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## CHANG LU

Department of Chemical Engineering  
Virginia Tech  
Blacksburg, VA 24061  
Tel: 540-231-8681  
Email: changlu@vt.edu  
Website: <http://www.microfluidics.che.vt.edu/>

### **RESEARCH INTERESTS**

Microfluidic biotechnology, genomic technology, epigenomics and gene regulations, single cell genomics, precision medicine, brain neuroscience, cancer

### **EDUCATION**

2002-2004	Cornell University, Ithaca, NY Postdoctoral associate in Applied Physics Advisor: Harold G. Craighead
1998-2002	University of Illinois at Urbana-Champaign, Urbana, IL Ph.D. in Chemical Engineering M.S. in Chemical Engineering Advisor: Richard I. Masel
1994-1998	Peking University, Beijing, China B.S. in Chemistry (with honors)

### **PROFESSIONAL EXPERIENCE**

2020-present	<i>Graduate Program Director.</i> Department of Chemical Engineering, Virginia Tech, Blacksburg, VA
2017-present	<i>Precision medicine Track leader.</i> Virginia Tech ICTAS Center for Engineered Health
2016-present	<i>Fred W. Bull Endowed Professor of Chemical Engineering.</i> Virginia Tech, Blacksburg, VA
2016	<i>Visiting professor (on sabbatical) in Prof. Joseph Ecker lab.</i> Salk Institute for Biological Studies, La Jolla, CA
2015-2016	<i>Professor of Chemical Engineering.</i> Virginia Tech, Blacksburg, VA
2010-2015	<i>Associate professor of Chemical Engineering.</i> Virginia Tech, Blacksburg, VA
2009	<i>Associate professor of Biological Engineering.</i> Purdue University, West Lafayette, IN
2004-2009	<i>Assistant professor of Biological Engineering.</i> Purdue University, West Lafayette, IN

### **HONORS AND AWARDS**

2020	Fellow, American Institute for Medical and Biological Engineering (AIMBE)
2016	IChemE global biotechnology award finalist
2016	Fred W. Bull Endowed Professorship, Virginia Tech
2015	Dean's Award for Research Excellence, Virginia Tech
2012	Faculty Fellow, College of Engineering, Virginia Tech
2008	Teaching for Tomorrow Award, Purdue University
2008	NSF CAREER Award
2007	Wallace H. Coulter Foundation Early Career Award

- 2006 DARPA Young Faculty Award Finalist
- 2006 Seed for Success Award, Purdue University
- 2006 First Annual Millionaires Club Award, Purdue University

## **PUBLICATIONS**

### **Representative publications**

1. de la Fuente Revenga, M., Zhu, B. #, Guevara, C.A. #, Naler, L.B., Saunders, J.M., Zhou, Z., Toneatti, R., Sierra, S., Wolstenholme, J.T., Beardsley, P.M., Huntley, G.W., Lu, C.\*, Gonzalez-Maeso, J.\* Prolonged epigenomic and synaptic plasticity alterations following single exposure to a psychedelic in mice. *Cell Reports*, 37 (2021) 109836. (*For the first time, we described the prolonged epigenomic alternation after psychedelic exposure in mouse brain, in contrast to highly transient transcriptomic changes*)
2. Zhu, B., Hsieh, Y.-P., Murphy, T.W., Zhang, Q., Naler, L.B., Lu, C. MOWChIP-seq for low-input and multiplexed profiling of genome-wide histone modifications. *Nature Protocols*, 14 (2019) 3366-3394. (*We described semi-automated MOWChIP-seq with 8 assays running in parallel*)
3. Ma, S., Hsieh, Y.-P., Ma, J., Lu, C. Low-input and multiplexed microfluidic assay reveals epigenomic variation across cerebellum and prefrontal cortex. *Science Advances*, 4 (2018) eaar8187. (*SurfaceChIP-seq was demonstrated to profile histone modifications with both ultralow input ~30 cells (compared to 10 million cells required by conventional assays) and high throughput ~8 assays in parallel*)
4. Ma, S., de la Fuente Revenga, M., Sun, Z., Sun, C., Murphy, T.W., Xie, H., Gonzalez-Maeso, J., Lu, C. Cell-type-specific brain methylomes profiled via ultralow-input microfluidics. *Nature Biomedical Engineering*, 2 (2018) 183-194. (*We demonstrated MID-RRBS which is capable of profiling DNA methylomes with ng-to-single cell quantities of DNA*)
5. Cao, Z., Chen, C., He, B., Tan, K., Lu, C. A microfluidic device for epigenomic profiling using 100 cells. *Nature Methods*, 12 (2015) 959-962. (*We described the first microfluidic epigenomic profiling technology "MOWChIP-seq", which is capable of profiling epigenomes using 100 cells, compared to 10 million cells required by conventional methods*)
6. Geng, T., Zhan, Y., Wang, J., Lu, C. Transfection of cells using flow-through electroporation based on constant voltage. *Nature Protocols*, 6 (2011) 1192-1208. (*a paper that summarizes our flow-through electroporation for gene delivery protocol*)

### **Journal papers**

1. Afrose, S., Song, W., Nemeroff, C.B., Lu, C., Yao, D. Subpopulation-specific Machine Learning Prognosis for Underrepresented Patients with Double Prioritized Bias Correction. *Communications Medicine* 2 (2022) 111.
2. Liu, Z., Naler, L.B., Zhu, Y., Deng, C., Zhang, Q., Zhu, B., Zhou, Z., Sarma, M., Murray, A., Xie, H., Lu, C. nMOWChIP-seq: low-input genome-wide mapping of non-histone targets. *NAR Genomics and Bioinformatics* 4 (2022) Iqac030.
3. Hsieh, Y.-P. #, Naler, L.B. #, Ma, S., Lu, C. Cell-type-specific epigenomic variations associated with BRCA1 mutation in pre-cancer human breast tissues. *NAR Genomics and Bioinformatics* 4 (2022) Iqac006.
4. Naler, L.B. #, Hsieh, Y.-P. #, Geng, Z., Zhou, Z., Li, L.\* Lu, C.\* Epigenomic and transcriptomic analyses reveal differences between low-grade inflammation and severe exhaustion in LPS-challenged murine monocytes. *Communications Biology* 5 (2022) 102.
5. de la Fuente Revenga, M., Zhu, B. #, Guevara, C.A. #, Naler, L.B., Saunders, J.M., Zhou, Z., Toneatti, R., Sierra, S., Wolstenholme, J.T., Beardsley, P.M., Huntley, G.W., Lu, C.\*, Gonzalez-Maeso, J.\* Prolonged epigenomic and synaptic plasticity alterations following single exposure to a psychedelic in mice. *Cell Reports* 37 (2021) 109836.

6. Murphy, T. W., Hsieh, Y.-P., Zhu, B., Naler, L.B., Lu, C. Microfluidic platform for next-generation sequencing library preparation with low-input samples. **Analytical Chemistry** 92 (2020) 2519-2526.
7. Deng, C., Murphy, T.W., Zhang, Q., Naler, L., Xu, A., Lu, C. Multiplexed and ultralow-input ChIP-seq enabled by tagmentation-based indexing and facile microfluidics. **Analytical Chemistry** 92 (2020) 13661-13666.
8. Rahtes, A., Pradhan, K., Sarma, M., Xie, H., Lu, C., Li, L. 4-PBA facilitates resolution of inflammatory macrophages programmed by subclinical low dose LPS. **Innate Immunity**, 26 (2020) 62-72.
9. Deng, C., Naler, L.B., Lu, C. Microfluidic epigenomic mapping technologies for precision medicine. **Lab on a Chip**, invited review, 19 (2019) 2630-2650.
10. Zhu, B., Hsieh, Y.-P., Murphy, T.W., Zhang, Q., Naler, L.B., Lu, C. MOWChIP-seq for low-input and multiplexed profiling of genome-wide histone modifications. **Nature Protocols**, 14 (2019) 3366-3394.
11. Hu, Y., Xu, F., Zhang, R., Legarda, D., Dai, J., Wang, D., Li, H., Zhang, Y., Xue, Q., Dong, G., Zhang, H., Lu, C., Mortha, A., Liu, J., Cravedi, P., Ting, A., Li, L., Qi, C., Pierce, S., Merad, M., Heeger, P., Xiong, H. Interleukin-1 $\beta$ -induced IRAK1 ubiquitination is required for T<sub>H</sub>-GM-CSF cell differentiation in T cell-mediated inflammation. **Journal of Autoimmunity**, 102 (2019) 50-64.
12. Zhang, X., Wang, Y., Chiang, H.-C., Hsieh, Y.-P., Lu, C., Park, B. H., Jatoi, I., Jin, V. X., Hu, Y., Li, R. BRCA1 mutations attenuated super-enhancer function and chromatin looping in haploinsufficient human breast epithelial cells. **Breast Cancer Research**, 21 (2019) 51.
13. Zhu, Y., Cao, Z., Lu, C. Microfluidic MeDIP-seq for low-input methylomic analysis of mammary tumorigenesis in mice. **Analyst** 144 (2019) 1904-1915.
14. Murphy, T.W., Sheng, J., Naler, L.B., Feng, X., Lu, C. On-chip Manufacturing of Synthetic Proteins for Point-of-care Therapeutics. **Microsystems & Nanoengineering** 5 (2019) 13.
15. Cox, M., Deng, C., Naler, L., Lu, C., Verbridge, S. Effects of culture condition on epigenomic profiles of brain tumor cells. **ACS Biomaterials Science & Engineering** 5 (2019) 1554-1552.
16. Sarma, M., Lee, J., Ma, S., Li, S., Lu, C. A diffusion-based microfluidic device for single-cell RNA-seq. **Lab on a Chip** 19 (2019) 1247-1256.
17. Ma, S., Hsieh, Y.-P., Ma, J., Lu, C. Low-input and multiplexed microfluidic assay reveals epigenomic variation across cerebellum and prefrontal cortex. **Science Advances** 4 (2018) eaar8187.
18. Ma, S., de la Fuente Revenga, M., Sun, Z., Sun, C., Murphy, T.W., Xie, H., Gonzalez-Maeso, J., Lu, C. Cell-type-specific brain methylomes profiled via ultralow-input microfluidics. **Nature Biomedical Engineering** 2 (2018) 183-194.
19. Murphy TW, Hsieh Y-P, Ma S, Zhu Y, Lu C. Microfluidic low-Input fluidized-bed enabled ChIP-seq device for automated and parallel analysis of histone modifications. **Analytical Chemistry**. 90 (2018) 7666–7674.
20. Murphy, T.W., Zhang, Q., Naler, L.B., Ma, S., Lu, C. Recent advances on microfluidic technologies for single cell analysis. (review) **Analyst** 143 (2018) 60-80.
21. Sun, C., Lu, C. Microfluidics-based chromosome conformation capture (3C) technology for examining chromatin organization with a low quantity of cells. **Analytical Chemistry** 90 (2018) 3714–3719.
22. Ma, S., Murphy, T.W., Lu, C. Microfluidics for Genome-wide Studies Involving Next Generation Sequencing. Invited Review, **Biomicrofluidics**, 11 (2017) 021501.
23. Sun, C., Hsieh, Y.P., Ma, S., Geng, S., Cao, Z., Li, L., Lu, C. Immunomagnetic Separation of Tumor Initiating Cells by Screening Two Surface Markers. **Scientific Reports**, 7 (2017) 40632.
24. Sun, C., Hassanisaber, H., Yu, R., Ma, S., Verbridge, S.S., Lu, C. Paramagnetic structures within a microfluidic channel for enhanced immunomagnetic isolation and surface patterning of cells. **Scientific Reports** 6 (2016) 29407.
25. Ma, S., Bryson, B.D., Sun, C., Fortune, S.M., Lu, C. RNA extraction from a mycobacterium under ultrahigh electric field intensity in a microfluidic device. **Analytical Chemistry** 88 (2016) 5053-5057.

