

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Jun Liu

eRA COMMONS USER NAME (credential, e.g., agency login): junliu1

POSITION TITLE: Professor of Microbial Pathogenesis

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
Sichuan University, Chengdu, Sichuan, China	B.A.	07/1992	Physics
Wuhan University, Wuhan, Hubei, China	M.A.	07/1995	Physics
Chinese Academy of Sciences, Beijing, China	Ph.D	07/1998	Physics
Florida State University, Tallahassee, Florida, USA	Postdoc	05/2001	Biophysics

A. Personal Statement

I am a biophysicist with 27 years of experience in cryo-electron microscopy (cryo-EM) and cryo-electron tomography (cryo-ET). My laboratory specializes in developing high-throughput cryo-EM/ET pipelines to study *in-situ* structure and function of large macromolecular complexes essential for bacterial motility, protein secretion, phage infection, and host-pathogen interactions. Recognizing the enormous potential of a breakthrough method, cryo-focused ion beam (cryo-FIB) milling of cellular samples, we recently established an advanced cryo-FIB/ET workflow that enables high-resolution 3D structure determination for organelles and protein complexes in their natural environments and a remarkable array of discoveries. I have published over 120 research papers, many in high-impact journals. As a PI, I have mentored many trainees, six of them (Drs. Bo Hu, Jiagang Tu, Raphael Park, Shiwei Zhu, Yunjie Chang, Phil Guo) become independent investigators who continue using cryo-EM/ET as a major tool in their own laboratories. As a collaborator, I have worked closely with Professors Tim Hoover, Md Motaleb, Chris Li, Karen Ottemann, Fitnat Yildiz, and Steven Norris to characterize structure and function of the flagella in *Helicobacter pylori*, *Vibrio cholerae*, and *Borrelia burgdorferi* by combining genetic and biochemical approaches with cryo-EM/ET since 2007. Collectively, our studies provide new insights into flagellar assembly and function at the molecular level.

- R01 AI087946 (NIH/NIAID) Liu (PI) 02/15/2015 - 05/31/2026

Structure-Function Relationships in the Spirochetal Flagellar Motor

The objective of this application is to illuminate three fundamental but challenging aspects of the bacterial flagellar motor: 1) the structure and function of the flagellar type III secretion apparatus; 2) the mechanism underlying the flagellar rotation driven by proton motive force across membrane; and 3) the mechanisms by which flagella switch rotational directions to control the motility and chemotaxis.
- R01AI152421(NIH/NIAID) Liu, Roy (MPI) 09/16/2020 - 08/31/2026

Title: Functional and Structural Analysis of the Dot/Icm Type IVB Secretion Machine

The goal of this project is to determine the structure and assembly of the Dot/Icm type IV secretion machine and elucidate how the individual Dot and Icm proteins contribute to machine function at the molecular level.
- R01 GM110243 (NIH/NIGMS) Liu, Molineux (MPI) 05/01/2014 - 11/30/2025(NCE)

Structural Basis of Phage Infection and DNA Ejection

The objective of this study is to understand conformational rearrangements during phage infection by combining high throughput cryo-electron tomography with molecular genetics of both phage and host.

B. Positions, Scientific Appointments, and Honors

2021- Professor, Department of Microbial Pathogenesis, Yale School of Medicine, New Haven, CT
2021- Professor, Department of Cell Biology, Yale School of Medicine, New Haven, CT
2017- Member, Microbial Sciences Institute, Yale University, West Haven, CT
2017-2021 Associate Professor with tenure, Department of Microbial Pathogenesis, Yale School of Medicine, New Haven, CT
2014-2017 Associate Professor with tenure, Department of Pathology and Laboratory Medicine, University of Texas-Houston Medical School, Houston, TX
2010-2017 Faculty member of the Program of Structural and Computational Biology and Molecular Biophysics, Baylor College of Medicine, Houston, TX
2008-2017 Faculty Member, Graduate School of Biomedical Sciences (GSBS) University of Texas Health Science Center, Houston, TX
2008-2017 Adjunct Professor, Department of Microbiology and Molecular Genetics, University of Texas Health Science Center, Houston, TX
2007-2014 Assistant Professor, Department of Pathology and Laboratory Medicine, University of Texas-Houston Medical School, Houston, TX
2006-2007 Staff Scientist, Laboratory of Cell Biology, National Cancer Institute, National Institutes of Health. Supervisor: Dr. Sriram Subramaniam
2001-2006 Visiting Assistant in Research, Institute of Molecular Biophysics, Florida State University Supervisor: Dr. Ken Taylor

