

Abstract Submitted
for the DFD13 Meeting of
The American Physical Society

Experimental and modeling study of global circulation by bent rod precession in low Reynolds number flows¹ ROBERTO CAMASSA, J.D. MARTINDALE, RICHARD MCLAUGHLIN, Department of Mathematics, University of North Carolina at Chapel Hill, LEANDRA VICCI, Department of Computer Science, University of North Carolina at Chapel Hill, LONGHUA ZHAO, Department of Mathematics, Case Western Reserve University, UNC JOINT FLUIDS LAB TEAM — The precessing motion of a bent rod over a plane in viscous dominated regimes can generate global fluid flow structures in the form of recirculating tori. Such motion can play an important role in the development of multicellular organisms, where primary cilia are the main agent for the embryonic forms of nutrient circulation. Results from an experimental investigation using PIV techniques to analyze the flow field will be presented and compared with a first principle theory based on slender body approximations. While good qualitative agreement can be achieved with Blake images enforcing the no-slip condition at the plane, quantitative agreement requires a more sophisticated approach, which will be outlined.

¹We acknowledge funding received from the following NSF grants: RTG DMS-0943851 and DMS-1009750.

Roberto Camassa
Department of Mathematics, University of North Carolina at Chapel Hill

Date submitted: 01 Aug 2013

Electronic form version 1.4