Kai Zhang, Ph.D.

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APPOINTMENT

Assistant Professor, University of Illinois at Urbana-Champaign **2014-present**
Assistant Professor, **Department of Biochemistry**
Affiliated Faculty, Neuroscience Program
Affiliated Faculty, Cancer Center at Illinois
Affiliated Faculty, Center for Biophysical and Computational Biology
Affiliated Faculty, Beckman Institute
Affiliated Faculty, Chemistry-Biology Interface Training Program

PROFESSIONAL PREPARATION

Postdoctoral Scholar **Stanford University,** Stanford, California **2009-2014**
Department of Chemistry
Research Advisor: Dr. Bianxiao Cui

Ph.D. **University of California, Berkeley,** Berkeley, California **2002-2008**
Department of Chemistry
Research Advisor: Dr. Haw Yang
Dissertation title: Methodology Development for Single-Molecule/Particle Optical Study of Biological Systems

B.S. University of Science and Technology of China (USTC), Hefei, Anhui, PRC **1997-2002**
Department of Chemical Physics
Research Advisor: Dr. Hongfei Wang

EDITORSHIP

Journal of Molecular Biology – Associate Editor 2018-present
Edited work: Article collection: Chemogenetics and Optogenetics [Link]
Frontiers in Molecular Neuroscience
- Review Editor 2015-2019
- Associate Editor 2020-present

HONORS AND AWARDS

Scialog Fellow	*Research Corporation for Science Advancement*	**2020**
Spotlight on Early Career Researchers	Journal of Molecular Biology	**2017**
Innovative Teaching and Learning Grant	*UIUC*	**2016**
American Cancer Society Postdoctoral Fellowship	*American Cancer Society*	**2013**
Biophysical Society Education Travel Award	*Biophysical Society*	**2013**
American Society for Cell Biology (ASCB) Travel Award	*ASCB*	**2012**
Irving Fatt/Samuel Ruben Award	*UC Berkeley*	**2004**
Guo Moruo Fellowship, Top Fellowship	*USTC*	**2001**
Award for Best Undergraduate Research	*USTC*	**2001**
Asian Spectra Physics Corporation Fellowship	*USTC*	**2000**
Legend (now Lenovo) Fellowship	*USTC*	**1999**
He Duohui Academician Fellowship	*USTC*	**1998**
Outstanding Undergraduate Award	*USTC*	**1997**

RESEARCH SUPPORT

Ongoing Research Support

R01GM132438 Zhang (PI) 09/15/2019-06/30/2023
Precise regulation of native transcription factor at the single-cell level
The goal of this study is to develop an optogenetic approach to control the transcriptional activity of native transcription factor.
Role: PI

R01 MH124827 Tsai (PI), Zhang (MPI) 12/01/2020-10/31/2025
Mechanism of Gp1 mGluR-dependent translation and plasticity
The goal of this study is to determine the role of mGluR dependent translation and neuronal plasticity.
Role: PI

R03NS120516 Tsai (PI) 08/01/2020-07/31/2021
Study of PAK3 in epilepsy-associated defects in synaptic plasticity
The goal of this project is to determine how nuclear and cytoplasmic PAK3 contributes to epilepsy-associated defects in synaptic plasticity.
Role: Co-Investigator

R01 MH119149-01 Wang (PI) 04/01/2019-01/31/2024
Nonconventional role of ADCY in Gq-mediated neuronal signaling and neuroplasticity.
The goal of this study is to determine the role of adenylate cyclases (ADCY) in the development of neuroplasticity.
Role: Co-Investigator

R01MH124992 Wang (PI) 12/01/2020-10/31/2024
Mechanism underlying cognitive and synaptic flexibility

The goal of this study is to determine the role of adenylate cyclases 8-PI3K/Akt-GSK3β signaling in the regulation of synaptic depotentiation reversal/suppression of memory.
Role: Co-Investigator

Completed Research Support

American Cancer Society PF-13-030-01-DDC, Zhang (PI) 2013/01/01-2013/12/31
Cell-fate determination by light-gated MAPK and AKT signaling pathways
The goal of this study is to compare the effects of light-activated MAPK and AKT pathway on cell proliferation and differentiation.
Role: PI

R56MH118908 Wang (PI) 08/02/2019-08/01/2020
Mechanism underlying cognitive and synaptic flexibility
The goal of this study is to determine the role of adenylate cyclases 8-PI3K/Akt-GSK3β signaling in the regulation of synaptic depotentiation reversal/suppression of memory
Role: Co-Investigator

PATENT

Glimpse: generalizable light modulated protein stabilization system, UIUC Ref. No. UIUC2019-080-01(PRO).