2020-2024 Member, Macromolecular Structure and Function C Study Section (MSFC), NIH, USA
2008-present Member, American Society for Microbiology
2001-present Member, Biophysical Society
2001-present Member, Microscopy Society of America

Ad hoc reviewer for *NIH Enabling Bioanalytical & Imaging Technologies (EBIT) Study Section*, The Research Grants of the Medical Research Council (MRC), UK, Fellowship grants for the Wellcome Trust and Royal Society, UK, The Research Grants of the Swiss National Science Foundation, Switzerland. NIH Macromolecular Structure and Function C Study Section (MSFC) NIH special emphasis panel (ZRG1 AARR-P) NIH Bacterial Pathogenesis Study Section (BACP)

Ad hoc reviewer for *Nature, Cell, Science, Nature Communications, Journal of Structural Biology, Virology, Journal of Visualized Experiments, Biological Chemistry, Molecular Microbiology, PloS One, Journal of Virology, Journal of Bacteriology, PNAS, Cell, Nature Microbiology, PloS Pathology, Nature Methods, eLife*

2022: Invited speaker. *Biology of Spirochetes Gordon Research Conference*, Ventura, CA
2021: Invited speaker. *Keystone symposium-Frontiers in Cryo-Electron Microscopy* (Virtual)
2020: Invited speaker. *3rd Bacterial Cell Biology Conference*, Nassau, Bahamas
2020: Invited speaker. *Sensory Transduction in Microorganisms Gordon Research Conference*
2018: Co-Chair. The 2018 Kuo Symposium on 3D Cryo-EM Molecular Imaging, Hangzhou, China
2018: Discussion leader. *Gordon Research Conference on Three-Dimensional Electron Microscopy*
2018: Invited speaker. *Gordon Research Conference on Bacterial Cell Surface*, West Dover, VT
2018: Invited speaker. *FASEB: Virus Structure and Assembly*, Steamboat Springs, CO
2016: Invited speaker. Type III Secretion Meeting at Tübingen, Germany.
2015: Invited speaker. *Gordon Research Conference on Three-Dimensional Electron Microscopy*
2014: Invited speaker. Microscopy & Microanalysis 2014 Meeting, Hartford, Connecticut, USA.
2014: Invited speaker. *Spirochete, Biology of Gordon Research Conference*
2013: Invited speaker. *The 113th General Meeting of the American Society for Microbiology*
2012: Invited speaker. *Sensory Transduction in Microorganisms Gordon Research Conference*

2011: Co-Chair. Microscopy Society of America Annual Meeting
 2010: Invited speaker. *Sensory Transduction in Microorganisms Gordon Research Conference*
 2008: Invited speaker. *Beijing Workshop of Cryo-Electron Microscopy in Structural Biology*, Beijing, China
 2005: Invited speaker. *Gordon Research Conference on Three-Dimensional Electron Microscopy*
 2016: McGovern Scholar Award

