

Abstract Submitted  
for the DFD16 Meeting of  
The American Physical Society

**Outsourcing neural active control to passive composite mechanics: a tissue engineered cyborg ray.** MATTIA GAZZOLA, University of Illinois at Urbana-Champaign, SUNG JIN PARK, Harvard University, KYUNG SOO PARK, University of Michigan, SHIRLEY PARK, Stanford University, VALENTINA DI SANTO, Harvard University, KARL DEISSEROTH, Stanford University, GEORGE V. LAUDER, L. MAHADEVAN, KEVIN KIT PARKER, Harvard University — Translating the blueprint that stingrays and skates provide, we create a cyborg swimming ray capable of orchestrating adaptive maneuvering and phototactic navigation. The impossibility of replicating the neural system of batoids fish is bypassed by outsourcing algorithmic functionalities to the body composite mechanics, hence casting the active control problem into a design, passive one. We present a first step in engineering multilevel "brain-body-flow" systems that couple sensory information to motor coordination and movement, leading to behavior. This work paves the way for the development of autonomous and adaptive artificial creatures able to process multiple sensory inputs and produce complex behaviors in distributed systems and may represent a path toward soft-robotic "embodied cognition".

Mattia Gazzola  
University of Illinois at Urbana-Champaign

Date submitted: 28 Jul 2016

Electronic form version 1.4