PUBLICATIONS (*CORRESPONDING AUTHOR)

Complete List of Published Work in My Bibliography:
https://www.ncbi.nlm.nih.gov/myncbi/kai.zhang.3/bibliography/public/

Peer-reviewed journal publications – independent career (UIUC)

1. Vishnu V. Krishnamurthy, Hyojeong Hwang, Jia Fu, Jing Yang,* **Kai Zhang***, "Optogenetic control of the canonical Wnt signaling pathway during Xenopus laevis embryonic development", Journal of Molecular Biology, 2021 (in press).
2. Teak-Jung Oh†, Huaxun Fan†, Savanna S. Skeeters†, **Kai Zhang*** "Steering Molecular Activity with light: Recent Advances and Perspectives", ***Advanced Biology***, 2021, 2000180. [Link].
3. Parinaz Fathi, Ayman Roslend, Kritika Mehta, Parikshit Moitra, **Kai Zhang** and Dipanjan Pan "UV-Trained and Metal-Enhanced Fluorescence of Biliverdin and Biliverdin Nanoparticles", ***Nanoscale***, 2021, 13, 4785-4798. [Link] (Inside Front Cover)
4. Qixin Chen, Hongbao Fang, Xintian Shao, Zhiqi Tian, Yuming Zhang, Huaxun Fan, **Kai Zhang***, Weijiang He*, Zijian Guo*, Jiajie Diao*, "A dual-labeling probe to track functional mitochondria–lysosome interactions in live cells", ***Nature Communications,*** 2020,11, 6290. [Link]
5. Savanna S. Skeeters, Ana C. Rosu, Divyanshi, Jing Yang, **Kai Zhang*** "Comparative determination of cytotoxicity of sub-10-nm copper nanoparticles to prokaryotic and eukaryotic cells", ***ACS Applied Materials & Interfaces,*** 2020,12, 45, 50203–50211. [Link]

6. Qin Wang, Huaxun Fan, Feng Li, Savanna S. Skeeters3, Vishnu Krishnamurthy3, Yuanquan Song*, **Kai Zhang***, Optical control of ERK and AKT signaling promotes axon regeneration and functional recovery of PNS and CNS in Drosophila, ***eLife***, 2020, 9, e57395 [Link]. Highlighted in the School of MCB.
7. Taida Huang, Yan Zhang, Zitian Wang, Hongda Chen, Nan Wang, Huaxun Fan, Zhangsen Huang, Yixun Su, Xiaomin Huang, Hui Chen, **Kai Zhang***, Chenju Yi*, Optogenetically-controlled TrkA activity improves the regenerative capacity of hair-follicle-derived stem cells to differentiate into neurons and glia", ***Advanced Biology***, 2020, 2000134. [Link]
8. Miaoling Li§, Teak-Jung Oh§, Huaxun Fan§, Jiajie Diao*, **Kai Zhang***, "Role of SNARE protein conformation in synaptic transmission: Challenges and Perspectives", ***Journal of Molecular Biology***, 2020, 432, 4773-4782. (§ These authors contributed to this work equally).[Link]
9. Yixun Su, Xiaomin Huang, Zhangsen Huang, Taida Huang, Tao Li, Huaxun Fan, **Kai Zhang***, Chenju Yi*, "Early but not Delayed RAF Activation Promotes Astrocytogenesis in Mouse Neural Progenitors Resolved by Optogenetics", ***Journal of Molecular Biology***, 2020, 432, 4358-4368 [Link].
10. Vishnu V. Krishnamurthy, Jia Fu, Teak-Jung Oh, John Khamo, Jing Yang*, **Kai Zhang*** "A Generalizable Optogenetic Strategy to Regulate Receptor Tyrosine Kinases during Vertebrate Embryonic Development", ***Journal of Molecular Biology***, 2020, 432, 10, 3149-3158. [Link]
11. Melody Esmaeili, Shelby Blythe, **Kai Zhang**, Jing Yang, Peter Klein "Loss of Competence in early development is mediated by loss of chromatin accessibility", ***Developmental Biology***, 2020, 452, 1, 20-35. [Link]
12. Tyler Camp, Kritika Mehta, Stephen Sligar*, **Kai Zhang***, "Molecular Orientation Determination in Nanodiscs at the Single-Molecule Level", ***Analytical Chemistry***, 2020, 92, 2, 2229-2236 [Link].
13. Zichen Wang, Huaxun Fan, Xiao Hu, John Khamo, Jiajie Diao*, **Kai Zhang***, Taras Pogorelov* "Coaction of Electrostatic and Hydrophobic Interactions: Dynamic Constraints on Disordered TrkA Juxtamembrane Domain", ***Journal of Physical Chemistry B,*** 2019, 123, 50, 10709-10717. [Link].
14. Payel Mondal, Vishnu V. Krishnamurthy, Savanna R. Sharum, Neeka Haack, Huiwen Zhou, Jenifer Cheng, Jing Yang, **Kai Zhang*** "Repurposing protein degradation for optogenetic modulation of protein activities" ***ACS Synthetic Biology***, 2019, 8, 11, 2585-2592 [Link] (Cover)

    Highlighted in Science Daily, Nanowerk, Illinois News Bureau
15. I. Srivastava, J. S. Khamo, S. Pandit, P. Fathi, X. Huang, A. Cao, R. T. Haasch, S. Nie, **K.Zhang***, D. Pan* "Influence of Electron Acceptor and Electron Donor on the Photophysical Properties of Carbon Dots: A Comparative Investigation at the Bulk-State and Single-Particle Level. ***Advanced Functional Materials*** 2019, 1902466. [Link]