C. Contributions to Science

1. Cryo-electron tomography (cryo-ET) has emerged as the most powerful technique for high resolution structure determination of large macromolecular complexes *in situ*. I am fortunate to have 20 years of experience in cryo-ET by working with Dr. Kenneth Taylor (2008-2006) and Dr. Sriram Subramaniam (2006-2007) and then in my own laboratory (2007-present). I had the opportunity to push the cryo-ET envelope and determine the first 2.0 nm structure of myosin-V in its inactive state (**Liu et al., Nature 2006**). I then applied the technique from *in vitro* myosin-V assemblies to the native HIV-1 Env trimer and its interactions with CD4 and antibodies at 2.0 nm resolution (**Liu et al., Nature 2008**). In my own laboratory, I demonstrated that high-throughput cryo-ET can be effectively utilized to study many important and challenging biological processes, such as viral infection (**Hu, et al., Science 2013**), flagellar assembly (**Zhao, et al., PNAS 2013**), protein secretion (**Hu, et al., Cell 2017**), and host-pathogen interaction (**Park, et al., eLife 2018**). These studies are among the best-known cryo-ET applications and have profound impacts on this exciting field.
 - a. **Liu J**, Taylor DW, Kremmentsova EB, Trybus KM, Taylor KA: Three-dimensional structure of the myosin V inhibited state by cryo-electron tomography. **Nature** 2006, 442:208-211. PMID: 16625208
 - b. **Liu J**, Bartesaghi A, Borgnia M, Sapiro G, Subramaniam S: Molecular architecture of native HIV-1 gp120 trimers. **Nature** 2008, 455:109-113. PMCID: PMC2610422
 - c. Hu B, Lara-Tejero M, Kong Q, Galán JE, **Liu J**: *In situ* molecular architecture of the *Salmonella* type III secretion machine, **Cell** 2017 Mar 9;168(6):1065-1074.e10.
 - d. Park D, Lara-Tejero M, Waxham MN, Li W, Hu B, Galán JE, **Liu J**: Visualization of the type III secretion mediated *Salmonella*-host cell interface using cryo-electron tomography, **Elife**. 2018 Oct 3;7. pii: e39514. doi: 10.7554/eLife.39514.
2. In collaboration with Drs. Md Motaleb, Chris Li, Steven Norris, and Nyles Charon, we utilized the Lyme disease spirochete as a model system to study the structure and function of bacterial flagellar motor by combining genetics with high-throughput cryo-ET. This collaboration generated breakthroughs in characterizing flagella *in situ*. We provided the first structural blueprint of the assembly process of bacterial flagella in intact cells. We recently addressed some of longstanding questions regarding the mechanisms of flagellar torque generation, directional switching, and protein secretion.
 - a. Chang Y, Zhang K, Carroll BL, Zhao X, Charon NW, Norris SJ, **Motaleb MA**, Li C, **Liu J**: Molecular mechanism for rotational switching of the bacterial flagellar motor. **Nat Struct Mol Biol**. 2020 Nov;27(11):1041-1047. doi: 10.1038/s41594-020-0497-2. Epub 2020 Sep 7. PMCID: PMC8129871
 - b. Chang Y, Moon KH, Zhao X, Norris SJ, **Motaleb MA**, **Liu J**: Structural insights into flagellar stator-rotator interactions. **Elife** 2019; 9:e48979. PMCID: PMC6663468
 - c. Zhao X, Zhang K, Boquoi T, Hu B, **Motaleb MA**, Miller K, James M, Charon NW, Manson MD, Norris SJ, Li C, **Liu J**: Cryo-electron tomography reveals the sequential assembly of bacterial flagella in *Borrelia burgdorferi*. **Proc Natl Acad Sci U S A**, 110(35):14390-5, 2013. PMCID: PMC3761569
 - d. **Liu J**, Lin T, Botkin DJ, McCrum E, Winkler H, Norris SJ: Intact flagellar motor of *Borrelia burgdorferi* revealed by cryo-electron tomography: Evidence for stator ring curvature and rotor/C ring assembly flexion, **J Bacteriol** 191(16):5026-36, 2009. PMCID: PMC2725586
3. In collaboration with Drs. William Margolin and Ian Molineux, we genetically engineered bacteria to generate tiny minicells from parental cells. The minicells, as small as 0.2 µm in diameter, have been successfully utilized for *in situ* structure determination of molecular machines using high-throughput cryo-ET. We have provided unprecedented structural information on bacteriophage adsorption and DNA ejection during infection.
 - a. Wang C, Tu J, **Liu J**, Molineux IJ: Structural Dynamics of Bacteriophage P22 Infection Initiation Revealed by Cryo-electron Tomography, **Nat Microbiol**, 2019, 4(6): 1049-1056, PMCID: PMC653319

