Bo-Jui Chang (張博睿)

Date of birth: 24th, Jan. 1978
Nationality: Taiwan
Address: Room NL 5.120GC, 5323 Harry Hines Blvd, Dallas TX 75390-9039, USA
Tel: +1(469)8184982
Email: bo-jui.chang@utsouthwestern.edu, kb0124@gmail.com
Website: http://www.researchgate.net/profile/Bo-Jui_Chang
https://scholar.google.com/citations?hl=en&user=BxmyKVoAAAAJ
https://www.ncbi.nlm.nih.gov/myncbi/bo-jui.chang.1/bibliography/public/
https://www.linkedin.com/in/bo-jui-chang-38647210a/
https://twitter.com/bojuichang

Research Interests

- Light sheet based-fluorescence microscopy
- Structured illumination microscopy
- Super-resolution microscopy
- Optical Tweezers

Current position

I am currently a Research Assistant Professor in the Lyda Hill Department of Bioinformatics, UT Southwestern Medical Center. My research focuses on bio-imaging with light-sheet fluorescence microscopy (LSFM) and super-resolution structured illumination microscopy (SIM). In addition to build LSFM and SIM, I collaborate closely with biologists to study behavior of cells, tissues, embryos, etc. in physiologically relevant environments. My work is mainly carried out within Danuser and Fiolka labs. Specifically, my duties are:

- Use cutting edge light-sheet microscope to perform 3D live imaging of single cancer cell or in the context of small organelles and spheroids.
- Use zebrafish as animal model to study cancer cell biological processes.
- Establish imaging collaborations across campus that will lead to new biological insights.
- Combine super-resolution microscopy, particularly structured illumination microscopy, single molecule localization microscopy, and expansion microscopy with light-sheet microscopy.

Experience

2022 Sep. - present	Research Assistant Professor, *Lyda Hill Department of Bioinformatics, UT Southwestern Medical Center, Dallas, U.S.A.* UTSouthwestern Medical Center
2019 Nov. – 2022 Aug	Senior research scientist, *Department of Cell Biology, UT Southwestern Medical Center, Dallas, U.S.A.* Dr. Reto Fiolka group UTSouthwestern Medical Center

2017 Sep. – 2019 Nov.	Assistant instructor, *Department of Cell Biology, UT Southwestern Medical Center, Dallas, U.S.A.* Dr. Reto Fiolka group
2016 - 2017	Postdoctor, *Research Center for Applied Sciences, Academia Sinica, Taiwan* Dr. Bi-Chang Chen group
2011 - 2016	Postdoctor, *Buchmann Institute for Molecular Life Sciences, Goethe University Frankfurt am Main, Germany* Prof. Dr. Ernst H.K. Stelzer group
2013 - 2015	Adjunct investigator, *Cluster of excellent Frankfurt Macromolecular Complexes, Germany* Prof. Dr. Ernst H.K. Stelzer group
2007 - 2011	Postdoctor, *National Synchrotron Radiation Research Center, Taiwan* Dr. Su-Yu Chiang group

Fellowship

2013 March - June	EMBO Short-term fellowship, *European Molecular Biology Organization, Germany* Prof. Dr. Ernst H.K. Stelzer group
2011 - 2012	Postdoctoral Research Abroad Program, *National Science Council, Taiwan* Prof. Dr. Ernst H.K. Stelzer group

Education

2001 - 2006	Ph.D., *Institute of Electro-Optical Engineering, National Chiao-Tung University, Taiwan* Advisor: Prof. Long Hsu and Prof. Sien Chi Thesis: Design and study of an optical tweezers system for measuring adhesion and extension properties of biological materials
1999 - 2001	M.S., *Department of Electrophysics, National Chiao-Tung University, Taiwan* Advisor: Prof. Long Hsu Thesis: Design and Application of In-focus and Off-focus Optical Tweezers

1995 - 1999	B.S., *Department of Electrophysics, National Chiao-Tung University, Taiwan*

Computer Skills

LabVIEW, MATLAB, Mathematica, Fiji(ImageJ), and Autodesk Inventor

Language

English: Proficient

Chinese: Native speaker

German: Beginner

Seminars (invited speaker)