16. H. Hwang, Z. Jin, V. V. Krishnamurthy, A. Saha, P. S. Klein, B. Garcia, W. Mei, M. L. King, **K. Zhang**, J. Yang "Novel functions of the ubiquitin-independent proteasome system in regulating Xenopus germline development", ***Development***, 2019, 146, 8, dev172700. [Link]
17. P. Fathi, J. S. Khamo, X. Huang, I. Srivastava, M. B. Esch, **K. Zhang***, D. Pan* "Bulk-state and single-particle imaging are central to understanding carbon dot photo-physics and elucidating the effects of precursor composition and reaction temperature", ***Carbon***, 2019, 145, 572-585. [Link]
18. Q. Chen, X. Shao, Z. Tian, Y. Chen, P. Mondal, F. Liu, F. Wang, P. Ling*, W. He*, **K. Zhang***, Z. Guo, and J. Diao* "Nanoscale monitoring of mitochondria and lysosome interactions for drug screening and discovery", ***Nano Research***, 2019, 12, 5, 1009–1015. [Link]
19. B. Cai, L. Yu, S. R. Sharum, **K. Zhang***, J. Diao* "Single-vesicle measurement of protein-induce membrane tethering", ***Colloids and Surfaces B: Biointerfaces***, 2019, 177, 267-273. [Link].
20. J. S. Khamo, V. V. Krishnamurthy, Q. Chen, J. Diao, **K. Zhang***, "Optogenetic delineation of receptor tyrosine kinase subcircuits in PC12 cell differentiation", ***Cell Chemical Biology***, 2019, 26, 400-410 [Link]

    Highlighted in School of MCB and Neuroscience Program News at UIUC.
21. S. K. Misra, I. Srivastava, J.S. Khamo, V. V. Krishnamurthy, D. Sar, A. S. Schwartz-Duval, J. A. N. T. Soares, **K. Zhang*** and D. Pan* **"**Carbon Dots with Induced Surface Oxidation Permits Imaging at Single-Particle Level for Intracellular Studies", ***Nanoscale***, 2018, 10, 18510-18519. [Link]

    Highlight in the School of MCB at UIUC.
22. V. V. Krishnamurthy, **K. Zhang*** "Chemical physics in living cells – using light to visualize and control intracellular signal transduction" ***Chinese Journal of Chemical Physics***, 2018 31(4), 375-392. [Link]
23. K. Sung, L. F. Ferrari, W. Yang, C. Chung, X. Zhao, Y. Gu, S. Lin, **K. Zhang**, B. Cui, M. L. Pearn, M. T. Maloney, W. C. Mobley, J. D. Levine and C. Wu " Swedish Nerve Growth Factor Mutation (NGFR100W) Defines a role for TrkA and p75NTR in Nociception", ***Journal of Neuroscience***, 2018, 38(14), 3394-3413. [Link]
24. J.S. Khamo, V. V. Krishnamurthy, P. Mondal, S. R. Sharum, and **K. Zhang*** "Applications of optobiology in intact cells and multi-cellular organisms", ***Journal of Molecular Biology***, 2017, 429, 2999-3017. [Link]
25. V. V. Krishnamurthy, A. J. Turgeon, J. S. Khamo, W. Mei, P. Mondal, S. R. Sharum, J. Yang*, and **K. Zhang* "**Light-mediated, reversible modulation of protein localization and kinase activity during cell differentiation and *Xenopus* embryonic development" ***Journal of Visualized Experiments (JoVE)***, 2017, 124, e55823. [Link]
26. Y. Osakada, **K. Zhang** "Single particle tracking reveals a dynamic role of actin filaments in assisting long-range axonal transport in neurons" ***Bulletin of the Chemical Society of Japan (BCSJ)***, 2017, 90, 714-719. [Link]

27. P. Mondal, J. S. Khamo, V. V. Krishnamurthy, Q. Cai, and **K. Zhang*** "Drive the car(go)s—new modalities to control cargo trafficking in live cells" ***Frontiers in Molecular Neurosciences***, 2017, 10, 4. doi: 10.3389/fnmol.2017.00004. [Link]
28. V. V. Krishnamurthy, J.S. Khamo, W. Mei, A. J. Turgeon, H. M. Ashraf, P. Mondal, D. B. Patel, N. Risner, E. E. Cho, J. Yang*, and **K. Zhang*** "Reversible optogenetic control of kinase activity during differentiation and embryonic development" ***Development***, 2016, 143, 4085-4094. [Link]
29. V. V. Krishnamurthy, J. S. Khamo, E. Cho, C. Schornak, and **K. Zhang*** "Multiplex gene removal by two-step polymerase chain reactions", ***Analytical Biochemistry***, 2015, 481, 7-9. [Link]
30. V. V. Krishnamurthy, J. S. Khamo, E. Cho, C. Schornak, and **K. Zhang*** "Polymerase chain reaction-based gene removal from plasmids", ***Data in Brief***, 2015, 4, 75-82. [Link]

Contributed journal perspective and book chapter – independent career (UIUC)

31. **Kai Zhang***, Vishnu V. Krishnamurthy, "Enabling versatile control of molecular activity with small molecules and light", ***Journal of Molecular Biology***, 2020, 432, 19, 5209-5211. [Link]
32. Vishnu Krishnamurthy, John Khamo, Payel Mondal, Savanna Sharum, Jing Yang, and **Kai Zhang*** "Reversible Optogenetic Control of Growth Factor Signaling During Cell Differentiation and Vertebrate Embryonic Development", ***Biophotonics Congress: Optics in the Life Sciences Congress***, 2019, AW1E.1. [Link]
33. V. V. Krishnamurthy, **K. Zhang*** "Simultaneous removal of multiple DNA segments by polymerase chain reactions" ***Methods Mol Biol.***, Synthetic DNA, Ed R. Hughes. (Springer New York) 2017, 1472, 193-203. [Link]

