Abstract Submitted
for the MAR17 Meeting of
The American Physical Society

Period doubling bifurcation in the zebrafish heart[1] JAMES FARMER, CONNER HERNDON, ILIJA UZELAC, FLAVIO FENTON, Georgia Inst of Tech — The study of voltage and calcium alternans in electrocardiology has vast implications in the medical field. By analyzing the bifurcations of restitution curves, we may be able to better understand the path that leads a heart into fibrillation. Zebrafish are becoming a valuable model organism for scientific research as it has many characteristics that make it useful for studying human genetics and disease. In this case, a period two bifurcation when paced at high rates. In this talk we present experimental and theoretical results for this bifurcation. We record zebrafish voltage and calcium signals via optical mapping at high spatiotemporal resolution with JPW-6003 and Rhod-2 ratiometric dyes for voltage and calcium, respectively. We find that: (1) alternans (period two) are present at pacing cycles in the range of 250ms to 150ms; (2) that alternans are enhanced when calcium is strongly reduced, indicating that the bifurcation is driven by voltage; and (3) experimental results can be reproduced by a one dimensional map model of a restitution function.

[1]Georgia Tech's PURA and NSF grant 1028261

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Date submitted: 11 Nov 2016 Electronic form version 1.4