2019 April 18th	Cancer Research UK Cambridge institute, United Kingdom, "Light sheet fluorescence microscopy: imaging from single cells to live organisms" (http://www.lightmicroscopy.cruk.cam.ac.uk/next-generation-microscopy-workshop/)
2017 April 10th	Brain Research Center, National Tsing Hua University, Taiwan (R.O.C.), "Advanced microscopic techniques other than STED and Localization microscopy: SR-SIM, LSFM, LLSM, csiLSFM"
2014 April 22nd	Graduate Institute of Electro-Optical Engineering, Chang Gung University, Taiwan (R.O.C.), "Development and Application of Coherent Structured Illumination-Light Sheet Fluorescence Microscope (csiLSFM)"
2014 April 21st	Institute of Biophotonics, National Yang-Ming University, Taiwan (R.O.C.) "Development and Application of Coherent Structured Illumination-Light Sheet Fluorescence Microscope (csiLSFM)"
2014 April 10th - 11th	Lightsheet Fluorescence Microscopy Workshop, Institute for Medical Biology (IMB), Biopolis, Singapore (http://www.imcb.a-star.edu.sg/bseminars/20140410a.pdf)
2011 April 12th	Department of Photonics, Feng Chia University, Taiwan (R.O.C.), "Super resolution structured illumination fluorescence microscopy" (http://www.photonics.fcu.edu.tw/wSite/ct?xItem=109767&ctNode=20988&mp=505101)

2009 September 24th	Department of Electrophysics, National Chiao Tung University, Taiwan (R.O.C.), "High spatial resolution image in structured illumination microscopy patterned with a spatial light modulator" (http://www.ep.nctu.edu.tw/app/news.php?Sn=376)

Publications

Preprint

1. T.Isogai, K.Dean, P.Roudot, Q.Shao, J.Cillay, E.Welf, M.Driscoll, S.Royer, N.Mittal, B.-J.Chang, S.Han, R.Fiolka, and G.Danuser, "Direct Arp2/3-vinculin binding is essential for cell spreading, but only on compliant substrates and in 3D," bioRxiv 756718 (2019)., https://doi.org/10.1101/756718 (in revision)

Journal papers

1. A. D.Weems, E. S.Welf, M. K.Driscoll, F. Y.Zhou, H.Mazloom-Farsibaf, B. J.Chang, V. S.Murali, G. M.Gihana, B. G.Weiss, J.Chi, D.Rajendran, K. M.Dean, R.Fiolka, andG.Danuser, "Blebs promote cell survival by assembling oncogenic signalling hubs," Nat. 2023 1 – 9 (2023). https://doi.org/10.1038/s41586-023-05758-6
2. B.Chen, B.-J.Chang, P.Roudot, F.Zhou, E.Sapoznik, M.Marlar-Pavey, J. B.Hayes, P. T.Brown, C.-W.Zeng, T.Lambert, J. R.Friedman, C.-L.Zhang, D. T.Burnette, D. P.Shepherd, K. M.Dean, andR. P.Fiolka, "Resolution doubling in light-sheet microscopy via oblique plane structured illumination," Nat. Methods 2022 1–8 (2022)., https://doi.org/10.1038/s41592-022-01635-8
3. B.Chen, B.-J.Chang, F. Y.Zhou, S.Daetwyler, E.Sapoznik, B. A.Nanes, B. A.Nanes, I.Terrazas, I.Terrazas, I.Terrazas, G. M.Gihana, L. P.Castro, I. S.Chan, I. S.Chan, I. S.Chan, M.Conacci-Sorrell, M.Conacci-Sorrell, M.Conacci-Sorrell, K. M.Dean, A.Millett-Sikking, A. G.York, andR.Fiolka, "Increasing the field-of-view in oblique plane microscopy via optical tiling," Biomed. Opt. Express, Vol. 13, Issue 11, pp. 5616-5627 13(11), 5616–5627 (2022)., https://doi.org/10.1364/BOE.467969
4. D.Segal, H.Mazloom-Farsibaf, B.-J.Chang, P.Roudot, D.Rajendran, S.Daetwyler, R.Fiolka, M.Warren, J. F.Amatruda, andG.Danuser, "In vivo 3D profiling of site-specific human cancer cell morphotypes in zebrafish," J. Cell Biol. 221(11), (2022)., https://doi.org/10.1083/jcb.202109100
5. E. H. K.Stelzer, F.Strobl, B.-J.Chang, F.Preusser, S.Preibisch, K.McDole, andR.Fiolka, "Light sheet fluorescence microscopy," Nat. Rev. Methods Prim. 2021 11 1(1), 1–25 (2021)., https://doi.org/10.1038/s43586-021-00069-4
6. B.-J.Chang, J. D.Manton, E.Sapoznik, T.Pohlkamp, T. S.Terrones, E. S.Welf, V. S.Murali, P.Roudot, K.Hake, L.Whitehead, A. G.York, K. M.Dean, and R.Fiolka, "Real-time multi-angle projection imaging of biological dynamics," Nat. Methods 1–6 (2021)., https://doi.org/10.1038/s41592-021-01175-7
7. E.Sapoznik, B.-J.Chang, J.Huh, R. J.Ju, E.VAzarova, T.Pohlkamp, E. S.Welf, D.Broadbent, A. F.Carisey, S. J.Stehbens, K.-M.Lee, A.Marín, A. B.Hanker, J. C.Schmidt, C. L.Arteaga, B.Yang, Y.Kobayashi, P. R.Tata, R.Kruithoff, K.Doubrovinski, D. P.Shepherd, A.Millett-Sikking, A. G.York, K. M.Dean, and R. P.Fiolka, "A versatile oblique plane microscope for large-scale and high-resolution imaging of subcellular dynamics," Elife 9:e57681, (2020)., https://doi.org/10.7554/eLife.57681
8. T.Chakraborty, B.Chen, S.Daetwyler, B.-J.Chang, O.Vanderpoorten, E.Sapoznik, C. F.Kaminski, T. P. J.Knowles, K. M.Dean, and R.Fiolka, "Converting lateral scanning into axial focusing to speed up three-dimensional microscopy," Light Sci. Appl. 9(1), 165 (2020)., https://doi.org/10.1038/s41377-020-00401-9