Peer-reviewed journal publications – prior to UIUC

34. **K. Zhang*** and B. Cui* "Optogenetic control of intracellular signaling pathways", ***Trends in Biotechnology***, 2015, 33, 92-100. (*corresponding author) [Link]
35. P.D. Chowdary, D. Che, **K. Zhang**, B. Cui "Retrograde NGF axonal transport – coordination of opposite polarity motors near unidirectional motility regime" ***Biophysical Journal***, 2015, 108, 2691-2703. [Link]
36. D. L. Che, L. Duan, **K. Zhang**, B. Cui, The dual characteristics of light-induced cryptochrome 2 homo-oligomerization and hetero-dimerization for optogenetic manipulation in mammalian cells, ***ACS Synthetic Biology***, 2015, accepted. [Link]
37. L. Duan, D. Che, **K. Zhang**, Q. Ong, S. Guo, and B. Cui, Optogenetic control of molecular motors and organelle distributions in cells, ***Chemistry & Biology***, 2015, 22, 671-682. [Link]
38. Q. Ong, S. Guo, L. Duan, **K. Zhang**, E. A. Collier, and B. Cui "The Timing of Raf/ERK and AKT Activation in Protecting PC12 Cells against Oxidative Stress", ***PLOS ONE***, 2016, e0153487. [Link]
39. Q. Ong, S. Guo, **K. Zhang**, and B. Cui "U0126 Protects Cells against Oxidative Stress Independent of Its Function as a MEK Inhibitor", ***ACS Chem. Neurosci.***, 2015, 6,130–137. [Link]

40. **K. Zhang** and B. Cui "Lighting up FGFR signaling", ***Chemistry & Biology***, 2014, 21, 806-808. [Link]
41. **K. Zhang**, L. Duan, Q. Ong, Z. Lin, P. Varman, K. Sung, and B. Cui "Light-mediated kinetic control reveals the temporal effect of the Raf/Mek/ERK pathway in PC12 cell neurite outgrowth", ***PLOS ONE***, 2014, 9, e92917. [Link]
42. **K. Zhang**, R. F. B. Kenan, Y. Osakada, W. Xu, R. S. Sinit, L. Chen, X. Zhao, J-Y. Chen, B. Cui, and C. Wu "Defective Axonal Transport of Rab7 GTPase Results in Dysregulated Trophic Signaling", ***J. Neuroscience*** 2013, 33, 7451-7462. [Link]
43. W. J. Xie, **K. Zhang**, B. Cui "Functional characterization and axonal transport of quantum dot labeled BDNF", ***Integrative Biology***, 2012, 4, 953-960. [Link]
44. **K. Zhang**, Y. Osakada, W. J. Xie, and B. Cui "Automated image analysis for tracking cargo transport in axons", ***Microscopy Research and Technique*** 2011, 74, 605-613. [Link]
45. K. A. Vossel, **K. Zhang**, X. Wang, G. Q. Yu, K. Ho, B. Cui, and L. Mucke "Tau reduction ameliorates Aβ-induced impairments in axonal transport", ***Science*** 2010, 330 198. [Link]
46. **K. Zhang**, H. V. Mudrakola, L. Chen, M. Vrljic, and B. Cui "Single molecule imaging of NGF axonal transport in a microfluidic device ", ***Lab on a Chip*** 2010, 10, 2566-2573. [Link]
47. H. V. Mudrakola*, **K. Zhang***, and B. Cui "Optically resolving individual microtubules in live axons using dynamic object tracking", ***Structure*** 2009, 17, 1433-1441. [Link]
48. **K. Zhang**, W. K. Zhang, C. Y. Yang, and H. Yang "Bipolar Cellular Morphology of Malignant Melanoma in Unstained Human Melanoma Skin Tissue", ***J. Biomedical Optics*** 2009, 14, 024042. [Link]
49. S. Li, **K. Zhang**, J. M. Yang, L. W. Lin, and H. Yang "Single Quantum Dots as Local Temperature Markers", ***Nano Lett.*** 2007, 7, 3102-3105. [Link]
50. N. Ji, **K. Zhang**, H. Yang, and Y. R. Shen "Three-Dimensional Chiral Imaging by Sum Frequency Generation", ***J. Am. Chem. Soc***. 2006, 128, 3482-3483. [Link]
51. **K. Zhang**, H. Chang, A. H. Fu, A. P. Alivisatos, and H. Yang "Continuous Distribution of Emission States from Single CdSe/ZnS quantum dots", ***Nano Lett***.2006, 6, 843-847. [Link]
52. **K. Zhang** and H. Yang "Photon-by-Photon Determination of Emission Burst from Diffusion Single Chromophores", ***J. Phys. Chem. B.*** 2005, 109, 21930-21937. [Link]
53. **K. Zhang**, Z. J. Liu, and K. Y. Wang "Formation and Applications of Laser-Excited Surface Plasma Waves", ***Chinese J. Nature*** 2002, 24, 44-47.

