Abstract Submitted
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Co-existence of silent and oscillatory regimes of a single neuron's activity TATIANA MALASCHENKO, Georgia State University, ANDREY SHILNIKOV, Dept. of Mathematics and Statistics, Georgia State University, GENNADY CYMBALYU, Dept. of Physics and Astronomy, Georgia State University — Bursting, tonic spiking, sub-threshold oscillations and silence are basic robust regimes of activity of a single neuron. A model of a leech heart interneuron demonstrates three different types of co-existence: (1) silence and bursting, (2) silence and tonic spiking, and (3) silence and sub-threshold oscillations. We show that these types of co-existence can be explicated by the unstable sub-threshold oscillations (USTO) separating silence and an oscillatory regime and setting the threshold between them. The range of parameters, where the co-existence is observed, is determined by the critical values at which the USTO appear and disappear. More precisely, the USTO occur through the sub-critical Andronov-Hopf bifurcation, where the rest state loses stability. Then, the USTO disappear on the homoclinic bifurcation near which the oscillatory regime disappears as a regime. The bifurcation values are calculated and shown to match the empirical transition values found in numerical experiments in Cymbalyuk et al., 2002.

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