9. B.-J.Chang, K.Dean, and R.Fiolka, "A systematic and quantitative comparison of lattice and Gaussian light-sheets," Opt. Express 28(18), 27052 (2020)., https://doi.org/10.1364/OE.400164

10. B.-J.Chang, W.-C.Tang, Y.-T.Liu, Y.-C.Tsai, C.Tsao, P.Chen, andB.-C.Chen, "Two-beam interference lattice lightsheet for structured illumination microscopy," J. Phys. D. Appl. Phys. 53(4), 044005 (2020). DOI:10.1088/1361-6463/ab50e2

11. Bo-Jui Chang, and Reto Fiolka: *Light-sheet engineering using the Field Synthesis theorem*. J. Phys. Photonics 2(1), 014001 (2019)., DOI:10.1088/2515-7647/ab5028

12. Tonmoy Chakraborty, Meghan K. Driscoll, Elise Jeffery, Malea M. Murphy, Philippe Roudot, Bo-Jui Chang, Saumya Vora, Wen Mai Wong, Cara D. Nielson, Hua Zhang, Vladimir Zhemkov, Chitkale Hiremath, Estanislao Daniel De La Cruz, Yi Yating, Ilya Bezprozvanny, Hu Zhao, Raju Tomer, Rainer Heintzmann, Julian P. Meeks, Denise K. Marciano, Sean J. Morrison, Gaudenz Danuser, Kevin M. Dean, and Reto Fiolka: *Light-sheet microscopy of cleared tissues with isotropic, subcellular resolution*. Nature Methods 11/2019; 16(11):1109-1113., DOI:10.1038/s41592-019-0615-4

13. Vasanth S. Murali, Bo-Jui Chang, Reto Fiolka, Gaudenz Danuser, Murat Can Cobanoglu, Erik S. Welf: *An image-based assay to quantify changes in proliferation and viability upon drug treatment in 3D microenvironments*. BMC Cancer 12/2019; 19(1)., DOI:10.1186/s12885-019-5694-1

14. Bo-Jui Chang, Mark Kittisopikul, Kevin M. Dean, Philippe Roudot, Erik S. Welf, Reto Fiolka: *Universal light-sheet generation with field synthesis*. Nature Methods 02/2019; 16(3)., DOI:10.1038/s41592-019-0327-9

