

## Tsai-Yi Lu, Ph.D.

The Solomon H. Snyder Department of Neuroscience  
The Johns Hopkins University School of Medicine  
725 N. Wolfe St. / PCTB 817  
Baltimore, MD 21205  
Tel: (410)955-6949  
E-mail: [tlu24@jhmi.edu](mailto:tlu24@jhmi.edu), [tsaiyilu@gmail.com](mailto:tsaiyilu@gmail.com)

### RESEARCH INTERESTS

I am interested in understanding the molecular basis of neuron–glia communications under both physiological and pathological conditions. My most recent research focuses on how brain activity alters the intracellular signaling of oligodendrocyte precursor cells (OPCs), the least-understood glial cells in the brain. My future goal is to study how OPCs and the differentiated oligodendrocytes adapt to the changing environment and maintain homeostasis throughout life.

### ACADEMIC EXPERIENCE AND EDUCATION

- 2022 – present**      **Research Associate** (Advisor: Dwight E. Bergles, Ph.D.)  
Johns Hopkins University, Baltimore, MD, USA
- Investigating the role of neuropeptides in regulating oligodendrocyte precursor cell proliferation and differentiation (Lu et al., manuscript in preparation).
- 2017 – 2022**      **Research Fellow** (Advisor: Dwight E. Bergles, Ph.D.)  
Johns Hopkins University, Baltimore, MD, USA
- Studying the regulation of calcium dynamics in oligodendrocyte precursor cells and myelin plasticity (Lu et al., *bioRxiv*; in revision at *Nature Neuroscience*).
- 2015 – 2016**      **Postdoctoral Scholar** (Advisor: Baljit S. Khakh, Ph.D.)  
University of California, Los Angeles, Los Angeles, CA, USA
- Co-developed and characterized a novel transgenic mouse line (*Aldh111-CreER*) to investigate astrocyte functions in the brain (Co-first author in Srinivasan, Lu, and Hua et al., *Neuron*).
  - Co-developed and advanced the techniques of using open-source miniaturized fluorescence microscopes (UCLA Miniscopes) to record brain activity in freely-moving mice (<http://miniscopes.org>).
- 2008 – 2015**      **Ph.D.** in Neurobiology (Advisor: Marc R. Freeman, Ph.D.)  
University of Massachusetts Medical School, Worcester, MA, USA
- Identified genes required for glial responses to axonal injury using *Drosophila* as the model organism (Lu et al., *PNAS* and Lu et al., *Nat. Commun.*)
- 2004 – 2006**      **M.S.** in Microbiology (Advisor: Lih-Hwa Hwang, Ph.D.)  
National Taiwan University College of Medicine, Taipei, Taiwan

- Demonstrated the anti-interferon alpha mechanism of hepatitis C virus non-structural protein 4B in the master's thesis: "The Effects of Hepatitis C Virus on Cellular Interferon Alpha Responses".

2000 – 2004

**B.S.** in Biological Sciences and Technology

National Yang Ming Chiao Tung University, Hsinchu, Taiwan

## PREPRINT

**Lu, T.-Y.**, Hanumaihari, P., Hsu, E.T., Agarwal, A. and Bergles, D.E. (2022) "Norepinephrine enhances oligodendrocyte precursor cell calcium dynamics in the cerebral cortex during arousal." *bioRxiv* 2022.08.25.505119. DOI: [10.1101/2022.08.25.505119](https://doi.org/10.1101/2022.08.25.505119)

## PUBLICATIONS

**Lu, T.-Y.**, MacDonald, J.M., Neukomm, L.J., Sheehan, A.E., Bradshaw, R., Logan, M.A. and Freeman, M.R. (2017). "Axon Degeneration Induces Glial Responses through Draper-TRAF4-JNK Signalling." *Nature Communications*, 8:14355. DOI: [10.1038/ncomms14355](https://doi.org/10.1038/ncomms14355)

Srinivasan, R.\* , **Lu, T.-Y.\***, Chai, H.\* , Xu, J., Huang, B.S., Golshani, P., Coppola, G. and Khakh, B.S. (2016). "New Transgenic Mouse Lines for Selectively Targeting Astrocytes and Studying Calcium Signals in Astrocyte Processes In Situ and In Vivo." *Neuron*, 92: 1181-95. \*: Equal contributions. DOI: [10.1016/j.neuron.2016.11.030](https://doi.org/10.1016/j.neuron.2016.11.030)

