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**Quasi-Steady Capillary Driven Flow in Complex Geometries**[1]
MARK WEISLOGEL, ALEX BAKER, Portland State University, DONALD PETTIT, NASA Johnson Space Center — Lubrication theory has been successfully applied to a large class of local capillary driven flows along interior corners in simple conduits of uniform cross section (i.e. right polygonal cylinders). In this work, the evolution equations governing the local corner flows are re-scaled based on global conduit geometry, and the resulting system of equations are solved analytically in the quasi-steady limit. Several important closed form solutions are obtained with applications to passive filling, draining, and phase separations at both micro and macro length scales. Simple experiments are conducted that confirm the essential assumptions of the approach. As an example of the utility of the solutions, optimal geometries are computed for a unique "large length scale" flow aboard a spacecraft—a microgravity coffee cup.

[1]NASA NNX09AP66A, Glenn Research Center

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