15. Chih-Wei Chen, Po-Hsun Wang, Li-Jun Chou, Yin-Yu Lee, Bo-Jui Chang, Su-Yu Chiang: *High-resolution light-scattering imaging with two-dimensional hexagonal illumination patterns: System implementation and image reconstruction formulations*. Optics Express 09/2017; 25(18):21652., DOI:10.1364/OE.25.021652

16. Bo-Jui Chang, Victor Didier Perez Meza, Ernst H. K. Stelzer: *csiLSFM combines light-sheet fluorescence microscopy and coherent Structured illumination for a lateral resolution below 100 nm*. Proceedings of the National Academy of Sciences 04/2017; 114(19):201609278., DOI:10.1073/pnas.1609278114

17. Victor Perez, Bo-Jui Chang, Ernst Hans Karl Stelzer: *Optimal 2D-SIM reconstruction by two filtering steps with Richardson-Lucy deconvolution*. Scientific Reports 11/2016; 6:37149., DOI:10.1038/srep37149

18. Francesco Pampaloni, Bo-Jui Chang, Ernst H K Stelzer: *Erratum to: Light sheet-based fluorescence microscopy (LSFM) for the quantitative imaging of cells and tissues*. Cell and Tissue Research 03/2015; 360(1)., DOI:10.1007/s00441-015-2144-5

19. Hsiao-Chih Huang, Bo-Jui Chang, Li-Jun Chou, Su-Yu Chiang: *Three-beam interference with circular polarization for structured illumination microscopy*. Optics Express 10/2013; 21(20):23963-23977., DOI:10.1364/OE.21.023963

20. Mao-Feng Weng, Bo-Jui Chang, Su-Yu Chiang, Niann-Shiah Wang, Huan Niu: *Cellular uptake and phototoxicity of surface-modified fluorescent nanodiamonds*. Diamond and Related Materials 02/2012; 22:96–104., DOI:10.1016/j.diamond.2011.12.035

21. Bo-Jui Chang, Shiuan Huei Lin, Li-Jun Chou, Su-Yu Chiang: *Subdiffraction scattered light imaging of gold nanoparticles using structured illumination*. Optics Letters 12/2011; 36(24):4773-5., DOI:10.1364/OL.36.004773

22. Bo-Jui Chang, Li-Jun Chou, Yun-Ching Chang, Su-Yu Chiang: *Isotropic image in structured illumination microscopy patterned with a spatial light modulator*. Optics Express 09/2009; 17(17):14710-21., DOI:10.1364/OE.17.014710
23. Bo-Jui Chang, Ying-Jung Huang, Chia-Han Chan, Long Hsu, Hwei-Ling Peng, Hwan-You Chang, Tri-Rung Yew, Cheng-Hsien Liu, Sien Chi: *Measurement of the adhesive force between a single Klebsiella pneumoniae type 3 fimbria and collagen IV using optical tweezers*. Biochemical and Biophysical Research Communications 12/2006; 350(1):33-8., DOI:10.1016/j.bbrc.2006.08.190
24. Chia-Fen Hsieh, Bo-Jui Chang, Chyi-Huey Pai, Hsuan-Yi Chen, Jin-Wu Tsai, Yung-Hsiang Yi, Yi-Ting Chiang, Da-Wei Wang, Sien Chi, Long Hsu, Chi-Hung Lin: *Stepped Changes of Monovalent Ligand-binding Force during Ligand-induced Clustering of Integrin αIIBβ3*. Journal of Biological Chemistry 09/2006; 281(35):25466-25474
25. Bo-Jui Chang, Sien Chi, Long Hsu: *Rapid and simple automatic trapping-force calibration system for optical tweezers*. Optical Engineering 11/2005; 44(11)., DOI:10.1117/1.2128632

