Improved Healthcare

Artificial Kidney

An ex vivo prototype will serve as a vehicle to investigate the fundamental engineering and scientific issues that will limit the performance of a miniaturized device for human implementation and inform its design.

New Projects

- Surface patterning to control blood delivery in biosensors
- Improved sensors for glycemic control in Type II diabetes

Complex Fluids in Microenvironments

Flow from the larger container into the smaller tube drastically reduces the number of red blood cells. This is known as the Fahreus-Linquist effect but the actual mechanism is not understood. It could be related to the high shear at the contraction which was also responsible for the particle flocculation shown below.

Particle Flocculation due to complex flow fields

Fluid Dynamics in Microenvironments

Hydrodynamics of Marine Larval Locomotion

We are using a micro-fluidic 4-Roll Mill, developed by Susan Muller, to study the response of marine larvae to shear, extensional, and rotational flows.

Directed Fluid Flow using Topographic Gradients

We are designing a droplet-actuation device that relies purely on capillary pressure gradients induced by surface topologies. Current work focuses on pillar capillary designs on a PDMS substrate and water droplets (0.25 ~ 5 μL) in low Bond number.

Flow Control using Biocompatible Polymers

Rapid Valving System using Pluronics for Micromixing

Two-Photon Microscopy for in vivo flow field measurements in cerebral capillaries in mice