26. Cao, Z., Lu, C. A microfluidic device with integrated sonication and immunoprecipitation for sensitive epigenetic assays. **Analytical Chemistry** 88 (2016) 1965-1972.
27. Cao, Z., Chen, C., He, B., Tan, K., Lu, C. A microfluidic device for epigenomic profiling using 100 cells. **Nature Methods** 12 (2015) 959-962.
28. del Rosal, B., Sun, C., Yan, Y., Mackenzie, M.D., Lu, C., Bettiol, A.A., Kar, A.K., Jaque, D. Flow effects in the laser-induced thermal loading of optical traps and optofluidic devices. **Optics Express** 22 (2014) 23938-23954.
29. Sun, C., Ouyang, M., Cao, Z., Ma, S., Alqublan, H., Sriranganathan, N., Wang, Y., Lu, C. Electroporation-delivered fluorescent protein biosensors for probing molecular activities in cells without genetic encoding. **Chemical Communications** 50 (2014) 11536-11539.
30. Sun, C., Cao, Z., Wu, M., Lu, C. Intracellular Tracking of Single Native Molecules with Electroporation-delivered Quantum Dots. **Analytical Chemistry** 86 (2014) 11403-11409.
31. Ma, S., Loufakis, D.N., Cao, Z., Chang, Y., Achenie, L.E.K., Lu, C. Diffusion-based Microfluidic PCR for "One-pot" Analysis of Cells. **Lab on a Chip** 14 (2014) 2905-2909. (Selected as HOT article and the journal cover of issue 16)
32. Ma, S., Schroeder, B., Sun, C., Loufakis, D.N., Cao, Z., Sriranganathan, N., Lu, C. Electroporation-based delivery of cell-penetrating peptide conjugates of peptide nucleic acids for antisense inhibition of intracellular bacteria. **Integrative Biology** 6 (2014) 973-978.
33. Loufakis, D.N., Cao, Z., Ma, S., Mittelman, D., Lu, C. Focusing of mammalian cells under an ultrahigh pH gradient created by unidirectional electropulsion in a confined microchamber. **Chemical Science** 5 (2014) 3331-3337.
34. Cao, Z., Geng, S., Li, L., Lu, C. Detecting intracellular translocation of native proteins quantitatively at the single cell level. **Chemical Science** 5 (2014) 2530-2535.
35. Geng, T., Lu, C. Microfluidic Electroporation for Cellular Analysis and Delivery. (Critical review) **Lab on a Chip** 13 (2013) 3803-3821.
36. del Rosal, B., Sun, C., Loufakis, D.N., Lu, C., Jaque, D. Thermal loading in flow-through electroporation microfluidic devices. **Lab on a Chip** 13 (2013) 3119-3127.
37. Cao, Z., Chen, F., Bao, N., He, H., Xu, P., Jana, S., Jung, S., Lian, H., Lu, C. Droplet Sorting Based on the Number of Encapsulated Particles Using a Solenoid Valve. **Lab on a Chip** 13 (2013) 171-178.
38. Wang, J., Zhan, Y., Bao, N., Lu, C. Quantitative measurement of quantum dot uptake at the cell population level using microfluidic evanescent-wave-based flow cytometry. **Lab on a Chip** 12 (2012) 1441-1445 (Cover article).
39. Awwad, Y., Geng, T., Baldwin, A.S., Lu, C. Observing single cell NF-kappa B dynamics under stimulant concentration gradient. **Analytical Chemistry** 84 (2012) 1224-1228.
40. Zhan, Y., Cao, Z., Bao, N., Li, J., Wang, J., Geng, T., Lin, H., Lu, C. Low-frequency ac electroporation shows strong frequency dependence and yields comparable transfection results to dc electroporation. **Journal of Controlled Release** 160 (2012) 570-576.
41. Shi, C., Shan, X., Pan, Z.-Q., Xu, J.J., Lu, C., Bao, N., Gu, H.-Y. Quantum-Dot-Modified Carbon Tape Electrodes for Reproducible Electrochemiluminescence Emission on a Paper-based Platform. **Analytical Chemistry** 84 (2012) 3033-3038.
42. Zhan, Y., Loufakis, D.N., Bao, N., Lu, C. Characterizing osmotic lysis kinetics under microfluidic hydrodynamic focusing for erythrocyte fragility studies. **Lab on a Chip** 12 (2012) 5063-5068.
43. Zhan, Y., Sun, C., Cao, Z., Bao, N., Xing, J., Lu, C. Release of intracellular proteins by electroporation with preserved cell viability. **Analytical Chemistry** 84 (2012) 8102-8105.
44. Geng, T., Bao, N., Sriranganathan, N., Li, L., Lu, C. Genomic DNA extraction from cells by electroporation on an integrated microfluidic platform. **Analytical Chemistry** 84 (2012) 9632-9639.
45. Geng, T., Zhan, Y., Wang, J., Lu, C. Transfection of cells using flow-through electroporation based on constant voltage. **Nature Protocols** 6 (2011) 1192-1208.

46. Chen, F., Zhan, Y., Geng, T., Lian, H., Xu, P., Lu, C. Chemical transfection of cells in picoliter aqueous droplets in fluorocarbon oil. **Analytical Chemistry** 83 (2011) 8816-8820.
47. Bao, N., Kodippili, G.C., Giger, K.M., Fowler, V.M., Low, P.S., Lu, C. Single-cell Electrical Lysis of Erythrocytes Detects Deficiencies in the Cytoskeletal Protein Network. **Lab on a Chip** 11 (2011) 3053-3056. **(Selected as a hot article.)**
48. Geng, T., Bao, N., Litt, M.D., Glaros, T.G., Li, L., Lu, C. Histone modification analysis by chromatin immunoprecipitation from a low number of cells on a microfluidic platform. **Lab on a Chip** 11 (2011) 2842-2848.
49. Wang, J., Fei, B., Zhan, Y., Geahlen, R.L. and Lu, C. Kinetics of NF-kappaB nucleocytoplasmic transport probed by single-cell screening without imaging. **Lab on a Chip** 10 (2010) 2911 - 2916.
50. Wang, J., Fei, B., Geahlen, R.L. and Lu, C. Quantitative analysis of protein translocations by microfluidic total internal reflection fluorescence flow cytometry. **Lab on a Chip** 10 (2010) 2673-2679.
51. Zhan, Y., Martin, V.A., Geahlen, R.L. and Lu, C. One-step extraction of subcellular proteins from eukaryotic cells. **Lab on a Chip** 10 (2010) 2046-2048.
52. Geng, T., Zhan, Y., Wang, H.Y., Witting, S.R., Cornetta, K.G. and Lu, C. Flow-through electroporation based on constant voltage for large-volume transfection of cells. **Journal of Controlled Release** 144 (2010) 91-100.
53. Wang, J., Zhan, Y., Ugaz, V.M. and Lu, C. Vortex-assisted DNA Delivery. **Lab on a Chip** 10 (2010) 2057-2061. **Selected as the journal cover; Top 10 most accessed articles in July and August 2010.**
54. Bao, N., Le, T.T., Cheng, J.X. and Lu, C. Microfluidic electroporation of tumor and blood cells: observation of nucleus expansion and implications on selective analysis and purging of circulating tumor cells. **Integrative Biology** 2 (2010) 113-120. **Selected as the journal cover. Top 10 articles (2010).**
55. Zhan, Y., Wang, J., Bao, N. and Lu, C. Electroporation of cells in microfluidic droplets. **Analytical Chemistry** 81 (2009) 2027-2031. **Selected for inclusion in "Microfluidics thematic collection" in Analytical Chemistry (Oct 2010).**
56. Geng, T., Bao, N., Gall, O.Z. and Lu, C. Modulating DNA adsorption on silica beads using an electrical switch. **Chemical Communications** (2009) 800-802.
57. Wang, J., Bao, N., Paris, L.L., Geahlen, R.L. and Lu, C. Total internal reflection fluorescence flow cytometry. **Analytical Chemistry** 80 (2008) 9840-9844.
58. Bao, N., Zhan, Y. and Lu, C. Microfluidic electroporative flow cytometry for studying single cell biomechanics. **Analytical Chemistry** 80 (2008) 7714-7719.
59. Wang, H.Y., Bao, N. and Lu, C. A microfluidic cell array with individually addressable culture chambers. **Biosensors & Bioelectronics** 24 (2008) 613-617.
60. Wang, H.W., Bao, N., Le, T.T., Lu, C. and Cheng, J.X. Microfluidic CARS cytometry. **Optics Express** 16 (2008) 5782-5789.
61. Bao, N., Wang, J. and Lu, C. Recent advances in electric analysis of cells in microfluidic systems. **Analytical and Bioanalytical Chemistry** 391 (2008) 933-942. **Invited review.**
62. Bao, N. and Lu, C. A microfluidic device for physical trapping and electrical lysis of bacterial cells. **Applied Physics Letters** 92 (2008) 214103. **Selected for inclusion in Virtual Journal of Nanoscale Science & Technology and Virtual Journal of Biological Physics Research.**
63. Bao, N., Wang, J. and Lu, C. Microfluidic electroporation for selective release of intracellular molecules at the single cell level. **Electrophoresis** 29 (2008) 2939-2944.
64. Bao, N., Jagadeesan, B., Bhunia, A.K., Yao, Y., and Lu, C. Quantification of bacterial cells based on autofluorescence on a microfluidic platform. **Journal of Chromatography A** 1181 (2008) 153-158.
65. Wang, H.Y. and Lu, C. Microfluidic electroporation for delivery of small molecules and genes into cells using a common dc power supply. **Biotechnology and Bioengineering** 100 (2008) 579-586.

