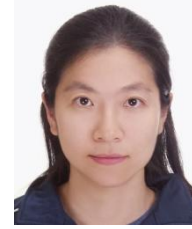


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## MAJOR RESEARCH INTERESTS

BioMEMS, Microfluidics, and Point-of-care diagnosis, Global health

## EDUCATION

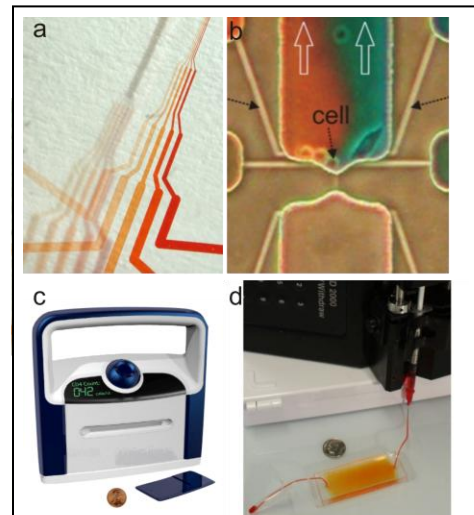
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|-----------|---|
| 2000-2006 | Ph.D. in Bioengineering/Nanotechnology<br><b>University of Washington</b> Seattle, Washington             |
| 1995-1997 | M.S. in Electrical Engineering/Biomedical Engineering<br><b>National Taiwan University</b> Taipei, Taiwan |
| 1991-1995 | B.S. in Electrical Engineering<br><b>National Taiwan University</b> Taipei, Taiwan                        |

## RESEARCH DESCRIPTION

Our mission is to develop microfluidic technologies for applications in biology and medicine, with a focus on the isolation and characterization of the cellular and sub-cellular components in blood. In particular, we apply micro- and nanotechnology to manipulate and separate target particle populations, which leads to more gentle, fast, and consistent handling of the sample, and therefore more accurate and better quality of extracted information. Toward the goal, we develop single-cell nanoprobe (such as patch-clamp chips), point-of-care microfabricated devices for fast, high yield sorting of specific homogeneous subpopulations of cells (such as CD4+ T lymphocytes), and on-chip purification and extraction of nucleic acids from serum microvesicles.

### Research Themes:

- Microfluidic devices for biological and medical applications
- Microfabrication technologies for microfluidics
- Point-of-care diagnostic instruments
- Global health



**Figure 1. Prior Work.** (a) A microfluidic photomask. (b) A patch-clamp chip performing the exchange of extracellular solutions. (c) A portable CD4+ T cell counter. (d) A setup for microfluidic isolation of microvesicles.

There will be two main categories of projects, namely (i) practical, engineering-oriented projects and (ii) engineering approaches to answering basic questions in biology. All projects represent bioengineering applied to

problems in biology and medicine, with the intent wherever possible, to have the project outcome benefit both the problem and the bioengineering's general knowledge base. All projects call for a combination of experimental and analytical/modeling skills. Prospective students are encouraged to request for details of each project or bring up their own ideas/research interests.

## HONORS and AWARDS

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2004-2005	Nanotechnology Graduate Research Award from the University of Washington Initiatives Fund
1997	Best Student Paper Award in <i>Annual Conference of Electro-optical Engineering</i> , Hsin-chu, Taiwan
1991-1995	President's Award of National Taiwan University, Taipei, Taiwan

## PATENTS

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2009	United States Patent application filing, "Microfluidic Isolation and Analysis of Microvesicles"
2008	United States Patent pending (Filing No. 61/100,420), "Microvortex for Focusing, Guiding and Sorting of Particles"
2006	United States Patent pending, "Elastomeric Patch-clamp Chips"
2004	United States Patent pending, "Elastomeric Molds with Tunable Microtopography ( $\mu$ TMs)"
2002	Taiwan Patent No. 482996, "Dynamic Compensator for Use in Servo Loop for Optical Pickup Head"
2000	United State Patent No. 6147467, "Dynamic Compensator for Use in Servo Loop for Optical Pickup Head"

## RESEARCH AND PROFESSIONAL EXPERIENCE

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2008-present	Scientific Advisory Board, <b>Daktari Diagnostics Inc.</b> , Cambridge, Massachusetts
2006-2009	Research Associate, Center for Engineering in Medicine and Department of Surgery, <b>Massachusetts General Hospital</b> , <b>Shriners Hospitals for Children</b> and <b>Harvard Medical School</b> , Boston, Massachusetts
2000-2006	Research Assistant, <b>University of Washington</b> , Seattle, Washington
1997-2000	R&D Engineer, <b>ASUSTek Computer Inc.</b> , Taipei, Taiwan
1995-1997	Research Assistant, <b>National Taiwan University</b> , Taipei, Taiwan
1995-1997	Teaching Assistant, <b>National Taiwan University</b> , Taipei, Taiwan

