1154-91-2429 **Elizabeth Tripp*** (elizabeth.a.tripp.gr@dartmouth.edu), Department of Mathematics, 27 North Main Street, Dartmouth College, Hanover, NH 03755, and **Feng Fu** and **Scott Pauls**.
Evolutionary Kuramoto Dynamics. Preliminary report.

Understanding the synchronization of systems of coupled oscillators has a rich history in the study of dynamical systems and applications in numerous fields, where decades of work have demonstrated the complex interplay between the properties of these systems and the oscillators' ability to synchronize. We bring the tools of evolutionary game theory (EGT) to the study of coupled oscillatory systems, with the neurons of the suprachiasmatic nucleus as a motivating example. We cast the oscillatory system as a collection of agents, one for each oscillator, that play a game with one another where the payoffs are based on their phases. We find that even one of the simplest models of these systems yields a rich diversity of outcomes linked to classical games - the prisoner's dilemma, the snowdrift game, etc. - based on the relative costs and benefits of synchronization in the organism. Within this complexity lies a simplicity as well, as we consistently find a simple condition, under various assumptions, between the cost and benefit parameters which leads to the overall synchronization within the population of agents. This simple framework opens the door to a plethora of mathematical and biological questions for future study. (Received September 17, 2019)