66. Wang, F., Wang, H., Wang, J., Wang, H.Y., Rummel, P.L., Garimella, S.V. and Lu, C. Microfluidic delivery of small molecules into mammalian cells based on hydrodynamic focusing. **Biotechnology and Bioengineering** 100 (2008) 150-158. **Selected as the journal cover.**
67. Wang, J., Bao, N., Paris, L.L., Wang, H.Y., Geahlen, R.L. and Lu, C. Detection of kinase translocation using microfluidic electroporative flow cytometry. **Analytical Chemistry** 80 (2008) 1087-1093.
68. Wang, J., Stine, M.J. and Lu, C. Microfluidic cell electroporation using a mechanical valve. **Analytical Chemistry** 79 (2007) 9584-9587.
69. Wang, J. and Lu, C. Single molecule lambda-DNA stretching studied by microfluidics and single particle tracking. **Journal of Applied Physics** 102 (2007) 074703.
70. Wang, J. and Lu, C. Microfluidic cell fusion under continuous direct current voltage. **Applied Physics Letters** 89 (2006) 234102. **Selected for inclusion in Virtual Journal of Biological Physics Research.**
71. Wang, H.Y. and Lu, C. Microfluidic chemical cytometry based on modulation of local field strength. **Chemical Communications** (2006) 3528-3530. **Selected for inclusion in RSC Chemical Biology Virtual Journal.**
72. Wang, H.Y. and Lu, C. High-throughput and real-time study of single cell electroporation using microfluidics: effects of medium osmolarity. **Biotechnology & Bioengineering** 95 (2006) 1116-1125.
73. Wang, H.Y. and Lu, C. Electroporation of mammalian cells in a microfluidic channel with geometric variation. **Analytical Chemistry** 78 (2006) 5158-5164.
74. Wang, H.Y., Bhunia, A.K. and Lu, C. A microfluidic flow-through device for high throughput electrical lysis of bacterial cells based on continuous DC voltage. **Biosensors & Bioelectronics** 22 (2006) 582-588.
75. Chu, K.L., Gold, S., Subramanian, R., Lu, C., Shannon, M.A. and Masel, R.I. A nanoporous silicon membrane electrode assembly for on-chip micro fuel cell applications. **Journal of Microelectromechanical Systems** 15 (2006) 671-677.
76. Lu, C., Smith, A.E. and Craighead, H.G. Separation of denatured proteins in free solution on a microchip based on differential binding of alkyl sulfates with different carbon chain lengths. **Chemical Communications** (2005) 183-185. **Selected for inclusion in RSC Chemical Biology Virtual Journal.**
77. Gold, S., Chu, K.L., Lu, C., Shannon, M.A. and Masel, R.I. Acid loaded porous silicon as a proton exchange membrane for micro fuel cells. **Journal of Power Sources** 135 (2004) 198-203.
78. Waszczuk, P., Lu, G.Q., Wieckowski, A., Lu, C., Rice, C. and Masel, R.I. UHV and electrochemical studies of CO and methanol adsorbed at platinum/ruthenium surfaces, and reference to fuel cell catalysis. **Electrochimica Acta** 47 (2002) 3637-3652. **Invited review.**
79. Lu, C., Rice, C., Masel, R.I., Babu, P.K., Waszczuk, P., Kim, H.S., Oldfield, E. and Wieckowski, A. UHV, electrochemical NMR, and electrochemical studies of platinum/ruthenium fuel cell catalysts. **Journal of Physical Chemistry B** 106 (2002) 9581-9589.
80. Lu, C., Lee, I.C., Masel, R.I., Wieckowski, A. and Rice, C. Correlations between the heat of adsorption and the position of the center of the d-band: differences between computation and experiment. **Journal of Physical Chemistry A** 106 (2002) 3084-3091.
81. Lu, C. and Masel, R.I. The effect of ruthenium on the binding of CO, H<sub>2</sub> and H<sub>2</sub>O on Pt(110). **Journal of Physical Chemistry B** 105 (2001) 9793-9797.
82. Lu, C., Thomas, F.S. and Masel, R.I. Chemistry of methoxonium on (2x1)Pt(110). **Journal of Physical Chemistry B** 105 (2001) 8583-8590.
83. Thomas, F.S., Lu, C., Lee, I.C., Chen, N.S. and Masel, R.I. Evidence for a cation intermediate during methanol dehydration on Pt(110). **Catalysis Letters** 72 (2001) 167-175.
84. Ali, N., Lu, C. and Masel, R.I. Catalytic oxidation of odorous organic acids. **Catalysis Today** 62 (2000) 347-353.

## **Books**

1. Lu, C. ed. **Chemical Cytometry: Ultrasensitive analysis of single cells.** Wiley-VCH, Weinheim, Germany, Jan 2010. ISBN: 978-3-527-32495-8.
2. Lu, C., Verbridge, S.S. ed. **Microfluidic methods for molecular biology.** Springer, April 2016. ISBN: 978-3-319-30017-7.

## **Book Chapters**

1. Zhu, Y., Lu, C. Microfluidic Chromatin Immunoprecipitation for Analysis of Epigenomic Regulations, **Microfluidic methods for molecular biology**, (Lu, C. and Verbridge, S.S. ed.). Springer, April 2016.
2. Cao, Z.N., Lu, C. Quantitative detection of nucleocytoplasmic transport of native proteins at the single cell level. Single cell protein analysis, **Methods in Molecular Biology**, (Singh, A.K. and Chandrasekaran, A. ed.), in press, Springer, 2015.
3. Zhan, Y., Lu, C. Microfluidic devices for cellular proteomics studies. **Microfluidic technologies for human health.** Chapter 8 (Demirci, U. ed.) World Scientific Publishing Co, 2012.
4. Lu, C., Wang, J., Bao, N. and Wang, H.Y. Electroporative flow cytometry for single cell analysis. **Chemical Cytometry: Ultrasensitive analysis of single cells.** (Lu, C. ed.) Wiley-VCH, Weinheim, Germany, 2010.
5. Bao, N. and Lu, C. Microfluidics-based lysis of bacteria and spores for detection and analysis. **Principles of Bacterial Detection: Biosensors, Recognition Receptors and Microsystems** (Zourob, M. et al. ed.), P783-796, Springer, New York, NY, 2008.
6. Wang, H.Y., Banada, P.P., Bhunia, A.K. and Lu, C. Rapid electrical lysis of bacterial cells in a microfluidic device. **Methods in Molecular Biology, Vol. 385: Microchip-based Assay Systems: Methods and Applications** (P.N. Floriano ed.), P23-35, Humana Press, Totowa, NJ, 2007.

## **PATENTS**

1. Lu, C., Murphy, T.W., Systems and methods for high throughput and parallel chromatin immunoprecipitation assays. Provisional patent file on 10/18/2017, utility patent filed on 10/18/2018.
2. Lu, C., Cao, Z., Microfluidic device for chromatin immunoprecipitation. A provisional patent filed in Oct, 2013, a utility patent filed on Oct 10, 2014 (U.S. Patent Application No: 61/889,725, US patent 9,732,377 issued in Aug. 2017).
3. Lu, C., Ma, S., Methods and Devices For Analysis of Nucleic Acids From Cells. A provisional patent filed on March 27, 2014 (U.S. Patent Application No: 61/970,945).
4. Lu, C., Wang, J. Vortex-assisted Gene Delivery. Provisional patent filed, Sep 20, 2010 (Attorney Docket No. VTIP 11-013).
5. Lu, C., Wang, J., Bao, N. and Geahlen, R.L. Electroporative flow cytometry. PCT application (Pub. No. WO2009032827) Sept. 2008; US patent filed in April, 2010 (12/716,974).
6. Lu, C., Wang, H.Y. and Wang, J. Fluidic device and method for cell electroporation and electrofusion using constant direct current voltage, US patent (11/583,535), Oct. 2006.
7. Craighead, H.G. and Lu, C. Separation of denatured proteins in free solution. US patent (11/281,249) Nov. 17, 2005.

## **Refereed conference proceedings**

1. Murphy, T.W., Sheng, J., Feng, X., Lu, C. On-chip Manufacturing of Synthetic Proteins for Point-of-care Therapeutics. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS) 2018.*

2. Murphy, T.W., Ma, S., Lu, C. Low-input fluidized-bed enabled ChIP-seq device with parallel units for analysis of histone modifications. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2017.
3. Ma, S., Loufakis, D.N., Cao, Z., Chang, Y., Achenie, L.E.K., Lu, C. Diffusion-based Microfluidic PCR for “One-pot” Analysis of Cells, *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2014.
4. Ma, S., Schroeder, B., Sun, C., Loufakis, D.N., Cao, Z., Sriranganathan, N., Lu, C. Microfluidic electroporation for delivery of cell-penetrating peptide conjugates of peptide nucleic acids (PNA) for antisense inhibition of intracellular bacteria. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2014.
5. Loufakis, D.N., Cao, Z., Ma, S., Mittelman, D., Lu, C. Unidirectional electrical pulses for cell alignment in a closed microfluidic chamber. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2014.
6. Sun, C., Wang, Y., Ouyang, M., Lu, S., Wang, Y., Lu, C. Electroporation-delivered protein biosensors for study of molecular activity on microfluidic platform. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2014.
7. Sun, C., Cao, Z., Geng, T., Lu, C. Selective intracellular labeling using microfluidic electroporation-delivered quantum dots. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2014.
8. Geng, T., Zhan, Y.H., Lu, C. Gene delivery by microfluidic flow-through electroporation based on constant DC and AC field. *Annual International Conference of the IEEE Engineering in Medicine and Biology Society Conference (EMBC) Proceedings* 2012, pp 2579-2582.
9. Zhan, Y., Loufakis, D.N., Bao, N., Lu, C. Rapid lysis of erythrocytes under hydrodynamic focusing reveals cell biomechanics. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2011, pp 544-546.
10. Geng, T., Bao, N., Litt, M.D., Glaros, T.G., Li, L., Lu, C. Microfluidic chromatin immunoprecipitation assay for histone modification analysis based on 50 cells. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2011, pp 993-995.
11. Wang, J., Fei, B., Zhan, Y., Geahlen, R.L., Lu, C. Studying NF-kappaB translocation between nucleus and cytoplasm by electroporative flow cytometry. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2010, pp 1661-1663.
12. Zhan, Y., Wang, J., Bao, N., Geng, T., Lu, C. Flow-through electroporation for transfection based on low-frequency AC voltage. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2010, pp 1550-1552.
13. Wang, J., Lu, C. A novel cytometric tool for studying kinetics of nanoparticles uptake into cells. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2010, pp 256-258.
14. Zhan, Y., Martin, V.A., Geahlen, R.L., Lu, C. Electroporation-based selective extraction of subcellular proteins. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2010, pp 1454-1456.
15. Wang, J., Zhan, Y., Ugaz, V.M., and Lu, C. Cell motion in shear flow combined with Dean vortices strongly affects DNA transfer during flow-through electroporation. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2009, pp 1180-1182.
16. Bao, N., Le, T.L., Cheng, J.-X., Lu, C. Flow-through Purging and Analysis of Circulating Tumor Cells in the Presence of Blood Cells. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2009, pp 1109-1111.
17. Bao, N. and Lu, C. Physical trapping and electric lysis of bacterial cells in a microfluidic device. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2008 (ed. Locascio, L.E., Gaitan, M., Paegel, B.M., Ross, D.J., Vreeland, W.N.) pp 1063-1065.
18. Bao, N., Zhan, Y. and Lu, C. Microfluidic electroporative flow cytometry for study of cell mechanics. *Proceedings of Micro Total Analysis Systems ( $\mu$ TAS)* 2008 (ed. Locascio, L.E., Gaitan, M., Paegel, B.M., Ross, D.J., Vreeland, W.N.) pp 1837-1839.