Contributed book chapter – prior to UIUC

54. **K. Zhang**, P.D. Chowdary, and B. Cui "Visualizing directional Rab7 and TrkA cotrafficking in axons by pTIRF microscopy" ***Methods Mol Biol.***, 2015, 1298:319-29. [Link]
55. H. V. Mudrakola, C. Wu, **K. Zhang**, and B. Cui, "Single Molecule Imaging of Axonal Transport in Live Neurons", in Laser Science XXV, OSA Technical Digest (CD) (Optical Society of America, 2009), LSThB3. [Link]
56. S. Li, **K. Zhang**, J-M Yang, L.W. Lin, and H. Yang "MEMS Temperature Characterization by CdSe Quantum Dots", *The 14th International Conference on Solid-State Sensors, Actuators and Microsystems*, 2007, 1369-1372. [Link]

57. **K. Zhang**, N. Ji, Y. R. Shen, and H. Yang "Optically Active Sum Frequency Generation Microscopy for Cellular Imaging", *Ultrafast Phenomena XV* Eds. P. Corkum, D. Jonas, D. Miller, A. M. Weiner, (Springer-Verlag, Berlin Heidelberg, 2007) 825. [Link]

INVITED TALKS AND PLATFORM IN CONFERENCE

1. "Optogenetic activation of ERK and AKT signaling promotes axon regeneration in Drosophila", Biophysical Society 65th annual meeting, 2021, virtual.
2. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Optogenetic Technologies and Applications, Boston, Massachussets, December, 2019. (**Session Chair**)
3. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Xenopus Resources and Emerging Technologies Meeting, Woods Hole, Massachussets, October, 2019.
4. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", International Conference on Biomechanics and Medical Engineering (ICBME), San Diego, California, September, 2019.
5. "Reversible optogenetic control of growth factor signaling during cell differentiation and Vertebrate Embryonic Development", OSA Biophotonics Congress, Tucson, Arizona, April, 2019.
6. "Optogenetic activation and inactivation of the neurotrophin pathway in live cells" Experimental Biology, Orlando, Florida, April 2019.
7. "Temporal control of growth factor-mediated signaling pathways during cell differentiation and *Xenopus* embryonic development", American Society for Biochemistry and Molecular Biology Society Meeting, San Diego, California, April, 2018. (**Travel Award**)
8. "Using light to control the timing of kinase activity during cell differentiation and *Xenopus* embryonic development" Xenopus Resource and Emerging Technologies Meeting, Woods Hole Institute, Marine Biology Lab, Massachusetts, August 2017.
9. "Reversible optogenetic activation of neurotrophin-mediated signal transduction", Houston Methodist Research Institute, Houston, Texas, March 2017.
10. "Reversible modulation of kinase activity during embryonic development", Midwest Society of Developmental Biology Regional Meeting, Ann Arbor, Michigan, October 2016.
11. "Steering growth factor-mediated signal transduction by light", East Lake Young Scholar Symposium, Huazhong University of Science and Technology, Wuhan, China, December 2014.
12. "Defective Axonal Transport of Rab7 GTPase Results in Dysregulated Trophic Signaling", Bay Area Trafficking Symposium, UC Berkeley, California, September 2013.
13. "Impact of Charcot-Marie-Tooth type 2B disease-associated Rab7 mutations on signaling and axonal trafficking of NGF/TrkA", 56th Biophysical Society Annual Meeting, San Diego, California, February 2012. [Link]

INVITED TALKS IN UNIVERSITY AND RESEARCH INSTITUTION

14. "Optical modulation of molecular activity during neural differentiation, regeneration, and embryonic development", Department of biology, Penn State University, February 2021.
15. "Single-molecule detection, Super-resolution imaging, and optogenetics", Biological Physics for Engineers invited lecture, University of Florida, February 2021.
16. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Department of Chemistry, University of Alberta, September 2020.
17. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Department of Physiology, Michigan State University, September 2020.
18. "Optical modulation of molecular activity during neural differentiation, regeneration, and embryonic development", Department of Biochemistry, University of Illinois at Urbana-Champaign, IL, September 2020.
19. "Optical inhibition of growth factor signaling in living cells", Cancer Center at Illinois, University of Illinois at Urbana-Champaign, IL, April 2020.
20. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Department of Chemistry, University of Chicago, IL, March 2020.
21. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Department of Chemistry, Princeton University, NJ, December 2019.
22. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Department of Chemistry, University of Pennsylvania, PA, November 2019.
23. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Department of Chemistry, Stanford University, CA, November 2019.
24. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Department of Cancer Biology, University of Cincinnati, OH, October 2019.
25. "Bidirectional optogenetic control of receptor tyrosine kinase signaling during cell differentiation and embryonic development", Department of Bioengineering, University of California, San Diego, September 2019.
26. "Bidirectional optogenetic control of growth factor signaling during cell differentiation and embryonic development" Center for Physics of Living Cells, University of Illinoi at Urbana-Champaign, IL, September 2019.

