

# Liang Chen

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## EDUCATION

- 2009-2014 Postdoctoral research fellow in Earth Science Division, Lawrence Berkeley National Laboratory, Berkeley, CA
- 2003-2009 Ph.D. in Applied Physics, Department of Applied Physics, Stanford University, Stanford, CA
- 1998-2003 B.S. in Physics, Special Class for Gifted Young, University of Science and Technology of China, Hefei, Anhui, China

## PROFESSIONAL EXPERIENCE

### **September 2014 - Present, *Research Scientist***

Earth Science Division (ESD) at Lawrence Berkeley National Lab

Supervisor: Dr. Hoi-Ying Holman, Staff Scientist, ESD

- Co-developer of the 2014 R&D 100 Award winning micro-printing technology---Berkeley Lab Multiplex Chemotyping Microarray.
- Applied the infrared spectroscopy analytical techniques to the study of cell wall structure of *Brachypodium*. The different natural accession lines are found to have distinct distribution of structure material in cell wall which may be exploited to fingerprint the strain identity. In addition, one mutant line is found to have significantly lower lignin content than the wild type, opening the possibility of breeding improved plants for bio-energy feedstock.

### **September 2009 - Present, *Postdoctoral Research Fellow***

Earth Science Division (ESD) at Lawrence Berkeley National Lab

Advisor: Dr. Hoi-Ying Holman, Staff Scientist, ESD

- Applied the infrared spectroscopy analytical techniques to study the electro-taxis phenomenon of Human Corneal Epithelial (HCE) cells. HCE cells are found to exhibit significant, spatially-different protein phosphorylation signals under the stimulation of 150 mV/mm electric field.
- Applied the infrared spectroscopy analytical techniques to study the low dose radiation bystander effects and discovered that the effects could span one millimeters away from the center of target and the effects of low dose radiation are qualitatively different from that of a high dose exposure.
- Developed combined fluorescence and infrared spectroscopy imaging technique to track protein phosphorylation in live PC12 cells.

- Designed, constructed and performed critical performance test on a transmembrane-based microfluidic cell culture platform for SIR-spectro-microscopy measurements.
- Designed and implemented a Matlab software package for automation of infrared spectra data analysis.

**September 2003 - August 2009, *Ph.D. Candidate***

Department of Applied Physics, Stanford University

*Dissertation Title:* Single molecule and single particle studies of neuronal axonal transport

Advisor: Professor Steven Chu, Secretary of Energy; Professor of Physics and Molecular & Cell Biology at UC-Berkeley; Emeritus Professor of Physics at Stanford University; Nobel Laureate of Physics in 1997

Co-advisor: Professor William Mobley and Professor Yanmin Yang, Department of Neurology and Neurological Sciences, Stanford University

Collaborator: Dr. Hoi-Ying Holman (ESD), Dr. Michael Martin, Dr. Hans Bechtel (Advanced Light Source, Lawrence Berkeley National Laboratory)

- Developed single molecule fluorescence imaging and image analysis technique to track the retrograde transport of nerve growth factor (NGF) in live dorsal root ganglion (DRG) neurons in real time.
- Designed and fabricated the microfluidic devices to culture compartmentalized primary neurons for isolated chemical treatment on distal axons from cell bodies.
- Constructed a dual-view single molecule imaging microscope for simultaneous tracking of retrograde transport of NGF and TrkA in DRG neurons.
- Applied the dual-view single molecule imaging and image analysis technique to study the pathogenesis of the Giant Axonal Neuropathy (GAN) disease.
- Developed a novel infrared imaging technique for detection of protein phosphorylation in live PC12 cells
- Constructed the nano-imaging devices for a proof-of-concept testing of near-field super-resolution infrared spectral imaging

**August 2007 - December 2007, *Technical Consultant to Amaxa, Inc.***

Collaborator: Amaxa, Inc., Gaithersburg, MD

- Optimized large-volume electroporation protocols for transfection of primary neurons
- Principle investigator of field testing the prototype micro-volume electroporation device for transfection of low-cell-count primary cells

**July 2007- August 2009, *Student Research Mentor***

Department of Neurology and Neurological Sciences, Stanford University School of Medicine