19. Wang, J., Bao, N., Paris, L.L., Wang, H.Y., Geahlen, R.L. and Lu, C. Rapid detection of kinase translocation at the single cell level on a microfluidic chip, **Proceedings of Micro Total Analysis Systems ( $\mu$ TAS) 2007** (ed. Viovy, J.L., Tabeling, P., Descroix, S., and Malaquin, L.) Vol. 1, pp 670-672.
20. Wang, H.Y. and Lu, C. Microfluidic electroporative delivery of small molecules and genes into cells using a common dc power supply. **Proceedings of Micro Total Analysis Systems ( $\mu$ TAS) 2007** (ed. Viovy, J.L., Tabeling, P., Descroix, S., and Malaquin, L.) Vol. 1, pp 194-196.
21. Wang, H.Y., Lu, C., Banada, P.P., Jagadeesan, B. and Bhunia, A.K. Microfluidic pretreatment of bacterial cells for analysis of intracellular contents. **Proceedings of SPIE** 5996 (2005) 15-24.

## **PRESENTATIONS**

### **Invited seminars and lectures**

1. Departmental colloquium, Electrical and Computer Engineering, University of Houston, April 11, 2022.
2. Departmental seminar, Chemical and Biomolecular Engineering, Clemson University, April 21, 2022.
3. Invited Talk, AIChE annual meeting, Boston, MA, Nov 8, 2021.
4. Wake Forest Baptist Comprehensive Cancer Center 1<sup>st</sup> Annual Signaling and Biotechnology (SBT) Retreat, Winston-Salem, NC, Dec 6, 2019
5. 20<sup>th</sup> Annual Innovative Molecular Analysis Technologies Meeting, NCI and Cedars-Sinai Medical Center, Los Angeles, CA, Nov 22, 2019.
6. Developmental and Translational Neurobiology Center special seminar series, Fralin Biomedical Research Institute of Virginia Tech Carilion School of Medicine, Roanoke, VA, Nov 5, 2019.
7. Craighead celebration symposium, Cornell University, Ithaca, NY, June 1, 2019.
8. AGTD meeting, Northeastern University, Boston, May 30, 2019.
9. Departmental seminar. Department of Chemical and Biomolecular Engineering, North Carolina State University, Feb 25, 2019.
10. Departmental seminar. Department of Physiology and Biophysics, School of Medicine, Virginia Commonwealth University, Richmond, VA, Feb 7, 2019.
11. Departmental seminar. Meinig School of Biomedical Engineering, Cornell University, Ithaca, NY, Feb 1, 2019.
12. Departmental seminar. Department of Bioengineering, UCSD, Dec 7, 2018.
13. Microtas 2018 workshop, Kaohsiung, Taiwan, Nov 11, 2018.
14. Analytical chemistry seminar, Department of Chemistry, University of Illinois at Urbana-Champaign, Sept 21, 2018.
15. Seminar series, School of Chemical and Biomolecular Engineering, Georgia Tech, Atlanta, GA, Sept 5, 2018.
16. Inaugural Single Cell Analysis conference at the Next Generation Dx Summit, Grand Hyatt Washington, Washington DC, August 23-24, 2018.
17. 2018 Applied Biosciences Horizons Conference, keynote lecture, University of Notre Dame, Indiana, July 22-24, 2018.
18. Departmental seminar, Department of Chemistry, City University of Hong Kong, Hong Kong, Dec. 20, 2017.
19. Plenary speaker, SciX 2017, Reno, Nevada, Oct 10, 2017.
20. Departmental seminar, Cain Department of Chemical Engineering, Louisiana State University, Baton Rouge, LA, Sept 22, 2017.

21. NIH Advanced Genomic Technology Development Meeting, Boston, MA, May 22-25, 2017.
22. Virginia Nanomedicine Symposium, Charlottesville, VA, April 20-21, 2017.
23. AACR Annual Meeting 2017, NCI Cross-Disciplinary Programs Supporting Integrated Cancer Research, April 4, 2017
24. Departmental seminar, Department of pharmaceutical sciences, Northeastern University, Boston, MA, March 23, 2017.
25. Departmental seminar, Department of Biomedical Engineering, Ohio State University, Columbus, OH, March 2, 2017.
26. 7th Persh workshop-the interface between materials and biology, Institute for Defense Analyses, Alexandria, VA, Feb 8, 2017.
27. Microfluidics in Biomedical Sciences Seminars, University of Michigan, Ann Arbor, MI, Nov 8, 2016.
28. Departmental seminar, Department of Biomedical Engineering, UC Irvine, Irvine, CA, May 20, 2016.
29. Harvard Biopolymers Core, Harvard Medical School, Boston, MA, May 4, 2016.
30. Departmental seminar, Department of Bioengineering, UCLA, Los Angeles, CA, Feb 25, 2016.
31. NIH IMAT Meeting, Bethesda, MD, Nov 12, 2015.
32. Chesapeake Cytometry Consortium, Johns Hopkins University, Rockville, MD, Nov 6, 2015.
33. Chemical Engineering seminar, Penn State University, University Park, PA, March 16, 2015.
34. Departmental seminar, Ohio State University, Chemical and Biomolecular Engineering, Columbus, OH, Oct 16, 2014.
35. Departmental seminar, Department of Biomedical Sciences, City University of Hong Kong, Hong Kong, Sept 24, 2014.
36. Joint Chemistry and Biomedical Engineering seminar, Hong Kong University of Science and Technology (HKUST), Hong Kong, Sept 22, 2014.
37. Departmental Seminar, UNC/NCSU Joint department of Biomedical Engineering, Chapel Hill, NC, March 28, 2014.
38. Invited talk, Award Session of the American Electrophoresis Society/AICHE annual meeting, San Francisco, Nov 6, 2013.
39. Seminar at School of Public Health, Nantong University, Nantong, China, March 14, 2013.
40. Chemistry seminar, Nanjing University, Nanjing, China, March 13, 2013.
41. Invited talk, the 34<sup>th</sup> annual international conference of IEEE-EMBS (Engineering in Medicine and Biology Society). San Diego, Aug 28-Sept 1, 2012.
42. Departmental seminar, Department of Engineering Science and Mechanics, Virginia Tech, Blacksburg, VA, April 18, 2012.
43. Departmental seminar. Department of Chemical and Biomolecular Engineering, University of Akron, Akron, OH, Oct 27, 2011.
44. Chemical physics seminar, Imperial College London, Sept 8, 2011.
45. Plenary talk, the Bioprocessing Summit, "Optimizing Mammalian Cell Lines", Marriott Long Wharf hotel, Boston, August 24-25, 2011.
46. College of Pharmacy Seminar, University of South Carolina, Columbia, SC, Feb 8, 2011.
47. Plenary talk. 3<sup>rd</sup> National Symposium on Analytical Chemistry for Life Sciences. Beijing, China, Aug 19-22, 2010.
48. Plenary talk. Purdue University Center for Basic and Applied Studies of Biological Membranes symposium. West Lafayette, IN, May 8, 2009.
49. Chemical Engineering Departmental Seminar. Virginia Tech, Blacksburg, VA, May 4, 2009.
50. Analytical Chemistry Division seminar series. Department of Chemistry, University of California at Riverside, Riverside, CA, Feb 12, 2009.
51. Departmental seminar series, Department of Chemical and Biomolecular Engineering, University of Notre Dame, Notre Dame, IN, Jan 20, 2009.

52. Departmental seminar series, Department of Chemical and Petroleum Engineering, University of Kansas, Lawrence, KS, Nov 4, 2008.
53. Departmental seminar series, School of Biomedical Engineering, Purdue University, West Lafayette, IN, September 2007.
54. Nanotechnology seminar series, Birck Nanotechnology Center, Purdue University, West Lafayette, IN, November 2006.
55. Monthly MEMS and Microfluidics seminar series, GE Global Research Center, Niskayuna, NY, August 2006.
56. Departmental seminar. School of Chemical Engineering, Purdue University, West Lafayette, IN, June 2004.
57. Departmental seminar. Department of Chemistry, Purdue University, West Lafayette, IN, May 2004.
58. Departmental seminar. Department of Agricultural and Biological Engineering, Purdue University, West Lafayette, IN, May 2004.
59. Departmental seminar series, Department of Chemical Engineering, University of Houston, Houston, TX, March 2004.
60. Departmental seminar series, Department of Chemical Engineering, The City College of New York, New York, NY, February 2004.
61. Department of Chemical Engineering, departmental seminar series, Lehigh University, Bethlehem, PA, February, 2004.
62. Nanobiotechnology Center (NBTC) seminar series, Cornell University, Ithaca, NY, February 2004.

### **Contributed meeting presentations**

1. Hadlock, T., Neice, J., Rovira, A., Mor, S., Lu, C. A simplified purpose-built platform and improved diagnostic tool for testing of endemic and foreign animal vesicular diseases. 2022 AAVLD-USAHA annual meeting, Oct 6-12, 2022, Minneapolis, MN.
2. Zhou, Z., Zhang, Q., High-Throughput Full-Length Single-Cell RNA Sequencing Based On Droplet Microfluidics. 2021 MicroTAS, Oct 10-14, 2021, Palm Springs, CA.
3. Zhu, B., de la Fuente Revenga, M., Naler, L. B., Sanuders, J. M., Zhou, Z., Toneatti, R., Sierra, S., Lu, C., Gonzalez-Maeso, J., Low-input technology reveals prolonged epigenomic alterations following single exposure to a psychedelic in mice. AIChE meeting 2021, Boston, MA, Nov 7-11, 2021.
4. Liu, Z., Naler, L. B., Zhu, Y., Deng, C., Zhang, Q., Zhu, B., Zhou, Z., Sarma, M., Murray, A., Xie, H., Lu, C., Native MOWChIP-seq as a general tool for low-input profiling of genome-wide protein binding. BMES Annual Meeting 2021, Oct 6-9, 2021, Orlando, FL.
5. Zhang, Q., Zhu, B., Lu, C., Droplet-based Microfluidics to Profile Single-cell Epigenomes. BMES annual meeting, Orlando, FL, Oct 6-9, 2021.
6. Semi-automated and High-throughput Microfluidic Technology for Profiling Epigenomes to Understand Brain Neuroscience. Zhu, B., Hsieh, Y.P., Murphy, T.W., Zhang, Q., Naler, L.B., Maeso, J., Lu, C. BMES Virtual annual meeting, Oct 14-17, 2020.
7. Droplet-based Microfluidics to Profile Single-cell Epigenomes, Zhang, Q., Zhu, B., Lu, C., BMES Virtual annual meeting, Oct 14-17, 2020.
8. Cell-Type-Specific Epigenomic Variations Due to BRCA1 Mutation in Pre-Cancer Human Breast Tissue. Naler, L.B., Hsieh, Y.P., Ma, S., Lu, C., BMES Virtual annual meeting, Oct 14-17, 2020.
9. Low-input Microfluidic Technology for Genome-wide Profiling of RNA Polymerase II and Transcription Factor Binding Using Small Quantities of Tissue Samples. Liu, Z., Zhu, Y., Sarma, M., Xie, H., Lu, C., BMES Virtual annual meeting, Oct 14-17, 2020.