27. "Delineating receptor tyrosine kinase signaling pathways during cell differentiation and embryonic development" University of Southern California, Los Angeles, CA, December 2018.
28. "Developing an optogenetic toolbox for cell signaling control in mammalian cells and multicellular organisms" Center for Physics of Living Cells (CPLC), University of Illinois at Urbana-Champaign, Urbana, Illinois, July 2017.
29. "Dissection of growth factor signal transduction during cell differentiation and Xenopus embryonic development" Harvard Medical School, Boston, Massachusetts, June 2017.
30. "Dissection of growth factor signal transduction during cell differentiation and Xenopus embryonic development" Brown University, Providence, Rhode Island, June 2017.
31. "Delineating growth factor-regulated signaling pathways by light", Department of Pathobiology of the College of Veterinary Medicine, University of Illinois at Urbana-Champaign, March 2017.
32. "Control the timing of the mitogen-activated protein kinase pathway during cell differentiation and *Xenopus* embryonic development", School of Molecular Sciences, Arizona State University, Tempe, March 2017.
33. "Light-controlled growth factor signal transduction during cell differentiation and Xenopus embryonic development", Department of Physiological and Molecular Plant Biology, University of Illinois at Urbana-Champaign, Urbana, Illinois, January 2017.
34. "Developing an optogenetic toolbox for cell signaling control" Center for Physics of Living Cells, University of Illinois at Urbana Champaign. July 2016.
35. "Study signal transduction in live cells by light", School of Molecular and Cellular Biology, University of Illinois at Urbana-Champaign, Urbana, Illinois, August 2015.
36. "Control cell fate determination by light", Center for Biophysics and Computational Biology, University of Illinois at Urbana-Champaign, Urbana, Illinois, August 2015.
37. "Control PC12 cell differentiation by light", Neuroscience program, University of Illinois at Urbana-Champaign, Urbana, Illinois February 2015.
38. "Steering growth factor-mediated signal transduction by light", Fudan University, Shanghai, China, December 2014.
39. "Steering growth factor-mediated signal transduction by light", Huazhong University of Science and Technology, Wuhan, China, December 2014.
40. "Light-controlled activation of the mitogen-activated protein kinase pathway", Center for Biophysics and Computational Biology, University of Illinois at Urbana-Champaign, Urbana, Illinois, July 2014
41. "Observation and modulation of signal transduction in live cells using light", California Institute of Technology, California, January 2013.
42. "Dysregulated axonal transport of NGF/TrkA in Charcot-Marie-Tooth type 2B disease" Biophysics Talks, Stanford University, Stanford, California, January 2012.
43. "Observing quantum dot one at a time: optical characterization and applications in live cell imaging", Peking University, P. R. China, November 2011.

44. "Single Chromophore Experiments and Quantitative Analysis", November 23, 2006, Zhengzhou University, Zhengzhou, Henan, P. R. China.

POSTER PRESENTATIONS IN CONFERENCE

45. S. R. Sharum, P. Mondal, V. V. Krishnamurthy, K. Mehta, H. Fan, J. Yang, **K. Zhang** "Optical modulation of receptor tyrosine kinase signaling during cell differentiation and embryonic development", 64th Biophysical Society Meeting, San Diego, California, February 2020.
46. Z. Wang, H. Fan, X. Hu, J. Khamo, J. Diao, **K. Zhang**, T. Pogorelov, "Coaction of electrostatic and hydrophobic interactions in signaling: dynamic constraints on disordered TrkA juxtamembrane domains", 64th Biophysical Society Meeting, San Diego, California, February 2020.
47. P. Mondal, V. V. Krishnamurthy, S. R. Sharum, N. Haack, J. Yang, **K. Zhang** "Repurposing protein degradation for optogenetic modulation of protein activities", SPIE Photonic West Bio, San Diego, California, February 2020.
48. N. Haack, P. Mondal, V. V. Krishnamurthy, S. R. Sharum, **K. Zhang** "Repurposing protein degradation for optogenetic modulation of protein activities", Society for Neuroscience, Chicago, Illinois, December 2019.
49. V. V. Krishnamurthy, J. Khamo, P. Mondal, S. R. Sharum, **K. Zhang** "Bidirectional control of receptor tyrosine signaling during cell differentiation with light", Society for Developmental biology annual meeting, Boston, Massachusetts, July 2019.
50. V. V. Krishnamurthy, J. Khamo, P. Mondal, S. R. Sharum, **K. Zhang** "Bidirectional optogenetic control of growth factor signaling during cell differentiation and vertebrate embryonic development", Gordon Research Conference, Salve Regina University, Newport, Rhode Island, June 2019.
51. S. R. Sharum, P. Mondal, K. Cho, **K. Zhang** "Temporal inhibition of ERK Activity by Optogenetic Control of MAPK Phosphatase 3" Experimental biology, Orlando, Florida, April 2019.
52. J. Khamo, **K. Zhang** "Optogenetic delineation of receptor tyrosine kinase subcircuits in pc12 cell differentiation", 63th Biophysical Society Meeting, Baltimore, Maryland, March 2019.
53. P. Mondal, V. V. Krishnamurthy, J. Khamo, J. Yang, **K. Zhang** "Temporal control of growth factor-mediated signaling pathways during cell differentiation and *Xenopus* embryonic development", American Society for Biochemistry and Molecular Biology Society Meeting, San Diego, California, April 2018. (**Travel Award**)
54. **K. Zhang** "Control neurotrophin signaling using light during PC12 cell differentiation and Xenopus embryonic development", Biophysical Society Meeting, San Francisco, California, February 2018. [Link]
55. **K. Zhang** "Dissection of growth factor-regulated signaling pathways by light", Society for Developmental biology annual meeting, Minneapolis, Minnesota, July 2017.

