Abstract Submitted
for the MAR16 Meeting of
The American Physical Society

Influence of the Enteric Nervous System on Gut Motility Patterns in Zebrafish[1] RYAN BAKER, Dept of Physics, Univ of Oregon, JULIA GANZ, ELLIE MELANCON, JUDITH EISEN, Institute of Neuroscience, University of Oregon, RAGHUVEER PARTHASARATHY, Department of Physics, University of Oregon — The enteric nervous system (ENS), composed of diverse neuronal subtypes and glia, regulates essential gut functions including motility, secretion, and homeostasis. In humans and animals, decreased numbers of enteric neurons lead to a variety of types of gut dysfunction. However, surprisingly little is known about how the number, position, or subtype of enteric neurons affect the regulation of gut peristalsis, due to the lack of good model systems and the lack of tools for the quantitative characterization of gut motion. We have therefore developed a method of quantitative spatiotemporal mapping using differential interference contrast microscopy and particle image velocimetry, and have applied this to investigate intestinal dynamics in normal and mutant larval zebrafish. From movies of gut motility, we obtain a velocity vector field representative of gut motion, from which we can quantify parameters relating to gut peristalsis such as frequency, wave speed, deformation amplitudes, wave duration, and non-linearity of waves. We show that mutants with reduced neuron number have contractions that are more regular in time and reduced in amplitude compared to wild-type (normal) fish. We also show that feeding fish before their yolk is consumed leads to stronger motility patterns.

[1]We acknowledge support from NIH awards P50 GM098911 and P01 HD022486

Ryan Baker
Department of Physics, University of Oregon

Date submitted: 06 Nov 2015 Electronic form version 1.4