10. Hsieh, Y.-P., Naler, L. B., Zhang, X., Murphy, T.W., Li, R., Lu, C., Profiling cell-type-specific epigenomic changes associated with BRCA1 mutation in breast tissues using a low-input microfluidic technology. AICHE meeting 2019, Orlando, FL.
11. Deng, C., Murphy, T.W., Zhang, Q., Lu, C. Low-input and multiplexed microfluidic assay for genome-wide histone modification profiling. BMES annual meeting, Philadelphia, PA, Oct 17, 2019.
12. Murphy, T.W., Sheng, J., Feng, X., Lu, C. On-Chip Manufacturing of Synthetic Proteins for Point-of-Care Therapeutics. 2018 MicroTAS Meeting, Nov 11-15, Kaohsiung, Taiwan.
13. Sarma, M., Lee, J., Li, S., Lu, C. A Diffusion-based Microfluidic Device for Single-cell RNA-Seq. 2018 BMES meeting, Oct 17-20, Atlanta, GA
14. Murphy, T.W., Ma, S., Lu, C. Microfluidic ChIP-Seq Device for Rapid and Parallel Analysis of Histone Modifications. 2017 AICHE meeting, Oct 29-Nov 3, Minneapolis, MN.
15. Ma, S., Sun, Z., Sun, C., Murphy, T.W., Xie, H., Lu, C. Ultrasensitive Microfluidic Assay for Genome-wide DNA methylation Analysis and Precision Medicine. 2016 AICHE meeting, Nov 13-18, San Francisco, CA.
16. Ma, S., Luo, C., Sun, Z., Sun, C., Murphy, T.W., Xie, H., Lu, C. A Microfluidic Device for Low-Input Methylomic Analysis Based on Reduced Representative Bisulfite Sequencing. 2016 AICHE meeting, Nov 13-18, San Francisco, CA.
17. Zhu, Y., Cao, Z., Murphy, T.W., Lu, C. Microfluidic MeDIP-seq for Low-input Epigenomic Analysis and Personalized Medicine. 2016 AICHE meeting, Nov 13-18, San Francisco, CA.
18. Cox, M., Deng, C., Verbridge, S.V., Lu, C. Analyzing Hypoxia Induced Epigenetic Variations in Cell Subpopulations in the Tumor Microenvironment. 2016 BMES meeting, Oct 5-8, Minneapolis, MN.
19. Sun, C., Lu, C. One Step Microfluidic Immunomagnetic Separation of Tumor Initiating Cells Based On Multiple Markers. 2015 BMES meeting, Oct 7-10, Tampa, FL.
20. Sun, C., Yu, R., Hassanisaber, H., Ma, S., Lu, C. Enhanced Microfluidic Immunomagnetic Separation Based on Microfabricated Ferromagnetic Patterns. 2015 BMES meeting, Oct 7-10, Tampa, FL.
21. Ma, S., Lu, C. Diffusion-Based Microfluidic Bisulfite Conversion for DNA Methylation Detection. 2015 AICHE meeting, Salt Lake City, UT, November 8-13.
22. Ma, S., Sun, C., Lu, C. mRNA Extraction from Mycobacteria *M. Smegmatis* Utilizing Ultrahigh Field Intensity Electrolysis. 2015 AICHE meeting, Salt Lake City, UT, November 8-13.
23. Sun, C., Lu, C. One Step Microfluidic Immunomagnetic Separation of Tumor Initiating Cells Based On Multiple Markers. 2015 AICHE meeting, Salt Lake City, UT, November 8-13.
24. Sun, C., Yu, R., Hassanisaber, H., Ma, S., Lu, C. Enhanced Microfluidic Immunomagnetic Separation Based on Microfabricated Patterns from Ferromagnetic Nanoparticles. 2015 AICHE meeting, Salt Lake City, UT, November 8-13.
25. Ma, S., Loufakis, D.N., Cao, Z., Chang, Y., Achenie, L.E.K., Lu, C. Diffusion-based Microfluidic PCR for "One-pot" Analysis of Cells, Micro Total Analysis Systems ( $\mu$ TAS) 2014, October 26-30, San Antonio, TX, USA.
26. Ma, S., Schroeder, B., Sun, C., Loufakis, D.N., Cao, Z., Sriranganathan, N., Lu, C. Microfluidic electroporation for delivery of cell-penetrating peptide conjugates of peptide nucleic acids (PNA) for antisense inhibition of intracellular bacteria. Micro Total Analysis Systems ( $\mu$ TAS) 2014, October 26-30, San Antonio, TX, USA.
27. Loufakis, D.N., Cao, Z., Ma, S., Mittelman, D., Lu, C. Unidirectional electrical pulses for cell alignment in a closed microfluidic chamber. Micro Total Analysis Systems ( $\mu$ TAS) 2014, October 26-30, San Antonio, TX, USA.
28. Sun, C., Wang, Y., Ouyang, M., Lu, S., Wang, Y., Lu, C. Electroporation-delivered protein biosensors for study of molecular activity on microfluidic platform. Micro Total Analysis Systems ( $\mu$ TAS) 2014, October 26-30, San Antonio, TX, USA.

29. Sun, C., Cao, Z., Geng, T., Lu, C. Selective intracellular labeling using microfluidic electroporation-delivered quantum dots. Micro Total Analysis Systems ( $\mu$ TAS) 2014, October 26-30, San Antonio, TX, USA.
30. Cao, Z., Lu, C. Droplet Sorting for Generation of Single Heterotypic Cell Pairs. 2014 AIChE annual meeting, Nov 16-21, Atlanta, GA, USA.
31. Cao, Z., Chen, C., He, B., Tan, K., Lu, C. Ultrasensitive Microfluidic ChIP-Seq with Small Number of Cells. 2014 AIChE annual meeting, Nov 16-21, Atlanta, GA, USA.
32. Sun, C., Wang, Y., Ouyang, M., Lu, S., Wang, Y., Lu, C. Electroporation-delivered protein biosensors for study of molecular activity. 2014 AIChE annual meeting, Nov 16-21, Atlanta, GA, USA.
33. Sun, C., Cao, Z., Geng, T., Wu, M., Lu, C. Selective intracellular labeling using microfluidic electroporation-delivered quantum dots. 2014 AIChE annual meeting, Nov 16-21, Atlanta, GA, USA.
34. Ma, S., Loufakis, D.N., Cao, Z., Chang, Y., Achenie, L.E.K., Lu, C. Diffusion-based Microfluidic PCR for "One-pot" Analysis of Cells, 2014 AIChE annual meeting, Nov 16-21, Atlanta, GA, USA.
35. Ma, S., Schroeder, B., Sun, C., Loufakis, D.N., Cao, Z., Sriranganathan, N., Lu, C. Microfluidic electroporation for delivery of cell-penetrating peptide conjugates of peptide nucleic acids (PNA) for antisense inhibition of intracellular bacteria. 2014 AIChE annual meeting, Nov 16-21, Atlanta, GA, USA.
36. Loufakis, D.N., Cao, Z., Ma, S., Mittelman, D., Lu, C. Unidirectional electrical pulses for cell alignment in a closed microfluidic chamber. 2014 BMES annual meeting, Oct 22-25, San Antonio, TX, USA.
37. Lu, C., Ma, S., Loufakis, D.N., Cao, Z., Chang, Y., Achenie, L.E.K., Diffusion-based Microfluidic PCR for "One-pot" Analysis of Cells. 2014 BMES annual meeting, Oct 22-25, San Antonio, TX, USA.
38. Loufakis, D.N., Cao, Z.N., Ma, S., Mittelman, D., Lu, C. Alignment of cells under unidirectional electric pulses. 2013 SciX conference, Sept 29-Oct 4, 2013, Milwaukee, WI, USA.
39. Loufakis, D.N., Cao, Z.N., Ma, S., Mittelman, D., Lu, C. Cell Alignment Under Unidirectional Electropulsation In A Microfluidic Device. AIChE annual meeting, Nov 3-8, 2013, San Francisco, CA, USA.
40. Cao, Z., Chen, F., Bao, N., Xu, P., Jana, S., Jung, S., Lu, C. Sorting Droplets Based On the Number of Encapsulated Particles. AIChE annual meeting, Nov 3-8, 2013, San Francisco, CA, USA.
41. Cao, Z., Geng, S., Li, L., Lu, C. Nucleocytoplasmic Translocation of Proteins Detected By a Novel Flow Cytometry Assay without Imaging. AIChE annual meeting, Nov 3-8, 2013, San Francisco, CA, USA.
42. Sun, C., Wang, Y., Wang, Y., Lu, C. Electroporation-delivered protein biosensors for study of molecular activity. BMES annual meeting, Sept 25-28, 2013, Seattle, WA, USA.
43. Sun, C., Cao, Z., Geng, T., Wu, M., Lu, C. Intracellular Targeting with Electroporation-Delivered Quantum Dots. BMES annual meeting, Oct. 24-27, 2012, Atlanta, GA, USA.
44. Loufakis, D.N., Varghese, R., Mittelman, D., Lu, C. A Microfluidic Device for Single Cell PCR. BMES annual meeting, Oct. 24-27, 2012, Atlanta, GA, USA.
45. Zhan, Y., Loufakis, D.N., Bao, N., Lu, C. Biomechanical Study of Erythrocytes Using Microfluidic Osmotic Lysis. BMES annual meeting, Oct. 24-27, 2012, Atlanta, GA, USA.
46. Cao, Z., Chen, F., Bao, N., Xu, P., Jana, S., Jung, S., Lu, C. Droplet sorting based on the number of encapsulated particles using a solenoid valve. BMES annual meeting, Oct. 24-27, 2012, Atlanta, GA, USA.
47. Zhan, Y., Martin, V.A., Geahlen, R.L., Lu, C. One-Step Extraction of Subcellular Proteins From Eukaryotic Cells. American Institute of Chemical Engineers (AIChE) Annual Meeting, Nov. 7-12, 2010, Salt Lake City, UT, USA.