Student: Lisa He, Miridu Kapur, Jessica Gall

- Trained students of essential laboratory techniques, including preparation of primary neurons and cell lines, culture and transfection of primary neurons, fabrication of microfluidic device, fluorescence imaging and analysis technique
- Supervised students on summarizing and presenting experimental results and helped trouble shooting technical problems

**September 2001 – July 2003, *B.S. Thesis Research***

Department of Physics & Special Class for Gifted Young, University of Science and Technology of China (USTC)

Advisor: Dr. Chaoshu Shi, Professor of Physics, Department of Physics, USTC

- Designed and prepared novel High Efficiency Vacuum UV Photon Quantum Cutting Materials
- Prepared and structurally & spectrally characterized Tb<sup>3+</sup> doped nano ZrO<sub>2</sub> nanoparticles
- Prepared and spectrally characterized new types of rare earth doped long afterglow materials

## **TECHNICAL SKILLS**

### **Imaging Techniques**

Live cell fluorescence total-internal-reflection microscopy

Fluorescence confocal imaging

Fluorescence resonance energy transfer (FRET) imaging

Live cell Fourier transform infrared (FTIR) and synchrotron radiation Fourier transform infrared (SR-FTIR) molecular imaging

Combined fluorescence and infrared imaging

### **Biochemistry and Cell Biology Techniques**

Extensive primary tissue culture techniques (embryonic and neonatal tissues)

Protein enzymatic assays, protein fractionation, protein immunoprecipitation, recombinant protein purification, western blot, 2-D gel protein electrophoresis analysis

Cellular ligand uptake and internalization studies, cytotoxicity assays (proliferation, apoptosis)

Viral infection system (AAV and Lenti) construction, viral particle packaging and infection of primary neurons and cells

Transient cell transfection and stable cell transformation

### **Histological Techniques**

Mouse brain and spinal dissection

Immunohistochemical analysis of *in vitro* cultured primary neurons and cell lines

### **Molecular Biology Techniques**

DNA analysis (plasmid extraction, expression vector construction)

Molecular cloning, sequencing, site-directed mutagenesis

Qualitative and quantitative PCR

### **Data analysis and Computational Skills**

Fluorescence image analysis, infrared spectra data analysis, particle tracking algorithm

Univariate and multivariate statistical Analysis (Student t-test, ANOVA, Kolmogorov-Smirnov etc)

Proficient in programming on Matlab, Java and R platform

Proficient in MS Word, PowerPoint, Excel, EndNote, OriginLab, Adobe Illustrator, MetaMorph, NIH-ImageJ, Omnic

## RESEARCH PUBLICATIONS AND PATENTS

- Louterback K, **Chen L**, Holman HY. Open-Channel Microfluidic Membrane Device for Long-Term FT-IR Spectromicroscopy of Live Adherent Cells. *Anal Chem.* 2015 May 5; 87(9):4601-6.
- “Multiplex Chemotyping Microarray (MCM) system and methods” Holman HY, Sun C, Birarda, G, **Chen L**, IB-2013-073-02 2013, international patent pending
- Zhang K, Fishel Ben Kenan R, Osakada Y, Xu W, Sinit RS, **Chen L**, Zhao X, Chen JY, Cui B, Wu C. Defective axonal transport of Rab7 GTPase results in dysregulated trophic signaling. *J Neurosci.* 2013 Apr 24; 33(17):7451-62.
- Hu P, Borglin S, Kamennaya N, **Chen L**, Park H, Mahoney L, Kijac A, Shan G, Chavarría K, Zhang C, Quinn N, Wemmer D, Holman HY, Jansson C. Metabolic phenotyping of the cyanobacterium *Synechocystis* 6803 engineered for production of alkanes and free fatty acids. *Applied Energy.* 2013 Feb;102:850-859
- **Chen L**, Holman HY, Hao Z, Hans B, Wu C, Michael M, Chu S. Synchrotron infrared measurements of protein phosphorylation in living single PC12 cells during neuronal differentiation. *Anal Chem.* 2012 May 1;84(9):4118-25
- Lacayo CI, Malkin AJ, Holman HY, **Chen L**, Ding SY, Hwang MS, Thelen MP. Imaging cell wall architecture in single *Zinnia elegans* tracheary elements. *Plant Physiol.* 2010 Sep; 154(1):121-33.
- Zhang K, Osakada Y, Vrljic M, **Chen L**, Mudrakola H, Cui B, Single-molecule imaging of NGF axonal transport in microfluidic devices. *Lab on a Chip*, DOI: 10.1039/c003385e (2010).
- Wu C, Cui B., He L, **Chen L**, Mobley WC. The Coming of Age of Axonal Neurotrophin Signaling Endosomes. *Journal of Proteomics*, 2009 Feb 15;72(1):46-55
- Cui B, Wu C, **Chen L**, Ramirez A, Mobley WC, Chu S. One at a time: tracking NGF retrograde transport in live neurons. *Proc. Natl. Acad. Sci. USA*, 2007 Aug 21;104(34):13666-71