- b. Hu B, Margolin W, Molineux IJ, Liu J: Structural remodeling of bacteriophage T4 and host membranes during infection initiation, **Proc Natl Acad Sci U S A**. 2015 Sep 1;112(35):E4919-28. PMID: PMC4568249
 - c. Hu B, Margolin W, Molineux IJ, Liu J: The Bacteriophage T7 Virion Undergoes Extensive Structural Remodeling during infection, **Science** 339(6119):576-9, 2013. PMID: PMC3873743
 - d. Liu J, Hu B, Morado DR, Jani S, Manson MD, and Margolin W: Molecular architecture of chemoreceptor arrays revealed by cryoelectron tomography of *Escherichia coli* minicells. **Proc Natl Acad Sci U S A** 2012, 109(23):E1481-8. PMID: PMC3384206
4. In collaboration with Drs. Bill Picking, Craig Roy, Maria Lara-Tejero, and Jorge Galán, we used cryo-ET to determine bacterial secretion machine structures *in situ* at high resolution, providing new insights into the molecular mechanisms underlying protein secretion and bacterial pathogenesis.
 - a. Park D, Lara-Tejero M, Waxham MN, Li W, Hu B, Galán JE, Liu J: Visualization of the type III secretion mediated *Salmonella*-host cell interface using cryo-electron tomography, **Elife**. 2018 Oct 3;7. pii: e39514. doi: 10.7554/eLife.39514. PMID: PMC6175578
 - b. Chetrit D, Hu B, Christie PJ, Roy CR, Liu J: A Unique Cytoplasmic ATPase Complex Defines the *Legionella pneumophila* Type IV Secretion Channel, **Nat Microbiol** 3(6):678-686, 2018. PMID: PMC5970066
 - c. Hu B, Lara-Tejero M, Kong Q, Galán JE, Liu J: *In situ* molecular architecture of the *Salmonella* type III secretion machine, **Cell** 2017 Mar 9;168(6):1065-1074.e10. PMID: PMC5393631
 - d. Hu B, Morado DR, Margolin W, Rohde JR, Arizmendi O, Picking WL, Picking WD, Liu J: Visualization of the type III secretion sorting platform of *Shigella flexneri*. **Proc Natl Acad Sci U S A** 2015, 112(4):1047-1052. PMID: PMC4313800
5. In collaboration with Drs. Tim Hoover, Karen Ottemann (UCSC), and Anna Roujeinikova, we have discovered novel accessory proteins in *H. pylori* that enable the gastric bacterium colonizing approximately half of the world's population.
 - a. Qin Z, Lin W, Zhu S, Franco AT, Liu J: Imaging the motility and chemotaxis machineries in *Helicobacter pylori* by cryo-electron tomography. **J Bacteriol** 2016, pii: JB.00695-16.
 - b. Tachiyama S, Chan KL, Liu X, Hathroubi S, Peterson B, Khan MF, Ottemann KM, Liu J, Roujeinikova A: The flagellar motor protein FliL forms a scaffold of circumferentially positioned rings required for stator activation, **Proc Natl Acad Sci U S A** 2022 119 (4) e2118401119
 - c. Liu X, Tachiyama S, Zhou X, Mathias RA, Bonny SQ, Khan MF, Xin Y, Roujeinikova A, Liu J, Ottemann KM. Bacterial flagella hijack type IV pili proteins to control motility. **Proc Natl Acad Sci U S A**. 2024 Jan 23;121(4):e2317452121. doi: 10.1073/pnas.2317452121. Epub 2024 Jan 18. PMID: 38236729; PMID: PMC10823254.
 - d. Tachiyama S, Rosinke K, Khan MF, Zhou X, Xin Y, Botting JM, Yue J, Roujeinikova A, Hoover TR, Liu J: FlgY, PflA, and PflB form a spoke-ring network in the high-torque flagellar motor of *Helicobacter pylori*. **Proc Natl Acad Sci U S A** 2025 Apr 29;122(17):e2421632122. doi: 10.1073/pnas.2421632122. Epub 2025 Apr 22. PMID: 40261933.