48. Geng, T., Mishra, K. Bhunia, A.K., Lu, C. Rapid and Sensitive Detection of Salmonella Using An Integrated Microfluidic Chip and Real-Time PCR. AIChE Annual Meeting, Nov. 7-12, 2010, Salt Lake City, UT, USA.
49. Geng, T., Bao, N., Litt, M., Lu, C. Microfluidic Native Chromatin Immunoprecipitation ( $\mu$ NChIP) Assay for Histone Acetylation Detection. AIChE Annual Meeting, Nov. 7-12, 2010, Salt Lake City, UT, USA.
50. Zhan, Y., Bao, N., Wang, J., Lu, C. Flow-through Electroporation for Transfection Based On Low-Frequency AC Voltage. AIChE Annual Meeting, Nov. 7-12, 2010, Salt Lake City, UT, USA.
51. Wang, J., Lu, C. Tracking Nanoparticle Uptake Into Cells by Total Internal Reflection Fluorescence Flow Cytometry. AIChE Annual Meeting, Nov. 7-12, 2010, Salt Lake City, UT, USA.
52. Bao, N., Zhan, Y., Lu, C. Microfluidic electroporative flow cytometry for studying single-cell biomechanics, The 238th ACS National Meeting, Aug. 16-20, 2009, Washington D.C.
53. Bao, N., Wang, J., Lu, C. Microfluidic electroporation for high-throughput differentiation of intracellular materials at the single-cell level, The 238th ACS National Meeting, Aug. 16-20, 2009, Washington DC, USA.
54. Bao, N., Zhan, Y., Lu, C. Microfluidic electroporative flow cytometry for studying single-cell biomechanics, AIChE Annual Meeting, Nov. 7-13, 2009, Nashville, TN, USA.
55. Zhan, Y., Wang, J., Bao, N., Lu, C. Electroporation of cells in microfluidic droplets, AIChE Annual Meeting, Nov. 7-13, 2009, Nashville, TN, USA.
56. Wang, J., Fei, B., Geahlen, R.L., Lu, C. Nucleocytoplasmic Trafficking of NF-Kappa B Studied by Microfluidic Electroporative Flow Cytometry, AIChE Annual Meeting, Nov. 7-13, 2009, Nashville, TN, USA.
57. Wang, J., Zhan, Y., Ugaz, V.M., Lu, C. Enhanced Gene Delivery by Transverse Cell Migration During Flow-through Electroporation. AIChE Annual Meeting, Nov. 7-13, 2009, Nashville, TN, USA.
58. Wang, J., Bao, N., Paris, L.L., Geahlen, R.L., Lu, C. Total Internal Reflection Fluorescence Flow Cytometry, AIChE Annual Meeting, Nov. 7-13, 2009, Nashville, TN, USA.
59. Geng, T., Bao, N., Gall, O.Z., Lu, C. Modulating DNA Adsorption on Silica Beads in an Electrically Actuated Microfluidic Device. AIChE Annual Meeting, Nov. 7-13, 2009, Nashville, TN, USA.
60. Geng, T., Zhan, Y., Wang, H.Y., Witting, S.R., Cornetta, K.G., Lu, C. Flow-through Electroporation for Large-Volume Transfection of Cells. AIChE Annual Meeting, Nov. 7-13, 2009, Nashville, TN, USA.
61. Wang, J., Stine, M.J. and Lu, C. (Poster) Microfluidic cell electroporation using a mechanical valve. American Physical Society (APS) annual march meeting, March 11, 2008, New Orleans, LA.
62. Lu, C., Wang, J., Bao, N., Wang, H.Y., Geahlen, R.L. Detection of kinase translocation using microfluidic electroporative flow cytometry. (Focus Session: DNA and Biofluid Analysis with Micro and Nano Fluidic Devices). APS annual march meeting, March 12, 2008, New Orleans, LA.
63. Bao, N., Lu, C. (Poster) A Microfluidic Device for Physical Extraction of Intracellular Proteins from Bacterial Cells. Biomedical Engineering Society (BMES) annual Fall meeting, October 2-4, 2008, St. Louis, MO.
64. Geng, T. , Zhan, Y.H. and Lu, C. (Poster) Scale-up and optimization of flow-through electroporation for gene delivery. BMES annual Fall meeting, October 2-4, 2008, St. Louis, MO.
65. Wang, J. , Stine, M.J. and Lu, C. (Poster) Microfluidic cell electroporation using a mechanical valve. BMES annual Fall meeting, October 2-4, 2008, St. Louis, MO.
66. Wang, J., Bao, N., Paris, L.L., Wang, H.Y., Geahlen, R.L. and Lu, C. (Poster) Detection of kinase translocation using microfluidic electroporative flow cytometry. BMES annual Fall meeting, October 2-4, 2008, St. Louis, MO.
67. Bao, N., Lu, C. A Microfluidic Device for Physical Extraction of Intracellular Proteins from Bacterial Cells. AIChE annual meeting, November 16-21, 2008, Philadelphia, PA.

68. Wang, H.Y., Bao, N. and Lu, C. A microfluidic cell array with individually addressable culture chambers. AICHE annual meeting, November 16-21, 2008, Philadelphia, PA.
69. Wang, J. , Stine, M.J. and Lu, C. Microfluidic cell electroporation using a mechanical valve. AICHE annual meeting, November 16-21, 2008, Philadelphia, PA.
70. Wang, J., Bao, N., Paris, L.L., Wang, H.Y., Geahlen, R.L. and Lu, C. Detection of kinase translocation using microfluidic electroporative flow cytometry. AICHE annual meeting, November 16-21, 2008, Philadelphia, PA.
71. Wang, H.Y. and Lu, C. Microfluidics-based electroporative delivery of small molecules and genes into cells under constant voltage. 234th American Chemical Society (ACS) National Meeting, Boston, MA, August 19-23, 2007.
72. Wang, J. and Lu, C. Single molecule Lamda-DNA stretching studied by microfluidics and single particle tracking. AICHE annual meeting, November 4-9, 2007, Salt lake city, Utah.
73. Wang, F., Wang, H., Wang, J., Wang, H.Y., Rummel, P.L., Garimella, S.V. and Lu, C. Microfluidic delivery of small molecules into mammalian cells based on hydrodynamic focusing. AICHE annual meeting, November 4-9, 2007, Salt lake city, Utah.
74. Bao, N., Wang, J. and Lu, C. Differential release of intracellular molecules during electroporation observed at the single cell level. AICHE annual meeting, November 4-9, 2007, Salt lake city, Utah.
75. Wang, J. and Lu, C. Microfluidic cell fusion under constant direct current voltage. AICHE annual meeting, November 4-9, 2007, Salt lake city, Utah.
76. Bao, N., Jagadeesan, B., Bhunia, A.K., and Lu, C. Determination of the number of bacteria based on autofluorescence on a microfluidic chip. AICHE annual meeting, November 4-9, 2007, Salt lake city, Utah.
77. Wang, H.Y. and Lu, C. Electroporation of mammalian cells in a microfluidic channel with geometric variation. 2006 AICHE/AES annual meeting, November 12-17, 2006, San Francisco, CA.
78. Wang, H.Y. and Lu, C. Microfluidic chemical cytometry based on modulation of local field strength. 2006 AICHE/AES annual meeting, November 12-17, 2006, San Francisco, CA.
79. Wang, H.Y. , Mascarenhas, N., Kothari, S.A., Lu, C. Delivery of molecules and DNA into mammalian cells by electroporation on a microfluidic device. 2006 AICHE/AES annual meeting, November 12-17, 2006, San Francisco, CA.
80. Wang, H.Y. and Lu, C. High-throughput and real-time study of single cell electroporation using microfluidics: effects of medium osmolarity. 2006 AICHE/AES annual meeting, November 12-17, 2006, San Francisco, CA.
81. Lu, C. and Wang, H.Y. Microfluidic electroporation for analysis of intracellular materials at single cell level. 2006 MRS fall meeting, November 27-December 1, 2006, Boston, MA.
82. Wang, H.Y., Banada, P.P., Jagadeesan, B., Bhunia, A.K., Lu, C. Microfluidic devices for processing and analyzing bacterial cells. Optics East 2005, SPIE, Oct. 23-26, Boston, MA.
83. Wang, H.-Y., Jagadeesan, B., Bhunia, A.K., Lu, C. Integrated cell lysis and electrophoresis-based immunoassay for bacteria detection on a microfluidic chip. 2005 AICHE/AES annual meeting, October 30 - November 4, Cincinnati, OH.
84. Wang, H.-Y., Banada, P.P., Bhunia, A.K., Lu, C. Continuous lysis of cells in a locally concentrated DC field on a microfluidic chip. 2005 AICHE/AES annual meeting, October 30 - November 4, Cincinnati, OH.
85. Lu, C., Gold, S.A., Chu, K., Masel, R.I. Functionalized nanoporous semiconductors: active proton exchange membranes for micro fuel cells, 2003 AICHE annual meeting, November 16-21, San Francisco, CA.
86. Lu, C., Craighead, H.G., Walker, L.P. Protein transport and separation on a glass microchip, 2003 AICHE annual meeting, November 16-21, San Francisco, CA.

87. Lu, C., Gold, S.A., Chu, K., Masel, R.I. Functionalized nanoporous semiconductors: active proton exchange membranes for micro fuel cells, 2003 Materials Research Society (MRS) Fall meeting, December 1-5, Boston, MA.
88. Lu, C., Craighead, H.G., Walker, L.P. Protein transport and separation on a glass microchip, 2003 MRS Fall meeting, December 1-5, Boston, MA.
89. Lu, C., Rice, C., Masel, R.I., Lu, G.Q., Waszczuk, P., Wieckowski, A. The fundamental basis of CO tolerance in fuel cells, 2001 AIChE annual meeting, November 4-9, Reno, NV.
90. Lu, C., Masel, R.I. The effect of ruthenium on the binding of CO, H<sub>2</sub> and water on Pt(110), 2001 AIChE annual meeting, November 4-9, Reno, NV.
91. Lu, C., Thomas, F.S., Lee, I.C., and Masel, R.I. Chemistry of methoxonium on (2x1)Pt(110), 2000 AIChE annual meeting, November 12-17, Los Angeles, CA.

## **MEDIA COVERAGE**

1. "Are psychedelics superior for treating mental illness? Potentially, yes". *BioTechniques*, Dec 7, 2021.
2. "Psychedelics show promise in treating mental illness: Genomic analysis process developed at Virginia Tech helps scientists see why." *VT news*, Nov 18, 2021.
3. "Single dose of a psychedelic drug alters neurons' structure and gene environment". *VCU news*, Nov 8, 2021.
4. "Highly sensitive epigenomic technology combats disease". *VT news*, Nov 25, 2019.
5. "Epigenetic changes guide development of different brain regions". *Dana Foundation*, July 11, 2018.
6. "Difference in gene switching discovered in different parts of brain". *Virginia Tech news*. April 26, 2018.
7. "Virginia Tech team develops microfluidic technique for low-input ChIP-seq." *GenomeWeb*, April 19, 2018.
8. "Epigenomic tool breakthrough has implications for identifying disease processes." *Virginia Tech news*, March 9, 2018.
9. "Research highlights: microfluidic-enabled single-cell epigenetics." *Lab on a Chip*, Oct, 2015.
10. "Microfluidic ChIP makes a few cells go a long way". *Epigenie*, September 11, 2015.
11. "Well-washed ChIP-seq profiles the epigenome with just 100 cells". *GEN (Genetic Engineering & Biotechnology News)*, July 28, 2015.
12. "ChIP-seq Gets Fresh." *BioTechniques*, Sept 9, 2015.
13. "New technique can help scientists conduct epigenomic analysis with just 100 cells." *Tech Times*, July 28, 2015.
14. "New technology helps personalized medicine by enabling epigenomic analysis with a mere 100 cells" *Virginia Tech News*, July 28, 2015.
15. "Researchers follow a protein's travel inside cells to improve patient monitoring, develop drugs" *Virginia Tech COE news, Virginia Tech News*, May 5, 2014.
16. "NIH awards Chang Lu \$1.3 million to further research on analyzing epigenetics" *Virginia Tech COE News*, April 15, 2014.
17. "Based on earlier successes, NIH awards new study in cancer research to Virginia Tech Chang Lu" *Virginia Tech COE News*, June 13, 2013.
18. "Droplet Orchestrator". *Marblar.com, Challenge of new technologies*. Sponsored by Royal Society of Chemistry (RSC), April-June, 2013.
19. "Transfection Practices Change with Times." *Genetic Engineering & Biotechnology News (GEN)* (Vol 31, No.15, Sept 1, 2011).
20. "Professors target gene delivery". *Academic Sourceguide, Laboratory Equipment* magazine (November 2010).