Doherty, J., Sheehan, A.E., Bradshaw, R., Fox, A.N., **Lu, T.-Y.** and Freeman, M.R. (2014). "PI3K Signaling and Stat92E Converge to Modulate Glial Responsiveness to Axonal Injury." *PLoS Biology*, 12:e1001985. DOI: [10.1371/journal.pbio.1001985](https://doi.org/10.1371/journal.pbio.1001985)

**Lu, T.-Y.**, Doherty, J. and Freeman, M.R. (2014). "DRK/DOS/SOS Converge with Crk/Mbc/dCed-12 to Activate Rac1 during Glial Engulfment of Axonal Debris." *Proceedings of the National Academy of Sciences of the United States of America*, 111:12544-9. DOI: [10.1073/pnas.1403450111](https://doi.org/10.1073/pnas.1403450111)

Huang, C.-Y., **Lu, T.-Y.**, Bair, C.-H., Chang, Y.-S., Jwo, J.-K. and Chang, W. (2008). "A Novel Cellular Protein, VPEF, Facilitates Vaccinia Virus Penetration into HeLa Cells through Fluid Phase Endocytosis." *Journal of Virology*, 82:7988-99. DOI: [10.1128/JVI.00894-08](https://doi.org/10.1128/JVI.00894-08)

Tsai, Y.-H., Kuang, W.-F., **Lu, T.-Y.**, Kao, J.-H., Lai, M.-Y., Liu, C.-J., Chen, P.-J. and Hwang, L.-H. (2008). "The Non-Structural 5A Protein of Hepatitis C Virus Exhibits Genotype Differences in Interferon Antagonism." *Journal of Hepatology*, 49:899-907. DOI: [10.1016/j.jhep.2008.06.030](https://doi.org/10.1016/j.jhep.2008.06.030)

## MANUSCRIPT IN PREPARATION

**Lu, T.-Y.**, Sypek, E.I., Mironova, Y.A. and Bergles, D.E. "Neuropeptides Stimulate the Secretion of Neural Growth Factors from Oligodendrocyte Precursor Cells."

## SELECTED ORAL PRESENTATIONS

April 2022                      Frontiers in Neuropsychiatry Seminars at Weill Cornell Medicine (Virtual)  
"In vivo imaging of state-dependent neuromodulation of oligodendrocyte precursor cells." (**Invited talk**)

- March 2022 Baltimore Brain Series (Virtual)  
 “Noradrenergic signaling directly regulates calcium dynamics in oligodendrocyte precursor cells in the mouse cortex.” (**Abstract-selected talk**).
- November 2021 Intersections Science Fellows Symposium (Virtual)  
 “Noradrenergic signaling regulates calcium dynamics in oligodendrocyte precursor cells in the mouse cortex.” (**Flash talk competition - 3rd place**).
- September 2016 Neuroscience Program of Academic Sinica Seminar, Taipei, Taiwan  
 “Miniscopes: open-source miniaturized fluorescence microscopes to image brain cell activities in freely behaving mice.” (**Invited talk**).
- July 2016 Glia in Health and Disease at Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, USA  
 “Open-source wearable miniature microscopes to study astrocytes and astrocyte-neuron interactions in freely-behaving mice.” (**Abstract-selected talk**).
- July 2014 Glia in Health and Disease at Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, USA  
 “TRAF4 couples Draper to JNK and STAT signaling to activate glia after axonal injury.” (**Abstract-selected talk**).

## SELECTED ABSTRACTS/POSTERS

- July 2022 Glia in Health and Disease at Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, USA  
 “Norepinephrine regulates calcium dynamics in oligodendrocyte precursor cells in the mouse visual cortex.”  
Lu, T.-Y., Hanumaihgari, P., Hsu, E.T., Heo, D., Kim, A.A., Agarwal, A. and Bergles, D.E.
- May 2022 Myelin Gordon Research Conference 2022, Lucca, Italy  
 “Norepinephrine regulates calcium dynamics in oligodendrocyte precursor cells in the mouse visual cortex.”  
Lu, T.-Y., Hanumaihgari, P., Hsu, E.T., Heo, D., Kim, A.A., Agarwal, A. and Bergles, D.E.
- July 2020 Glia in Health and Disease at Cold Spring Harbor Laboratory, Cold Spring Harbor, NY, USA (Virtual)  
 “Generation of MHC class I and MHC class II reporter mice for investigation of antigen presentation by oligodendroglia.”  
 Harrington, E.P., Heo, D., Lu, T.-Y., Calabresi, P.A. and Bergles, D.E.
- December 2016 The 15<sup>th</sup> Molecular and Cellular Cognition Society Symposium, San Diego, CA, USA  
 “Using open-source wearable miniature microscopes (Miniscopes) to study astrocytes and astrocyte-neuron interactions in freely behaving mice.”  
Lu, T.-Y., Aharoni, D., Shuman, T., Cai, D.J., Silva, A.J., Golshani, P. and Khakh, B.S.