## JOURNAL PUBLICATIONS

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- A.K. Gupta, C. **Chen**, V. Ambravaneswaran, A.E. Rosenbach, K. Kotz, D. Irimia, and M. Toner, "Using Thermoreversible Gelation as a Cell Capture and Release Mechanism in a Microfluidic Device", *submitted*.
- C.H. Hsu, C. **Chen**, D. Irimia, and M. Toner, "Isolating Cells from Blood using Buoyancy Activated Cell Sorting", *submitted*.
- C. **Chen**, J. Skog, C.H. Hsu, R.T. Lessard, L. Balaj, T. Wurdinger, B.S. Carter, X.O. Breakefield, M. Toner, and D. Irimia, "Microfluidic Isolation and Transcriptome

- Analysis of Serum Microvesicles", *Lab Chip*, 2010, 10(4), 505-511.
- X.H. Cheng, A. Gupta, **C. Chen**, R.G. Tompkins, W. Rodriguez, and M. Toner, "Enhancing the Performance of a Point-of-care CD4+ T-cell Counting Microchip through Monocytes Depletion for HIV/AIDS Diagnostics", *Lab Chip*, 2009, 9(10), 1357-1364.
  - C.H. Hsu, D.D. Carlo, **C. Chen**, D. Irimia, and M. Toner, "Microvortex for Focusing, Guiding and Sorting of Particles", *Lab Chip*, 2008, 8(12), 2128-2134.
  - **C. Chen**, and A. Folch, "A High-Performance Elastomeric Patch Clamp Chip", *Lab Chip*, 2006, 6(10), 1338-1345.
  - **C. Chen**, N.L. Stucky, T.F. Kosar, and A. Folch, "Fabrication of Microfluidically-Accessible Planar Nanoholes on Elastomeric Substrates", *J. Biomed. Nanotech.*, 2005, 1(4), 384-391.
  - T.F. Kosar, **C. Chen**, N.L. Stucky, and A. Folch, "Arrays of Microfluidically-addressable Nanoholes", *J. Biomed. Nanotech.*, 2005, 1(2), 161-167.
  - C.H. Hsu, **C. Chen**, and A. Folch, "'Microcanals' for Micropipette Access to Single Cells in Microfluidic Environments", *Lab Chip*, 2004, 5, 420-424.
  - **C. Chen**, D. Hirdes and A. Folch, "Grey-scale Photolithography Using Microfluidic Photomasks", *Proc. Natl. Acad. Sci. U.S.A.*, 2003, 100, 1499-1504.

#### CONFERENCE PRESENTATIONS

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- C.H. Hsu, D.D. Carlo, **C. Chen**, D. Irimia, and M. Toner, "Microvortex Focusing and Sorting of Particles in Microchannels", *International Conference on Miniaturized Systems for Chemistry and Life Sciences ( $\mu$ TAS 2008)*, San Diego, CA.
  - **C. Chen**, N. Li and A. Folch, "A Patch Clamp Chip Featuring High Giga-Ohm Seal Yields and Microfluidic Exchange of Solutions", *Annual fall meeting of the Biomedical Engineering Society*, Chicago, IL, October, 2006.
  - **C. Chen**, N. L. Stucky and A. Folch, "Microfluidically Accessible Nanoholes Molded in PDMS Surface for Cellular Analysis", *Fourth annual nanoscale science and technology workshop*, Seattle, WA 2004.
  - **C. Chen**, T.F. Kosar, N. L. Stucky and A. Folch, "Arrays of Microfluidically Addressable Nanoholes for Cellular Analysis", *Annual fall meeting of the Biomedical Engineering Society*, Nashville, TN, October, 2003.
  - T.F. Kosar, N.L. Stucky, **C. Chen**, K.J. Kim, and A. Folch, "Nanohole Arrays for Parallel Patch-Clamping and Focal Delivery of Biochemical Factors to Cells", *7th International Conference on Micro Total Analysis Systems ( $\mu$ TAS 2003)*, Squaw Valley, CA.
  - **C. Chen**, D. Hirdes and A. Folch, "Grayscale Photolithography Using Microfluidic Photomasks ( $\mu$ FPMs)", *Third annual nanoscale science and technology workshop*, Seattle, WA 2003.
  - G. J. Jan, **C. Chen**, T. C. Wei, C.H. Chin, and S. Y. Wu, "Glucose Concentration Measurement with Polarization Method", *Medical engineering annual conference of the Republic of China*, Chung-Li, Taiwan, 1997.
  - T.C. Wei, G. J. Jan, **C. Chen**, C.H. Chin, and S. Y. Wu, "Glucose Concentration Measurement Based on Faraday Rotator", *Annual conference of Electro-optical Engineering*, Hsin-chu, Taiwan, December 1997.
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## **JOURNAL REVIEWER**

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- Microfluidic and Nanofluidics