Presentations at conferences

1. B.-J. Chang, K.M. Dean, R. Fiolka, “Physical Properties of Square and Hexagonal Lattice Light-Sheets”, Focus on Microscopy, MO-PAR2-D (2021).
2. B.-J. Chang, R. Fiolka, M. Kittisopikul, K.M. Dean, P. Roudot, E. Welf, “Positive and Negative Light-Sheets - an Attractive Combination”, Focus on Microscopy, MO-AF1-PAR-D (2019).
3. T. Chakraborty, B.-J. Chang, K.M. Dean, R. Fiolka, “Multi-Immersion Axially Swept Light-Sheet Microscopy for Large-Scale Tissue Imaging with Isotropic Sub-Micron Resolution”, Focus on Microscopy, MO-AF2-PAR-D (2019).
4. B.-J. Chang, M. Kittisopikul, K.M. Dean, P. Roudot, E. Welf, R. Fiolka, “Lattice Light-Sheet Microscopy without Optical Lattices”, Focus on Microscopy, P2-B-2/5 (2019).
5. R. Fiolka, K.M. Dean, B.J. Chang, “Rapid Subcellular Imaging with Light-Sheet Fluorescence Microscopy”, Focus on Microscopy, SU-AF-FLASH (2018).
6. R. Fiolka, B.-J. Chang, “Optical Properties of Lattice Light-Sheet Illumination”, Focus on Microscopy, SU-AF-PAR-A (2018).
7. B.-J. Chang, V. D. Perez-Meza, and E.H.K. Stelzer, “Structured illumination microscopy with counter-propagating light sheet illumination: csilsfm”, Focus on Microscopy, WE-MO1-PAR-C (2016).
8. V. D. Perez-Meza, B.-J. Chang, and E.H.K. Stelzer, “Optimizing 2D-SIM image reconstruction by artifact minimization”, Focus on Microscopy, WE-MO2-PAR-B (2016).
9. B.-J. Chang, V. D. Perez-Meza, and E.H.K. Stelzer, “Coherent Structured Illumination Provides a Lateral Resolution of λ/4n in LSFM (csiLSFM)”, 2nd Lightsheet fluorescence Microscopy international conference, http://www.lsfm2015.org/index.php/program/ (2015).
10. B.-J. Chang, V.D. Perez-Meza, and E.H.K. Stelzer, “Coherent structured illumination provides a lateral resolution of λ/4n in light sheet-based fluorescence microscopy”, Focus on Microscopy, TU-MO-PAR-D (2015).
11. V.D. Perez-Meza, B.-J. Chang, and E.H.K. Stelzer, “Automated optimization for 2D-SIM image reconstruction”, Focus on Microscopy, P2-B/10 (2015).
12. A. Jost, E. Tolstik, B.-J. Chang, E.H.K. Stelzer, A. Sentenac, and R. Heintzmann, “Blind structured illumination microscopy reconstruction in thick samples”, Focus on Microscopy, P2-B/03 (2015).