Complete List of Published Work in MyBibliography:

<http://www.ncbi.nlm.nih.gov/sites/myncbi/jun.liu.2/bibliography/40516970/public/?sort=date&direction=descending>

BIOGRAPHICAL SKETCH

Provide the following information for the Senior/key personnel and other significant contributors.
Follow this format for each person. **DO NOT EXCEED FIVE PAGES.**

NAME: Wangbiao Guo

eRA COMMONS USER NAME (credential, e.g., agency login): WANGBIAOGUO

POSITION TITLE: Postdoc

EDUCATION/TRAINING (*Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.*)

INSTITUTION AND LOCATION	DEGREE (if applicable)	Completion Date MM/YYYY	FIELD OF STUDY
China University of Mining and Technology, Xuzhou, Jiangsu, China	B.A.	7/2016	Safety Engineering
Zhejiang University, Hangzhou, Zhejiang, China	Ph.D.	7/2021	Energy and Environmental Engineering
Yale University, New Haven, CT, USA	Postdoctoral Associate	current	Microbiology

Research Experience

- 9/19-present Postdoctoral Associate, Lab of Professor Jun Liu, Department of Microbial Pathogenesis
Yale School of Medicine, CT
Research focus: *In situ* cryo-electron microscopy (cryo-EM) single particle analysis (SPA), cryo-electron tomography (cryo-ET), cryo-focused ion beam (cryo-FIB) milling of living microbes and microalgal cells (*Chlorella*, *Nannochloropsis salina*, *et al*).
- 9/18-6/21 Ph.D. student, Lab of Professor Xing Zhang, Center of Cryo-Electron Microscopy
Zhejiang University, China
Research focus: Focused ion beam scanning electron microscopy (FIB-SEM) of high-pressure frozen *Chlorella pyrenoidosa* cells.
- 9/16-6/21 Ph.D. student, Lab of Professor Jun Cheng, State Key Laboratory of Clean Energy Utilization
Zhejiang University, China
Research focus: Bio-engineering technology development of flue gas CO₂ fixation by microalgal cells: microalgal mutation by nuclear radiation, photobioreactor design for microalgal cultures, large-scale engineering processes of microalgal CO₂ fixation.

Bibliography

Selected Publications

1. **Guo, W.**, Feng, L., Wang, Z., Guo, J., Park, D., Carroll, B. L., . . . Cheng, J. (2022). In-situ high-resolution 3D imaging combined with proteomics and metabolomics reveals enlargement of subcellular architecture and enhancement of photosynthesis pathways in nuclear-irradiated *Chlorella pyrenoidosa*. **Chemical Engineering Journal**, 430, 133037.
2. Ye, Q., Shen, Y., Zhang, Q., Wu, X., & **Guo, W.***. (2022). Life-cycle assessment of flue gas CO₂ fixation from coal-fired power plant and coal chemical plant by microalgae. **Science of The Total Environment**, 848, 157728. (Corresponding author)
3. **Guo, W.**, Cheng, J., Ali, K. A., Kumar, S., & Guo, C. (2020). Conversion of NaHCO₃ to Na₂CO₃ with a growth of *Arthrospira platensis* cells in 660 m² raceway ponds with a CO₂ bicarbonation absorber. **Microbial Biotechnology**, 13(2), 470-478.

