

Bulletin of the American Physical Society**APS March Meeting 2021****Volume 66, Number 1****Monday–Friday, March 15–19, 2021; Virtual; Time Zone: Central Daylight Time, USA****Session F06: Active Materials**

11:30 AM–1:30 PM, Tuesday, March 16, 2021

Room: 06

Sponsoring Unit: DSOFT

Chair: Mario Sandoval-Espinoza, University of California, San Diego

Abstract: F06.00003 : Controlling flows of an intra-droplet active fluid across droplet interface

11:54 AM–12:06 PM Live

[← Abstract](#) [→](#)**Presenter:**

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Fluid dynamics of conventional passive fluid are known to be affected by boundary condition. For example, flow rates in a pipe depend on slipperiness of pipe surface. Similarly, active fluid, which consumes fuels locally to flow spontaneously, was reported to self-flow along a meter-long tubing with the flow rate depending on tubing geometry. However, how boundary condition influences fluid dynamics in an active fluid system remains poorly understood. Here, we investigated how a fluid boundary influenced self-organization of confined active fluid by establishing a 3D COMSOL-based nematic-hydrodynamic simulation platform where active fluid was confined in a compressed cylindrical water-in-oil droplet. Since the droplet interface was fluid, the fluid dynamics within and outside the droplet were coupled. Our simulation demonstrated that flow behaviors of intra-droplet active fluid were influenced by the amount of oil that surrounded the droplet: Without altering the droplet geometry, expanding the volume of oil could induce a circulatory flow within the droplet, which resembled our experimental observation. Our work suggested the feasibility of controlling the fluid dynamics of a confined active fluid system across a fluid interface.