North Carolina State University
Chancellor's Faculty Excellence Program
"Modeling the Living Embryo" Cluster presents:

Paul François

Associate Professor of Physics, McGill University
(https://www.mcgill.ca/francois-group/)

"Clock, waves, evolution: physics of vertebrae patterning"

November 10th, 2020 @ 11 am

Zoom link: **https://ncsu.zoom.us/j/98433536887?pwd=Skp4UmxUbllXaHZ6SEJiYVR4RkFEdz09**

The vertebrate body plan is first built on metameric units called somites, appearing during embryonic development in parallel to tail bud elongation. Oscillatory gene expressions in the tail initiate waves of genetic expression propagating from posterior to anterior. Those waves stabilize into spatial patterns defining somites. In this talk, I will discuss how dynamical system theory can be used in a predictive way to understand this process. I will first describe how unsupervised evolutionary algorithms naturally recover the fundamental dynamical modules driving this system, namely bistability and oscillations. Then, I will discuss experimental data acquired with our collaborators, quantifying the dynamics and shapes of the wave profile. Based on this, I will argue that oscillations disappear in a characteristic way, that can be naturally explained by a geometric transition (technically an emerging SNIC bifurcation, that I will describe in simple terms). I will discuss how one can distinguish experimentally between different dynamical scenarios, and will argue that our new model explains and connects many aspects of the process.