## INVITED TALKS & CONFERENCE ABSTRACTS

- “Imaging the Chemistry of living cells” 2013 ALS User meeting, Lawrence Berkeley National Laboratory, Berkeley, CA, October 2013
- “Comparative molecular imaging analysis of *Brachypodium distachyon* and its mutants” the 2011 USDA-DOE Plant Feedstock Genomics for Bioenergy Awardee Meeting, Arlington, VA, April 2011

- “Single molecule and Single particle studies of Neural Axonal Transport”, dissertation defense public seminar, Department of Applied Physics, Stanford University, Stanford, CA, October 2008
- “Role of Rab5- and Rab7-Endocytic Vesicles in Regulating Trafficking and Signaling of NGF”, Gordon research conference on Molecular & Cellular Neurobiology, Hong Kong University of Science and Technology, Hong Kong, China, June 2008
- “Single molecule imaging of NGF transport in a microfluidic device” , Gordon research conference on Molecular & Cellular Neurobiology, Hong Kong University of Science and Technology, Hong Kong, China, June 2008
- “One at a time: live tracking of NGF axonal transport using quantum dots”, 2007 ALS User meeting, Lawrence Berkeley National Laboratory, Berkeley, CA, October 2007
- “Methods for primary dorsal root ganglion(DRG) neuron transfection”, 2007 Amaxa Biosystems conference on Nucleofector Technology for primary cells, Stanford University, Stanford, CA, April 2007
- “Tracking NGF & its receptor transport in live DRG Neurons”, Neuroscience departmental Seminar, Stanford University, CA, January 2007
- “One at a time: Direct visualization of NGF retrograde transport in live DRG neurons” Bio-X Center Departmental seminar, Shanghai Jiao Tong University, Shanghai, China, July 2006
- “One at a time: live tracking of NGF retrograde transport using quantum dots”, Gordon research conference on Neurotrophic Factors, Salve Regina University, Newport, RI, June 2007
- “A High-Resolution Analysis of Axonal Trafficking of NGF Using Quantum Dots”, Gordon research conference on Neurotrophic Factors, Salve Regina University, Newport, RI, June 2007
- “Simultaneous Tracking of NGF and TrkA Retrograde Transport at the Single Molecule Level ”, Biophysical Society 51th Annual Meeting, Baltimore, MD, March 2007
- “Direct observation of NGF retrograde transport in live neurons at single molecular level”, Biophysical Society 50th Annual Meeting, Salt Lake City, UT, February 2006
- “Amyloid Precursor Protein C-Terminal Fragments Form Larger Aggregates and are Trafficked More Slowly than Full-Length Counterparts”, Alzheimer's Research Symposium, Stanford University, Stanford, CA, June 2007

## **HONORS & AWARDS**

- Member of the 2014 R&D 100 Award winner team of “Berkeley Lab Multiplex Chemotyping Microarray”
- Research Assistant Fellowship, Department of Neurology and Neurological Sciences, Stanford University , 2008-2009
- Research Assistant Fellowship, Department of Applied Physics, Stanford University , 2003-2008
- Outstanding Student Scholarship, University of Science and technology of China, 1999-2003
- Admission awarded to the Special Class for Gifted Young (SCGY) of USTC before graduation from high school, 1998
- Chen Xiangmei Scholarship, the Chen Xiangmei Foundation, 1995
- The Bronze medal award in the 5<sup>th</sup> “Hua Luogeng Gold Cup” National Junior Mathematics Competition, China, 1995