13. B.-J. Chang, V. D. Perez-Meza, and E.H.K. Stelzer, “Coherent structured illumination adds super resolution to light sheet-based fluorescence microscopy”, 1st Lightsheet fluorescence Microscopy international conference, p. 46 (2014).
14. B.-J. Chang, and E.H.K. Stelzer, “Coherent structured illumination adds super resolution to light sheet-based fluorescence microscopy”, Focus on Microscopy, MO-MO-PAR-A (2014).
15. D. von Wangenheim, A. Schmitz, B.-J. Chang, A. Maizel, and E.H.K. Stelzer, “Imaging lateral root organogenesis deep inside the main root with light sheet-based fluorescence microscopy (LSFM)”, Focus on Microscopy, WE-MO2-PAR-E (2014).
16. S.-Y. Chiang, H.-C. Huang, B.-J. Chang, and L.-J. Chou, “Three-beam interference with circular polarization for structured illumination microscopy”, Focus on Microscopy, P1-C/09 (2014).
17. S.-Y. Chiang, B.-J. Chang, S.-H. Lin, and L.-J. Chou, “Subdiffraction scattered light imaging of gold nanoparticles using structured illumination”, Focus on Microscopy, MO-AF1-PAR-A (2012).
18. S.-Y. Chiang and B.-J. Chang, “Scattered light imaging beyond the diffraction limit with structured illumination”, Focus on Microscopy, P1-B (2011).
19. B.-J. Chang, L.-J. Chou, and S.-Y. Chiang, “Three-dimensional structured illumination microscopy: double lateral resolution of wide-field fluorescence microscopy with optical sectioning ability”, The 15th Joint Biophysics Conference, P7-005 (2010), Taiwan.
20. B.-J. Chang, L.-J. Chou, and S.-Y. Chiang, “Resolution improvements in three-dimensional structured illumination microscopy”, Focus on Microscopy, MO-MO-PAR-A (2010).
21. B.-J. Chang, L.-J. Chou, and S.-Y. Chiang, “High resolution image in fluorescence microscopy via structured illumination patterned with a spatial light modulator”, PSROC2010, E3-3, Annual Meeting of the Physical Society of ROC in Taiwan (2010), Taiwan.
22. B.-J. Chang, L.-J. Chou, and S.-Y. Chiang, “Three-dimensional high resolution image in structured illumination microscopy patterned with a spatial light modulator”, OPT2009, FO135, Optics and Photonics Taiwan’09 (2009), Taiwan.
23. B.-J. Chang, L.-J. Chou, and S.-Y. Chiang, “High-resolution image in three-dimensional structured illumination microscopy patterned with a spatial light modulator”, The 14th Joint Biophysics Conference, P4-007 (2009), Taiwan. (First prize of poster competition of group C).
24. L.-J. Chou, B.-J. Chang, and S.-Y. Chiang, “Laterally isotropic image in structured illumination microscopy patterned with a spatial light modulator”, The 14th Joint Biophysics Conference, P4-006 (2009), Taiwan.
25. B.-J. Chang, L.-J. Chou, Y.-C. Chang, and S.-Y. Chiang, “Application of spatial light modulator in structured illumination microscopy”, LALS2008, Sat-P2-007 (2008).
26. B.-J. Chang, C.-K. Huang, and S.-Y. Chiang, “Two-photon fluorescence correlation spectroscopy and its application in the interactions of biomolecules”, Focus on Microscopy, PF2 (2008).
27. C.-K. Huang, B.-J. Chang, M.-F. Weng, Y.-C. Chen, and S.-Y. Chiang, “The Application of Two-Photon Fluorescence Correlation Spectroscopy for Single Molecular Detection”, 2nd Asia-Oceania Forum for Synchrotron Radiation Research, 220 (2007).
28. C.-H. Chan, B.-J. Chang, Y.-J. Huang, C.-C. Fan, H.-L. Peng, S. Chi, and L. Hsu, “Analysis of the swimming activity of Pseudomonas aeruginosa by using photonic force microscope”, Proc. SPIE 5930, 59300E-1-59300E-8 (2005).

29. C.-F. Hsieh, B.-J. Chang, L. Hsu, S. Chi, and C.-H. Lin, "Identification of stepped changes of binding affinity during interactions between the disintegrin rhodostomin and integrin αIIbβ3 in living cells using optical tweezers", Proc. SPIE 5514, 215-224 (2004).
30. C.-L. Tsai, B.-J. Chang, and L. Hsu, "Influence of the Condenser on Sample tracking of Small Beads via Forward Scattering Pattern Detection", Proc. SPIE 5514, 393-401 (2004).
31. B.-J. Chang, C.-F. Hsieh, C.-H. Lin, S. Chi, and L. Hsu, "Observing the dynamic variation of the binding force between rhodostomin ligand and integrin αIIbβ3 receptor using photonic force microscope", Proc. SPIE 5514, 552-559 (2004).
32. B.-J. Chang, C.-F. Hsieh, C.-H. Lin, S. Chi, and L. Hsu, "Photonic Force Microscope: An Optical Tweezers based Microscopy Technique", OPT2003 Proceedings ⅢPF1-9, 367-369, Optics and Photonics Taiwan' 03, Taipei, Taiwan (2003).
33. C.-L. Tsai, B.-J. Chang, and L. Hsu, "Position Dependence of the Condenser on Tracking of Small Beads via Forward Scattering Pattern Detection", OPT2003 Proceedings ⅢPF2-3, 376-378, Optics and Photonics Taiwan' 03, Taipei, Taiwan (2003).
34. B.-J. Chang, L. Hsu, and S. Chi, "An off-focus Optical Tweezers: A New Tool for Capturing and Manipulating a Group of Particles", SCI Proceedings of Signals Processing and Optical Systems, Technologies and Application X, 296-299 (2003).
35. T.-M. Hsieh, B.-J. Chang, and L. Hsu. "Automation of optical tweezers", Proc. SPIE 4082, 232-240 (2000).

