All pacemakers are synchronized

This model presents a plausible mode of communication between pacemaker cells. Accurate mathematical models of pacemakers may have useful medical applications in fields such as cardiology and neuroscience.