56. **K. Zhang** "Control neurotrophin signaling using light during cell differentiation and Xenopus embryonic development", Gordon Research Conference, Salve Regina University, Newport, Rhode Island, June 2017.
57. **K. Zhang** "Developing an optogenetic toolbox for cell signaling control", Center for Physics of Living Cells, University of Illinois at Urbana-Champaign, Urbana, Illinois, July 2016
58. **K. Zhang** "Resolving intracellular mechanisms of neurotrophin-mediated signal transduction via optogenetics" 16th International symposium on neural regeneration (ISNR), Pacific Grove, California, December 2015.
59. Q. Ong, A. McGuire, S. Guo, F Santoro, **K. Zhang**, and B. Cui "Optogenetic spatial control of TrkA-mediated pathways reveals a potential role for Raf/ERK pathway in inducing polarity in PC12 cell differentiation model" American Society for Cell Biology ASCB, San Diego, California, December 2015.
60. **K. Zhang** "Light-controlled growth factor-mediated signal transduction", 59th Biophysical Society Annual Meeting, Baltimore, Maryland, February 2015.
61. Q. Ong, **K. Zhang**, S. Guo, L. Duan, and B. Cui "Optogenetic modulation of the Raf/ERK pathway in PC12 cells", ASCB local meeting, Quantitative Imaging in Cell Biology, Santa Clara University, California, May 2014 ***(Best poster award).***
62. **K. Zhang**, L. Duan, Q. Ong, Z. Lin, P. Varman, K. Sung, and B. Cui "Light-controlled MAPK signaling pathway reveals a memory effect in PC12 cell neurite outgrowth", Single Cell Analysis Symposium, Stanford University, California, September 2013.
63. **K. Zhang**, L. Duan, Z. Lin, K. Sung, Y. Osakada, and B. Cui "Control the mitogen-activated protein kinase signaling pathway by light", Synthetic Biology Gordon Research Conference, Mount Snow Resort, Vermont, June 2013.
64. **K. Zhang**, L. Duan, Z. Lin, K. Sung, Y. Osakada, and B. Cui "Light-controlled mitogen - activated protein kinase (MAPK) signaling pathway in live cells", 57th Biophysical Society Annual Meeting, Philadelphia, Philadelphia, February 2013.
65. W. Zhao, **K. Zhang,** W. Xie, L. Hanson, Z. Lin, Y. Cui, and B. Cui "Accelerating the development of hippocampal neurons using nanopillar structures", 57th Biophysical Society Annual Meeting, Philadelphia, February 2013.
66. **K. Zhang**, L. Duan, Z. Lin, K. Sung, Y. Osakada, and B. Cui "Precise control of signal transduction in living cells by light", 2012 American Society for Cell Biology Annual Meeting, San Francisco, California, December, 2012.
67. **K. Zhang**, Y. Osakada, M. Vrljic, L. Chen, H. Mudrakola, and B. Cui "Single-molecule imaging of nerve growth factor axonal transport in microfluidic devices", 55th Biophysical Society Annual Meeting, Baltimore, Maryland, March 2011. [Link]
68. **K. Zhang**, C. Wu, H. Mudrakola, Y. Osakada, and B. Cui "Real time visualization of axonal transport of GTPase Rab7 in rat embryonic dorsal root ganglia", 54th Biophysical Society Annual Meeting, San Francisco, California, February 2010. [Link]

69. Y. Osakada, H. Mudrakola, **K. Zhang** and B. Cui "Effects of actin filaments on NGF retrograde transport", 54th Biophysical Society Annual Meeting, San Francisco, California, February 2010. [Link]
70. **K. Zhang**, W. K. Zhang, C. Y. Yang, and H. Yang "Nonlinear optical imaging of melanocytes in collagen matrix", 234th American Chemical Society National Meeting & Exposition, Boston, Massachusetts, August 2007.
71. H. Yang, **K. Zhang,** A. Fu, P. Alivisatos, C. Hayden "Studying Photoluminescence Dynamics of Single Quantum Dots Photon by Photon", American Physical Society Meeting, Baltimore, Maryland, March 2006.
72. **K. Zhang** and H. Yang "Photon-by-photon determination of emission bursts from diffusing single chromophores", American Physical Society Meeting, Baltimore, Maryland, March 2006.
73. **K. Zhang** and H. Yang "Photon-by-photon determination of emission bursts from diffusing single chromophores", 231st American Chemical Society Meeting & Exposition, Atlanta, Georgia, March 2006.
74. N. Ji, **K. Zhang**, H. Yang, and Y. R. Shen "Sum frequency generation microscopy for imaging chirality", 50th Biophysical Society Annual Meeting, Salt Lake City, Utah, February 2006.
75. **K. Zhang** and H. Yang "Field and fluorescence modification by colloidal gold nanoparticles", Materials Research Society Spring Meeting, San Francisco, California, March 2005.
76. **K. Zhang**, H. Chang, A. H. Fu, L. P. Watkins, A. P. Alivisatos, and H. Yang "Photon by photon analysis of single quantum dot emission dynamics", Materials Research Society Spring Meeting, San Francisco, California, March 2005.

