

# Joint COLLOQUIUM with Physics and BioEngineering

Speaker:

**VELIA M. FOWLER**

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University of Delaware

Thursday, April 23, 2020

## Red Blood Cell Membrane Architecture, Shape and Biomechanics from the Micro-to Nanoscale

The biconcave disk shape and deformability of the mammalian red blood cell (RBC) is vital for its circulatory function and relies upon a specialized cytoskeletal structure called the membrane skeleton. The membrane skeleton consists of a 2D viscoelastic network of membrane-associated actin filaments (F-actin) connected by long, flexible spectrin molecules. Previous models have proposed that elastic network properties and network linkages to transmembrane proteins are sufficient to explain RBC shapes. Recently, we discovered that RBC biconcave shape depends on the contractile activity of non-muscle myosin IIA (NMIIA). The NMIIA molecules assemble into bipolar filaments with F-actin binding motor domains at their ends that exert forces on the membrane skeleton. Inhibition of NMIIA leads to reduced filament association with the membrane, enhanced nanoscale membrane oscillations, micron-scale relaxation of the dimple and elongated shapes, and increased deformability. We are collaborating with computational biologists to examine the locations of actomyosin contractile forces and their interplay with membrane tension to determine RBC biconcave shape.

You're cordially invited to attend  
Prof. Fowler's colloquium  
at 4:25PM in Lewis Lab.. 316  
Date: 04.23.2020

Velia M. Fowler joined the University of Delaware as Professor and Chair of Department of Biological Sciences in January 2019. She received a B.A. from Oberlin College in 1974, a Ph.D. from Harvard University in 1980, and was a Jane Coffin Childs Postdoctoral Fellow at the NIH and Johns Hopkins University School of Medicine. She joined the Scripps Research Institute in 1987 and was promoted to Professor in 2000. Her research program investigates how actin dynamics and myosin contractility provide stability and exert forces to shape membrane curvature and influence cell and tissue biomechanics and physiology in red blood cells, striated muscle, and the eye lens. She has published 130 research papers, chapters and reviews, mentoring over 25 graduate students and postdoctoral fellows. Her research has been funded by investigator-initiated research grants from the NIH for over 30 years.