Patents

1. R. Fiolka, M. Kittisopikul, B.-J. Chang, "Flexible light sheet generation by field synthesis", US Patent App. 16/539,898, US Patent US20200049968A1 (2020), https://patents.google.com/patent/US20200049968A1/en.
2. S.-Y. Chiang, B.-J. Chang, J.-Y. Yuh, and L.-J. Chou, "Optical imaging system using structured illumination", US9599805B2 (2017).
3. S.-Y. Chiang, B.-J. Chang, J.-Y. Yuh, and L.-J. Chou, "Optisches Abbildungs-oder Bildgebungssystem mit Strukturierter Beleuchtung", Deutsches Patent DE102012103459B4 (2016).
4. S.-Y. Chiang, B.-J. Chang, J.-Y. Yuh, and L.-J. Chou, "Optical imaging system using structured illumination", Taiwan Patent TW I460468 B (2014). [使用結構光照明的光學取影系統, 中華民國發明專利 11th Nov. 2014].
5. S.-Y. Chiang, B.-J. Chang, J.-Y. Yuh, and L.-J. Chou, "Optical imaging system using structured illumination", JP 2013-088808, A (2013). [構造光照明を用いる光学撮像システム, 日本發明專利特開 2013-88808].

Others

1. 張宜仁(Yi-Ren Chang), 張博睿(Bo-Jui Chang), "光鑷在生物系統之應用與重要性", 物理雙月刊 Vol. 41(1), 23-35 (2019).
2. 張博睿(Bo-Jui Chang), 周俐君(Li-Jun Chou), 江素玉(Su-Yu Chiang), "結構照明螢光顯微術與生物應用", 科儀新知 No.180, 28-38 (2011).
3. 曾勝陽, 張博睿, 謝錚鳴, 余怡德, 徐琅, "顯微鏡中的第三隻手－雷射鑷夾帶著走", 物理雙月刊 Vol. 22(5), 494-499 (2000).

Contribution to Science

1. Optical tweezers. My first work in microscopy focused on optical tweezers. I built an optical tweezer system in the third year of my college. We collaborated with several biological groups in Taiwan: the group of Prof. Hwan-You Chang in Department of Life Science at National Tsing Hua University (a), the group of Prof. Hwei-Ling Peng in Department of Biological Science and Technology at National Chiao Tung University (a), and the group of Prof. Chi-Hung Lin in the Institute of Microbiology and Immunology at National Yang-Ming University (b). I also built an optical tweezers system during my master and Ph.D. training in Dr. Lin's lab, which was about 80 km from my university. I had to travel to his lab on my own several days per week.

a. Bo-Jui Chang, Ying-Jung Huang, Chia-Han Chan, Long Hsu, Hwei-Ling Peng, Hwan-You Chang, Tri-Rung Yew, Cheng-Hsien Liu, Sien Chi: Measurement of the adhesive force between a single Klebsiella pneumoniae type 3 fimbria and collagen IV using optical tweezers. Biochemical and Biophysical Research Communications 12/2006; 350(1):33-8., DOI:10.1016/j.bbrc.2006.08.190

b. Chia-Fen Hsieh, Bo-Jui Chang, Chyi-Huey Pai, Hsuan-Yi Chen, Jin-Wu Tsai, Yung-Hsiang Yi, Yi-Ting Chiang, Da-Wei Wang, Sien Chi, Long Hsu, Chi-Hung Lin: Stepped Changes of Monovalent Ligand-binding Force during Ligand-induced Clustering of Integrin αIIBβ3. Journal of Biological Chemistry 09/2006; 281(35):25466-25474.

2. Super-resolution structured illumination microscopy. I started to work on structured illumination microscopy (SIM) during my first postdoctoral training in Dr. Chiang's lab. This was the first structured illumination microscope at that time nationwide, and probably still the only one in Taiwan. I started the assembly from scratch and learned the whole concept of SIM by myself by reading the relevant literature. All the software and hardware to control the microscope, as well as the reconstruction of SIM images were conducted by me. We also implemented a spatial light modulator (SLM) to replace the mechanical movement of the grating, which removes the challenge of precise mechanical control of the grating and increases the acquisition speed (a). We also investigated the possibility of applying SIM in scattering media (b). After I left the lab, Dr. Chiang still discussed her SIM project with me from time to time, and in the end, we published a few more papers about SIM (c). Later, my colleague and I also improved the SIM reconstruction algorithm (d).

