Optoelectronic Tweezers -- An Optofluidic Platform for Potential Digital Biology

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Abstract
Advances in biology have made it possible to analyze DNA and RNA, down to single nucleotide variants in a single cell. However, most of the tools used for the analysis, particularly on the sample preparation side, are still at the stage of Babbage Machine for computers. Only very recently have integrated devices start to appear. In this talk, I will describe some of the new optofluidic devices developed in my group. Optoelectronic tweezers use projected “light cages” to corral single cells (think “invisible dog fences” that you can move at will). This enables us to process a large number of cells at the same time. Another device, light-actuated digital microfluidics (LADM), uses similar light cages to move and mix liquid droplets, therefore controlling chemical and biological reactions on the fluidic chip. With such integrated devices, we can start to think how to build desktop biological processors.

Biography
Ming C. Wu is Nortel Distinguished Professor of Electrical Engineering and Computer Sciences at the University of California, Berkeley. He is also Co-Director of Berkeley Sensor and Actuator Center (BSAC) and Faculty Director of UC Berkeley Marvell Nanolab.

Dr. Wu received his B.S. degree in Electrical Engineering from National Taiwan University, Taipei, Taiwan, and M.S. and Ph.D. degrees in Electrical Engineering and Computer Sciences from the University of California, Berkeley in 1986 and 1988, respectively. From 1988 to 1992, he was a Member of Technical Staff at AT&T Bell Laboratories, Murray Hill, New Jersey. From 1992 to 2004, he was a professor in the Electrical Engineering department at the University of California, Los Angeles. He has been a faculty member at Berkeley since 2004. His research interests include semiconductor optoelectronics, silicon photonics, MEMS (micro-electro-mechanical systems), MOEMS, nanophotonics, and biophotonics. He has published 8 book chapters, over 200 journal and 300 conference papers. He is the holder of 22 U.S. patents.

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