21. "A New Spin on DNA Delivery" Update in *Chemical Engineering Progress* (August 2010 page 11 and 13).
22. "More efficient methods for gene delivery." *Institute of Biological Engineering Blog* (July 11, 2010).
23. "Electroporation's Efficiency Improved, May Help DNA Delivery For Gene Therapy." *NCTimes* (July 11, 2010).
24. "A new spin on gene delivery." *Virginia Tech News* (July 12, 2010).
25. "Biotechnology: Swirling cells" Research highlight in *Nature* (Vol 466, July 8, 2010, page 163).
26. "Tackling rogue tumour cells." *Highlights in Chemical Biology* (Jan 13, 2010).
27. "Purdue researchers pioneer new cancer detection method." *The Exponent* (Oct 15, 2008).
28. "Research speeds cancer screens." *Journal and Courier* (Oct 5, 2008).
29. "Expanding cell girth indicates seriousness of breast cancer." *Purdue News* (Sept 18, 2008).
30. "Single cell analysis." *Biocompare Technology Spotlight* (Jul 14, 2008).
31. "CARS flow cytometry on a chip." *Biophotonics International* (Vol. 15, Issue 6, 2008).
32. "Flow cytometry technique detects translocating proteins." *Biophotonics International* (Vol. 15, Number 3, 2008).
33. "Purdue team develops method for detecting kinase translocation." *Proteomonitor* (Vol. 8, Number 5, Jan 31, 2008).
34. "New technique quickly detects cancer indicator." *Purdue News* (Jan 22, 2008).
35. "The power of one: A simpler, cheaper method for cell fusion." *Purdue News* (Dec 4, 2006).
36. "Single-cell analysis: quick and easy detection." *Medical Device & Diagnostic Industry* (Vol 28, Number 9, Sept 2006).
37. "The other chips: microfluidic devices come of age." Cover story, *Bioscience Technology* (Vol 31, Number 8, Aug 2006).
38. "Microchannels, electricity aid drug discovery, early diagnosis." *Purdue News* (June 21, 2006).

## **RESEARCH GRANTS**

<b>Funding category</b>	<b>Total</b>	<b>Lu lab portion</b>
Category I External Funding	\$22,139,609	\$9,837,622
Category III Internal Funding	\$2,065,845	\$1,042,030
Total	\$24,205,454	\$10,879,652

### **Category I External Funding**

<b>Agency</b>	<b>Title</b>	<b>Duration</b>	<b>Total amount</b>	<b>Investigators</b>	<b>Personal share</b>
NIH/NIGMS	Droplet microfluidic technology for single-cell epigenomic and multi-omic profiling (R01)	09/30/21-05/31/25	\$1.3M	Lu(PI), Maeso, Wang	\$811,000
NIH/NINDS	Divergent age-dependent peripheral innate immune response following TBI (R01)	07/01/21-06/30/26	\$2.5M	Theus (PI), Lu	\$449,288
Keck foundation	RNA polymerase II pausing in cellular memory	12/01/20-11/30/23	\$1,000,000	Li(PI), Nu, Shook, Hu, Wu, Lu	\$60,000

NIH/NIGMS	A low-input microfluidic ChIRP-seq technology for studying endogenous lncRNA binding (R01)	04/01/21-03/31/25	\$1,569,253	Lu (PI), Chen	\$1,146,853
USDA-APHIS	Agent Of Disease Point-Of-Care Genomics (AOD-POCgen): A Simplified Purpose-Built Platform And Improved Diagnostic Tool For Testing of Foreign Animal Diseases	02/01/21-01/31/23	\$425,925	Mor (PI), Lu, Hart	\$210,000
USDA-NIFA	Collaborative Research: CPS: Medium: Early stage plant disease detection via robotic sampling and on site metagenomic sequencing	01/15/21-01/14/24	\$612,919	Li (PI), Lu, Vinatzer	\$260,656
Wake Forest Comprehensive Cancer Center	High-throughput and high-quality single-cell technologies for epigenomic and multi-omic profiling of tumor cells	04/20-04/21	\$165,131	Lu (PI), Lin	\$99,079
AACR	Epigenetic modifications induced by TTFs in patient-derived GBM cells	07/01/20-6/30/22	\$250,000	Mittal, S. (PI), Lu	\$73,431
NIH/NCI	A tissue engineering approach to analyzing host-microbe interactions in cancer (R21)	08/01/19-07/31/21	\$358,627	Verbridge (PI), Slade, Lu	\$119,542
NIH/NCI	Understanding progesterone receptor action in obesity for endometrial cancer prevention (R01)	07/01/19-06/30/24	\$2.7M	Kim (PI, NWU), Lu	\$805,392
NIH/NHGRI	Drop-BS: high-throughput single-cell bisulfite sequencing on a microfluidic droplet platform (R21)	09/21/18-06/30/21	\$624,420	Lu (PI), Rong Li	\$502,420
Jeffress Memorial Trust	Unveiling the mystery of Innate Immune cell memory with single cell sequencing and machine learning	06/30/18-06/29/19	\$100,000	Song Li (PI), Lu (co-I), Li (co-I)	\$47,525
NIH/NCI (IMAT)	Next-generation MOWChIP-seq for high-throughput epigenomic profiling using clinically relevant samples (R33)	03/31/17-03/30/20	\$1,377,752	Lu (PI), Rong Li	\$1,072,752
NIH/NHGRI	Ultrasensitive microfluidic ChIP-MethylC-seq for integrative analysis of histone modification and DNA methylation (R21)	9/23/16-6/30/19	\$603,857	Lu	\$603,857
NIH/NHGRI	Single cell epigenomic study based on microfluidic chromatin immunoprecipitation (R21)	9/1/15-08/31/17	\$422,762	Lu, Tan (MPI)	\$347,712
NSF	Atomic scale design of nanostructures using In Situ	06/01/15-05/31/18	\$360,000	Karim (PI), Lu	\$126,723

	characterization-based kinetic model				
NIH/NIBIB	Probing dynamics in protein-DNA interactions during disease development using live animals and ultrasensitive microfluidic assays (R01)	04/01/14-03/31/18	\$1,335,237	Lu (PI), Li, Tan	\$824,333
NIH/NIBIB	3D micro-addressable tissue models to understand spatiotemporal heterogeneity in transcriptional regulation (R21)	10/1/14-09/30/16	\$406,481	Verbridge (PI), Lu	\$116,576
NIH/NIBIB	Ultrasensitive device for epigenomic profiling of stem cell differentiation (R21)	04/01/14-03/31/16	\$422,286	Tan, Lu (Multiple PI)	\$145,286
NIH/NCI	Sensitive and integrated microfluidic ChIP assays for studying transcriptional regulation in cancer development based on primary cells (R21)	05/01/13-04/30/16	\$709,029	Lu (PI), Baldwin (collaborator, UNC)	\$515,566
NSF-CBET	Travel supplement: CAREER:Transfected cell microarray technology based on microfluidic electroporation	05/01/12-08/01/12	\$2000	Lu (PI)	\$2000
NSF-CBET	GRS: CAREER:Transfected cell microarray technology based on microfluidic electroporation	08/22/12-08/21/13	\$40,991	Lu (PI)	\$40,991
NSF-CBET	Study of Protein Translocation Using Microfluidic Electroporative Flow Cytometry	09/01/10-08/31/13	\$340,000	Lu (PI), Geahlen	\$230,000
NSF-CBET	GRS: CAREER:Transfected cell microarray technology based on microfluidic electroporation	08/11/10-04/30/11	\$41,000	Lu (PI)	\$41,000
Indiana CTSI	Developing a field-use diagnostic kit for bubonic and pneumonic plague	07/30/09-12/30/09	\$10,000	C. Lu (PI)	\$10,000
USDA-ARS	Integrated Microchip Sensors for Detecting <i>Escherichia coli</i> O157:H7 and <i>Salmonella enterica</i> Based on TaqMan Assays	06/01/09-05/31/10	\$120,000	C. Lu (PI), Arun K. Bhunia	\$90,138
USDA-NRI	Nanoporous Silicon Based Sensor Array for Bacteria Detection	10/01/08-9/30/11	\$308,245	C. Lu (PI), Arun K. Bhunia	\$245,355
NSF-CBET	CAREER: Transfected cell microarray technology based on microfluidic electroporation	05/01/08-04/31/13	\$400,000	C. Lu (PI)	\$400,000

Wallace H. Coulter Foundation Early Career Award	Fluidic electroporation devices for large quantity genetic modification of cells	08/01/07-07/31/09	\$237,551	C. Lu (PI), Kenneth Cornetta (Collaborator)	\$223,099
USDA-ARS	Purdue Center for Food Safety Engineering	06/01/06-05/31/07	\$4,000,000	Linton (PI), Ladisch, Bhunia, Robinson, Hirleman, Bashir, Lu	\$217,048

## **ACADEMIC ADVISING**

### **PhD Students**

#### Former PhD students

1. Bohan Zhu, PhD in Chemical Engineering, Virginia Tech, 08/22 (current position: Postdoc at Icahn School of Medicine at Mount Sinai, New York City).
2. Qiang Zhang, PhD in Chemical Engineering, Virginia Tech, 08/22 (current position: Research Scientist, Bio-Rad, Pleasanton, CA).
3. Lynette Naler, PhD in Chemical Engineering, Virginia Tech, 05/21 (current position: Senior research specialist, Dow Chemical, Freeport, TX).
4. Chengyu Deng, PhD in Chemical Engineering, Virginia Tech, 12/20 (current position: postdoc at UCSF).
5. Yuan-pang Hsieh, PhD in chemical engineering, Virginia Tech, 5/20 (current position: Postdoc at Stanford University).
6. Travis Murphy, PhD in Chemical Engineering, Virginia Tech, 5/19. (current position: Research scientist, Decisive Analytics, Arlington, VA).
7. Mimosa Sarma, PhD in Chemical Engineering, Virginia Tech, 5/19. (current position: Scientist, 10x Genomics, Pleasanton, CA.)
8. Yan Zhu, PhD in chemical engineering, Virginia Tech, 5/18. (current position: Research scientist, Thermo Fisher Scientific, San Francisco, CA)
9. Sai Ma, PhD in Biomedical Engineering, Virginia Tech, 5/17. (current position: Assistant Professor, Department of Genetics and Genomic Sciences, Icahn School of Medicine at Mount Sinai, New York City.)
10. Chen Sun, microfluidic technology for cellular analysis and molecular biotechnology, PhD in Biomedical Engineering, Virginia Tech, 3/16. (current position: Research scientist at Guardant Health, Redwood City, CA)
11. Zhenning Cao, Microfluidic engineering for ultrasensitive molecular analysis of cells, PhD in Biomedical Engineering, Virginia Tech, 10/15. (current position: research scientist at Illumina, San Diego)
12. Despina Nelie Loufakis, Microfluidics for cell manipulation and analysis. PhD in Chemical Engineering, Virginia Tech, 12/14. (current position: Research scientist, Dow Chemical, Freeport, TX)

13. Fangyuan Chen, Microfluidic droplets as compartments for chemical transfection of cells. PhD in Chemistry, Nanjing University-Virginia Tech, 08/12. (current position: Research staff, Chinese academy of sciences)
14. Tao Geng, Microfluidics for genetic and epigenetic analysis of cells. PhD in Biological Engineering, Purdue University, 05/12. (current position: Research staff, Pacific Northwest National Laboratory (PNNL))
15. Yihong Zhan, Microfluidic electroporation for gene delivery and cellular analysis. PhD in Biological Engineering, Purdue University, 12/11.
16. Jun Wang, Microfluidic devices for cellular analysis and processing, PhD in Biological Engineering, Purdue University, 12/09. (current position: Associate Professor of Biomedical Engineering, Stony Brook University)
17. Hsiang-Yu Wang, Microfluidic electroporation and cell arrays. PhD in Chemical Engineering, Purdue University, 12/07. (current position: Professor of Engineering and System Science, National Tsing Hua University, Taiwan)

#### Current PhD Students

1. Zhengzhi Liu, PhD student in Biomedical Engineering.
2. Zirui Zhou, PhD student in Chemical Engineering.
3. Thomas Hadlock, PhD student in chemical engineering.
4. Gaoshan Li, PhD student in chemical engineering.
5. Jenna Catalano, PhD student in chemical engineering.
6. Xin Zhang, PhD student in chemical engineering.
7. Jacob Neice, MS student in chemical engineering.

