

BHE-031

A New Instrument for Quantitative Investigation of Cellular Behavior

Philip LeDuc

Assistant Professor, Mechanical Engineering, Carnegie Mellon University, Pittsburgh,
PA

William Messner

Professor, Mechanical Engineering, Carnegie Mellon University, Pittsburgh, PA

Paula A. Witt-Enderby

Duquesne University, Division of Pharmaceutical Sciences, Pittsburgh, PA

Abstract

Biological cells have numerous functional parts interacting in more complex ways than any human engineered device. Investigation of the cellular functions from a formal engineering perspective thus is a daunting challenge, because of both their small size and tremendous complexity. Our work will address this challenge by developing a novel experimental system called the Microfluidic Spatiotemporal Cell Control System (MSCCS) to enable researchers to study cellular dynamics more quantitatively. The MSCCS combines microfluidics, digitally controlled electromechanical systems, microscopy, and computer vision to examine cells as dynamic systems from an input-output perspective in both short- and long-term time scales.