a. Bo-Jui Chang, Li-Jun Chou, Yun-Ching Chang, Su-Yu Chiang: Isotropic image in structured illumination microscopy patterned with a spatial light modulator. Optics Express 09/2009; 17(17):14710-21., DOI:10.1364/OE.17.014710

b. Bo-Jui Chang, Shiuan Huei Lin, Li-Jun Chou, Su-Yu Chiang: Subdiffraction scattered light imaging of gold nanoparticles using structured illumination. Optics Letters 12/2011; 36(24):4773-5., DOI:10.1364/OL.36.004773

c. Hsiao-Chih Huang, Bo-Jui Chang, Li-Jun Chou, Su-Yu Chiang: Three-beam interference with circular polarization for structured illumination microscopy. Optics Express 10/2013; 21(20):23963-23977., DOI:10.1364/OE.21.023963

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3. Light-sheet fluorescence microscopy. I started to work on light-sheet fluorescence microscopy (LSFM) when I joined Dr. Stelzer's lab in 2011. Learning from the creator of this technology was a great experience. It was also the first time that I saw how biologists work with LSFM. Therefore, I have written a review paper with Dr. Pampaloni and Dr. Stelzer (a). We also successfully combined SIM with LSFM and

achieved a lateral resolution of sub-100 nm, which still holds the record in far field linear SIM combined with LSFM (b). Later when I joined Dr. Bi-Chang Chen's lab, I continued working on SIM and LSFM. There I investigated the SIM mode in lattice light-sheet microscope (LLSM) and published work related to 2D-SIM mode in LLSM. Now in Dr. Fiolka's lab, we work extensively with LSFM. We introduced a Fourier theorem for LSFM and developed a microscope based on it. This allows us to recreate almost any kind of light-sheet, such as Bessel and lattice light-sheets, while reducing the complexity and laser light losses of the system (c). We can also create other unique light-sheets that can potentially improve the axial resolution. In addition to the new development of light-sheet microscopy, we also applied our home-built light-sheet microscopes to many biological applications. Among them, we have successfully imaged the morphology and dynamics of Ewing's sarcoma cells inside live zebrafish in both low-resolution large field of view (FOV) and high-resolution zoom-in FOV. We have also developed axially-swept light-sheet microscopy (ASLM), which provides isotropic sub-micron resolution over a large field of view, to image live, expanded, and various cleared tissue specimens (d).

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List of references

Prof. Gaudenz Danuser	Chair of the Lyda Hill Department of Bioinformatics, Patrick E. Haggerty Distinguished Chair in Basic Biomedical Science, Professor of the Lyda Hill Department of Bioinformatics and Department of Cell Biology, UT Southwestern Medical Center Gaudenz.Danuser@UTSouthwestern.edu https://profiles.utsouthwestern.edu/profile/139751/gaudenz-danuser.html +1(214)648-3835 E04350, 5323 Harry Hines Blvd. Dallas TX 75390-9039, U.S.A
Prof. Reto Fiolka	Assistant Professor of Department of Cell Biology and the Lyda Hill Department of Bioinformatics, UT Southwestern Medical Center reto.fiolka@utsouthwestern.edu https://profiles.utsouthwestern.edu/profile/150662/reto-fiolka.html +1(214)648-4596 NL05108A, 5323 Harry Hines Blvd. Dallas TX 75390-9039, U.S.A
Prof. Dr. Ernst H.K. Stelzer	Professor of Johann Wolfgang Goethe-Universität Frankfurt am Main, Faculty 15 Biological Sciences, Institute for Cell Biology and Neuroscience, Buchmann Institute for Molecular Life Sciences ernst.stelzer@physikalischebiologie.de http://www.physikalischebiologie.de/people/ernst-hk-stelzer +49(69)79842547 Room 1.636, Max-von-Laue-Str. 15, D-60438 Frankfurt am Main, Germany
Prof. Long Hsu **徐琅教授** **(PhD advisor)**	Associate Professor of Department of Electrophysics, National Chiao Tung University, Taiwan (台灣國立交通大學電子物理系) long@nctu.edu.tw http://www.ep.nctu.edu.tw/teacher_members/teacher_member_view_tw/72 +886(3)5131244 SC555, Department of Electrophysics, 1001 University Road, Hsinchu, 30010, Taiwan