#### **Master Students**

##### Former Master students

1. Hamid Hassanisaber, Flow-through electroporation in asymmetric curving microfluidic channels, M.S. in Chemical Engineering, Virginia Tech, 12/13.
2. Yousef Awwad, The effect of interleukin-1 (IL-1) concentration on single cell NF- $\kappa$ B activation in a gradient-generating microfluidic device, M.S. in Biomedical Engineering, Virginia Tech, 12/11.
3. Yihong Zhan, Gene delivery based on microfluidic electroporation, M.S.E. in Biological Engineering, Purdue University, 05/09.
4. Oren Gall, Electrical actuation of DNA adsorption on silica beads, M.S.E. in Electrical and Computer Engineering, Purdue University, 05/08.
5. Diana Jiang, Microfluidics-based electroporation to delivery small interfering RNA (siRNA), M.S. in Biological Engineering, Purdue University, 12/07.
6. Fen Wang, Microfluidic delivery of small molecules into mammalian cells based on hydrodynamic focusing, M.S.E. in Biological Engineering, Purdue University, 5/07.

#### **Undergraduate Students (partial list)**

1. Yiwen Chang, 2015, MS student in industrial engineering at University of Michigan, Ann Arbor.
2. Yining Hao, 2016, PhD student at MIT.
3. Daniel Noelle, 2012, PhD student at UCSD.
4. Mary Jane Stine, 2007, PhD student at Purdue.

#### **Postdoctoral associates and visiting scholars supervised**

1. Bo Xiong, postdoc, 04/11-10/11 (Associate Professor, Institute of Analytical Chemistry, Central China Normal University, Wuhan, China).
2. Ning Bao, postdoc, 05/06-07/11 (Professor, Nan Tong University, Nan Tong, China).

## **STUDENT AWARDS**

1. 2016 Chinese Government Award for Outstanding Self-Financed Students Abroad (\$6000 cash award), Zhenning Cao
2. 2013 Gerondelis Foundation Scholarship (\$5000), Despina Nelie Loufakis
3. 2011 Chinese Government Award for Outstanding Self-Financed Students Abroad (\$6000 cash award), Tao Geng
4. 2011 Chemical and Biological Microsystems Society (CBMS) Student/Young Researcher Travel Grant, Tao Geng
5. 2011 Purdue Graduate Student Government (PGSG) Travel Grant Award, Yihong Zhan
6. 2009 Dimitris N. Chorafas Foundation Award for Outstanding PhD Thesis (one of the two Purdue awardees), Jun Wang
7. 2009 Departmental Outstanding PhD Student Award, Jun Wang
8. 2009 Bilsland Fellowship, Jun Wang
9. 2009 Purdue Graduate Student Government (PGSG) Travel Grant Award, Yihong Zhan
10. 2008 American Electrophoresis Society (AES) Travel Grant Award, Jun Wang
11. 2008 Purdue University SURF Best Young Researcher Award, Yuemin Celina Chee (undergraduate, Cornell University)
12. 2006 American Electrophoresis Society (AES) Travel Grant Award, Hsiang-Yu Wang
13. 2006 American Society of Mechanical Engineers (ASME) Oral Guard Presentation Competition for District C (Region VI and VII), 2nd place, Nashley Mascarenhas (ME, undergraduate).
14. 2005 American Electrophoresis Society (AES) Travel Grant Award, Hsiang-Yu Wang

## **PROFESSIONAL SERVICE**

### **Editorial boards**

1. Biomechanics (12/2015-present)

### **Federal grant review panels**

1. NIH Special emphasis panel on Cellular Senescence Network (Chair), NIH Common Fund UG3/UH3, Apr. 1, 2022.
2. NIH Enabling Bioanalytical and Imaging Technologies (EBIT) study section, Oct, 2021.
3. NIH NIDA, the rat opioid genome project (U01), March, 2020.
4. NIH Cellular and Molecular Technologies (CMT) study section: Feb 12-13, 2020.
5. NIH Director's transformative research award, Feb 28, 2019.
6. NHGRI Novel Genomic technology development, Feb 13, 2019
7. NCI IMAT R21/R33 panel, June 6, 2018.
8. Special emphasis panel on CFS/ME, Nov 1, 2017.
9. NIH NIBIB Trailblazer award, June 23, 2017.
10. NIH NHGRI, Advanced Genomic Technology Development (R01, R21, R43/44), March 15, 2017.
11. NIH Instrumentation and Systems Development (ISD) Study Section, Feb 15-16, 2017.
12. NIH NCI, Cancer Detection, Diagnosis and Treatment Technologies for Global Health (UH2/UH3), June 29, 2016.
13. NIH Instrumentation and Systems Development (ISD) Study Section, June 7-8, 2016.
14. NIH NCI IMAT "Innovative Molecular Analysis Technologies for Cancer Research" R21 review panel, March 8, 2016.
15. NIH NCI IMAT "Advanced Development and Validation of Emerging Molecular Analysis Technologies for Cancer Research (R33)" review panel, Nov 18, 2015.

16. NIH Brain Initiative: New Concepts and Early-Stage Research for Large-Scale Recording and Modulation in the Nervous System, July 13-14, 2015.
17. NIH Instrumentation and Systems Development (ISD) Study Section, Feb 17-18, 2015.
18. NIH Instrumentation and Systems Development (ISD) Study Section, Oct 8-9, 2014.
19. NIH NCI IMAT “Early-Stage Innovative Technologies Development” review panel, July 31, 2014.
20. NIH common fund, Single Cell Analysis program, May 8, 2012.
21. NIH Small business: Cell, Computational, and Molecular Biology, Nov 10, 2011.
22. NIH Small Business: Basic and Integrative Bioengineering, July 18-19, 2011.
23. NSF, CBET Biotechnology, Biochemical and Biomass Engineering (BBBE) program, Jan 2011.
24. NIH Cell Biology and Molecular Imaging SBIR/STTR review panel, June 30, 2010.
25. NIH Special Emphasis (Challenge grants) Panel 2009/10, July 2009.
26. NIH Study Section, cell biology and instrumentation, July 2009.
27. NSF, CBET, Biotechnology, Biochemical and Biomass Engineering (BBBE) Program, June 2009.
28. NSF, CBET Biotechnology program 2008.
29. USDA, 1890 Institutions Capacity Building Grants Program, 2007.
30. NSF SBIR Technologies for cellular analysis, 2007.
31. USDA, 1890 Institutions Capacity Building Grants Program, 2006.

#### **Mail-in grant reviewer**

1. Canada Research Chair nominations, Tier 1, Nov 2016.
2. Oak Ridge Associated Universities (ORAU) Proposal review, May and Sept 2014, Oct 2015, Dec 2016.
3. American Association for the Advancement of Science (AAAS) Research Competitiveness Program, August 2012
4. Louisiana Board of Regents, Oct 2009
5. Canada British Columbia Natural Resources and Applied Sciences (NRAS) Endowment, Oct 2009
6. NSF Inorganic Chemistry, Jan 2009
7. NSF MCB Cellular systems, Sept 2008.
8. NASA EPSCoR program, 2007.
9. American Chemical Society PRF grants, 2007.
10. Louisiana state board of trustees, 2007.
11. Missouri state research grants, 2007.
12. BARD, the United States - Israel Binational Agricultural Research & Development Fund, FY 2006.
13. CICEET (The Cooperative Institute for Coastal and Estuarine Environmental Technology) FY 2006 Environmental Technology Development.

#### **Journal peer reviewer**

*Nature Methods, Nature Biomedical Engineering, Nature Protocols, Nature Communications, Science Advances, PNAS, Molecular Psychiatry, Journal of Clinical Investigation, Nucleic Acids Research, Genome Biology, Plos Biology, Communications Biology, Journal of American Chemical Society, Chemical Reviews, Advanced Materials, Advanced Science, Analytical Chemistry, Lab on a Chip, Journal of Controlled Release, Chemical Communications, Nanomedicine, Biosensors and Bioelectronics, Applied Physics Letters, Langmuir, Optics Express, Electrophoresis, Analyst, Journal of Chromatography A, Biotechnology and Bioengineering, Microfluidics and Nanofluidics, Analytica Chimica Acta, Biomicrofluidics, Biotechnology Journal, Journal of Microelectromechanical Systems.*

#### **National/international organization and society**

1. 2022 AIMBE fellow review committee member (Biotech and Pharma).
2. 2021 AIMBE fellow review committee member (Biosensors and nanotechnology).

3. 2013 AIChE annual meeting, session co-chair: T3008 Electroporation, Electrophysiology and Cell Electrokinetics.
4. 2008 AIChE annual meeting session chair: T3008 BioMEMS and Microfluidics: Sensing, Detection, and Integration
5. 2007 AIChE annual meeting, session chair: T3008 BioMEMS and Microfluidics: Sensing, Detection, and Integration; co-chair: 15B15 Drug Delivery I
6. 2006 AIChE annual meeting, session chairs: T3008 BioMEMS and Microfluidics: Sensing, Detection, and Integration; 15B00 Division 15b Pharmaceuticals Poster Session

### Internal Service (2010-present)

Date	Committee	Member/chair
08/22- 08/23	Hord Endowed Professor search committee	Chair
12/20-12/21	Graduate program external review committee	Chair
11/20- 05/21	College of Engineering research task force	member
08/20-present	Graduate committee, Chemical Engineering	Chair
1/18-6/18	Chemical Engineering department head evaluation committee	Member
1/18-6/18	Interim Graduate Committee Chair, Chemical Engineering	Chair
8/17-8/20	Faculty senate	Senator
07/15-present	Promotion and Tenure Committee, Chemical Engineering	Member
10/14-05/15	Faculty search committee, chemical engineering	Member
09/13-05/14	Faculty search committee, chemical engineering (successfully hired Ayman Karim and Hongliang Xin)	Chair
08/12-08/13	Faculty search committee, Biosystems Engineering (BSE)	Member
08/11-08/20	Graduate Committee, Chemical Engineering	Member
08/10-08/11	Degree Requirements, Standards, Criteria, and Academic Policies (DRSCAP) Committee, Virginia Tech	Member
08/10-1/11	Commission on Graduate Studies and Policies, Virginia Tech	Member
08/10-5/11	Faculty search committee, Chemical Engineering	Member