Abstract:
The replacement of animal testing in toxicology assays with integrated organs on a chip is a major goal of the Human Microphysiological Systems initiative. In order to readout physiological changes in these organs in real time, we have built a multianalyte microphysiometer that detects multiple analytes involved in the cellular bioenergetics simultaneously. Metabolic processes such as glycolysis, mitochondrial ATP generation, and glycogenesis are all directly related to the flux of these analytes. Temporal resolution of metabolic responses is much faster than conventional well-plate studies, leading to dynamic metabolic data. By combining all of the information contained in the multianalyte "biosignature" we can observe metabolic pathway shifting from aerobic to anaerobic metabolism, the depletion of internal energy stores, and the dynamic decoupling of metabolic parameters. The adaption of this technology to instrumenting organs-on-a-chip is currently underway.

Bio
David E. Cliffel, Cornelius Vanderbilt Professor and Chair, Department of Chemistry, Vanderbilt University, directs an innovative research effort in instrumental design and electroanalytical methods applied to nanotechnology and biotechnology. He is the deputy director in the Vanderbilt Institute for Integrative Biosystems Research and Education (VIIBRE), and the Technical Editor for Physical and Analytical Electrochemistry, Electrocatalysis and Photoelectrochemistry for the Journal of the Electrochemical Society. He was a member of the Board of Directors for Society Electroanalytical Chemistry (SEAC) from 2011-2016, and is the Treasurer-elect. He received his Ph.D. in analytical chemistry from UT-Austin under the direction of Allen J. Bard in 1998, was a post-doctoral assistant with Royce W. Murray at UNC-Chapel Hill, and joined Vanderbilt University in September 2000.