October 2012                      Frontiers in Addiction Research, National Institute on Drug Abuse Mini-Convention, New Orleans, LA, USA  
"Drosophila glia require DRK/DOS/SOS to activate RAC1 during engulfment of axonal debris."  
**Lu, T.-Y.**, Doherty, J. and Freeman, M.R.

## **AWARDS AND HONORS**

**The Solomon H. Snyder Department of Neuroscience Annual Retreat Poster Award** (September 2022).

**The Myelin Gordon Research Conference Poster Award** (May 2022).

**Intersections Science Fellows Symposium Associate** (November 2021).

**Early Career Investigator Travel Award**, National Institute on Drug Abuse Mini-Convention (October 2012).

## **GRANTS**

Co-authored the proposal for the NIH grant: Aging dependent transformation of oligodendrocyte precursor cells (R01-AG072305, PI: Dwight E. Bergles).

## **EMPLOYMENT**

July 2006 – March 2008                      **Research Assistant (Full-time)**  
Laboratory of Dr. Wen Chang  
Institute of Molecular Biology, Academia Sinica, Taipei, Taiwan  
- Determined vaccinia virus enters HeLa cells via dynamin-dependent macropinocytosis mediated by a novel cellular protein, VPEF (2nd author in Huang et al., *J. Virol.*, 2008).

## **TEACHING AND MENTORING ACTIVITIES**

Spring 2020 – present                      **Undergraduate Research Mentor**  
Johns Hopkins University, Baltimore, MD, USA  
- Instructing undergraduate students to perform independent laboratory studies using mouse genetics, primary cell culture, immunohistochemistry, ImageJ and MATLAB to understand the homeostasis of oligodendrocyte lineage cells (Received the 2021 Provost's Undergraduate Research Award).  
- Provided recommendations and career advice as needed.

Fall 2021    **Part-time Lecturer**  
Morgan State University ASCEND (A Student Centered Entrepreneurship Development) Program, Baltimore, MD, USA  
- Introduced methods used in contemporary basic science research and helped the ASCEND undergraduate scholars to develop their own research proposals.

November 2016                                      **Instructor**

The 15th Annual Molecular and Cellular Cognition Society  
Workshop, San Diego, CA, USA

- Explained the principle, assembly and applications of the open-source fluorescence miniature microscopes (UCLA Miniscopes).

Spring and Fall 2016

**Lecturer**

Imaging the Behaving Brain with Miniscopes Workshop at the  
University of California, Los Angeles, Los Angeles, CA, USA

- Explained the principle, assembly and applications of the open-source fluorescence miniature microscopes (UCLA Miniscopes).

**SELECTED VOLUNTEER ACTIVITIES**

Marc 2023

**Co-Founder of the Solomon H. Snyder Department of  
Neuroscience Postdoc Seminar Series**

The Solomon H. Snyder Department of Neuroscience, Johns  
Hopkins University, Baltimore, MD, USA

- Create and curate the first seminar series for postdoctoral scholars to share their research and network with the neuroscience community at Johns Hopkins University.

Fall 2022 – present

**Postdoctoral Member, Committee on Diversity and Inclusion**

The Solomon H. Snyder Department of Neuroscience, Johns  
Hopkins University, Baltimore, MD, USA

- Developing plans to increase the diversity, equity and inclusion in the training environment of the department, including the recruitment of student, postdoc, and faculty to the department.

Fall 2021 – Spring 2022

**Co-Director, Baltimore Brain Series**

Baltimore, MD, USA

- Co-ordinated and hosted the semi-annual abstract competition between trainees from the Johns Hopkins University, the National Institute on Drug Abuse and the University of Maryland, Baltimore.

June 2014

**Symposium Organizer, Boston Taiwanese Biotechnology  
Symposium**

Boston, MA, USA

- Invited and hosted keynote speakers Dr. David Ho (Aaron Diamond AIDS Research Center) and Dr. Morgan Sheng (then at Genetech, Inc.).