TEACHING EXPERIENCE

Instructor

University of Illinois at Urbana-Champaign

Physical Biochemistry (MCB/BIOC 446, CHEM 472)	2016-present
Neuroscience Program (NEUR598, Organizer: Justin Rhodes)	2016-present
Center for Physics of Living Cells, Summer Workshop	2016-present
Tutorial (BIOP 586)	2015-present

Students: Yongjae Lee (Selvin), Chang-Ting Lin (Ha), Kai Wen Teng (Selvin), Zhiyu Zhao (Tajkhorshid), Chaoyi Jin (Selvin)

Part-time Lecturer

Biomedical, Chemical and Materials Engineering Department
San Jose State University

Graduate-division Chemical Engineering Thermodynamics 2012

Teaching Assistant

Department of Chemistry, UC Berkeley

Graduate-division Chemical Kinetics	2005
Undergraduate General Chemistry	2004
Undergraduate General Chemistry	2003

PROFESSIONAL ACTIVITIES

Grant Reviewer

Arizona Alzheimer's Disease Core Center Grant (2017)
Research Board, OVCR in UIUC (2017, 2018, 2019, 2020)

Ad Hoc reviewer – *Science, Nature Cell Biology, Nature Methods, Nature Communications, Nature Protocols, Cell Chemical Biology, Journal of American Chemical Society, ACS Synthetic Biology, Development, ACS Chemical Neuroscience, ACS Chemical biology, Current Opion in Biotechnology, Expert Opinion on Drug Discovery, Advanced Materials, Journal of Physical Chemistry B, Journal of Physical Chemistry Letter, Journal of Integrative Neurosciences, Chemical Sciences, Scientific Reports, Methods, Journal of Biomedical Optics, Frontiers in Molecular Neuroscience, Journal of Visualized Experiments, Dyes and Pigments, Experimental Neurology, Journal of Micro/nanolithography, MEMS, and MOEMS (J3M), SLAS Technology, Small* 2009-present

Mentoring

Supervisor of undergraduate students in the laboratory and current position

Cara Schornak Graduate student in Vanderbilt University. 2014-2015
Ellen Cho Biochemistry high distinction, work at Loyola University Chicago 2014-2016
Humza Ashraf Biochemistry high distinction, Summer Research Award, Graduate student at the University of Colorado, Boulder. 2015-2017
Dil Patel 2015-2017
Noah Risner 2015-2017
Adam Barm 2015-2015
Neeka Haack 2015-2019
Jennifer Cheng Biochemistry highest distinction, Outstanding Student, Outstanding Thesis Award, Graduate student in Northwestern University 2017-2018
Kelly Cho MCB Summer Undergraduate Research Fellowship, Medical School student at University of Illinois Chicago 2017-2019
Rachel Benedeck 2018-2018
Huiwen Zhou Graduate student at Northwestern University 2018-2019
Max Spiro 2019-2020
Dhananjay Shahdadpuri 2019-present
Tina Han (SURF fellowship) 2020-present
Irina Cheng 2020-present
Collin Barnes (BEST Fellow of MCB) 2021-present

Advisor for first-year rotation graduate student in MCB

2014 John Khamo, Erik Andersen
2015 Payel Mondal, Eric Shinn, Yeoan Youn
2016 Madhura Duttagupta, Nandan Haloi, Savanna Sharum
2018 Huaxun Fan, Micca Hecht, Kritika Mehta, Laura Suttenfield
2020 Jessica Palalay, Anna Mankovich, Kaylee Kuzelka, Jorge Calderin

Faculty advisor of other Biochemistry undergraduate students

Junyao Zhu, Zhouyang Zhu, Haoyuan Yan, Luis Tadeo, Tyanporn Tangpradabdul 2017-2018

Supervisor of high school students in the laboratory and current position

Ana Rosu	Johns Hopkins University	2018-2020
Sana Nabi	Herricks High School (New York) Virtual	2021

Outside Ph.D. dissertation committee

Arizona State University (Faculty: Prof. Jia Guo) 2017
University of Alberta (Student: Ms. Xiaocen Lu, Faculty: Prof. Robert E. Campbell) 2020

Memberships

Society of Developmental Biology	2016-present
Biophysical Society	2005-present
American Society for Cell Biology	2012
Optical Society of America	2009
American Chemical Society	2003 - 2006
Material Research Society	2003 - 2006
American Physical Society	2003 - 2006

Outreach

Instructor

Center for Physics of Living Cells (NSF funded) Summer workshop, UIUC 2016- present
Next generation Science Technology Engineering Art Math (STEAM) studio science demonstration (Nano Class 3-5 grade) 2017
Ecole Bilingue de Berkeley primary school Second grade, Berkeley, California 2017

Judge	Undergraduate research conference	
	East Central Illinois American Chemical Society	
	University of Illinois at Urbana-Champaign	2016
	Synopsys Championship	
	Santa Clara Valley Science and Engineering Fair Association	2009
Co-founder	Undergraduate Student Travel Award	
	University of Science and Technology of China	2008 - 2011