4. **Guo, W.**, Cheng, J., Liu, S., Feng, L., Su, Y., & Li, Y. (2020). A novel porous nickel-foam filled CO₂ absorptive photobioreactor system to promote CO₂ conversion by microalgal biomass. **Science of The Total Environment**, 713, 136593.
5. **Guo, W.**, Cheng, J., Song, Y., Kumar, S., Ali, K. A., Wang, Y., . . . Yang, W. (2020). Improving flashing light frequency and CO₂ fixation rate with vortex movement of algal cells in raceway pond with conic baffles. **Chemical Engineering Science**, 216, 115536.
6. **Guo, W.**, Cheng, J., Song, Y., Kumar, S., Ali, K. A., Guo, C., & Qiao, Z. (2019). Developing a CO₂ bicarbonation absorber for promoting microalgal growth rates with an improved photosynthesis pathway. **RSC Advances**, 9(5), 2746-2755.
7. **Guo, W.**, Cheng, J., Song, Y., Liu, S., Ali, K. A., & Kumar, S. (2019). Three-dimensional numerical simulation of light penetration in an optimized flow field composed of microalgae cells, carbon dioxide bubbles and culture medium. **Bioresource Technology**, 292, 121979.
8. Cheng, J., **Guo, W.**, Ali, K. A., Ye, Q., Jin, G., & Qiao, Z. (2018). Promoting helix pitch and trichome length to improve biomass harvesting efficiency and carbon dioxide fixation rate by *Spirulina sp.* in 660 m² raceway ponds under purified carbon dioxide from a coal chemical flue gas. **Bioresource Technology**, 261, 76-85. (advisor)
9. Cheng, J., **Guo, W.**, Cai, C., Ye, Q., & Zhou, J. (2018). Alternatively permutated conic baffles generate vortex flow field to improve microalgal productivity in a raceway pond. **Bioresource Technology**, 249, 212-218. (advisor)
10. Cheng, J., **Guo, W.**, Song, Y., Kumar, S., Ali, K. A., & Zhou, J. (2018). Enhancing vorticity magnitude of turbulent flow to promote photochemical efficiency and trichome helix pitch of *Arthrospira platensis* in a raceway pond with conic baffles. **Bioresource Technology**, 269, 1-8. (advisor)
11. Wang, H., **Guo, W.**, Zheng, C., Wang, D., & Zhan, H. (2017). Effect of temperature on foaming ability and foam stability of typical surfactants used for foaming agent. **Journal of Surfactants and Detergents**, 20(3), 615-622. (advisor)

Additional Publications

1. Carroll, B. L., Nishikino, T., **Guo, W.**, Zhu, S., Kojima, S., Homma, M., & Liu, J. (2020). The flagellar motor of *Vibrio alginolyticus* undergoes major structural remodeling during rotational switching. **eLife**, 9, e61446.
2. Cheng, J., Lai, X., Ye, Q., **Guo, W.**, Xu, J., Ren, W., & Zhou, J. (2019). A novel jet-aerated tangential swirling-flow plate photobioreactor generates microbubbles that enhance mass transfer and improve microalgal growth. **Bioresource Technology**, 288, 121531.
3. Cheng, J., Lai, X., Ye, Q., **Guo, W.**, & Zhou, J. (2020). Numerical simulation on optimizing flow field and flashing-light effect in jet-aerated tangential swirling-flow plate photobioreactor to improve microalgal growth. **Chemical Engineering Science**, 215, 115371.
4. Cheng, J., Liu, S., **Guo, W.**, Song, Y., Kumar, S., Kubar, A. A., . . . Li, Y. (2021). Developing staggered woven mesh aerator with three variable-micropore layers in recycling water pipeline to enhance CO₂ conversion for improving *Arthrospira* growth. **Science of The Total Environment**, 760, 143941.
5. Cheng, J., Miao, Y., **Guo, W.**, Song, Y., Tian, J., & Zhou, J. (2018). Reduced generation time and size of carbon dioxide bubbles in a volute aerator for improving *Spirulina sp.* growth. **Bioresource Technology**, 270, 352-358.
6. Cheng, J., Song, Y., **Guo, W.**, Miao, Y., Chen, S., & Zhou, J. (2019). Developing microporous fibrous-diaphragm aerator to decrease bubble generation diameter for improving microalgal growth with CO₂ fixation in a raceway pond. **Bioresource Technology**, 276, 28-34.
7. Cheng, J., Song, Y., Miao, Y., **Guo, W.**, Wang, Y., Li, X., . . . Zhou, J. (2019). Three-stage shear-serrated aerator broke CO₂ bubbles to promote mass transfer and microalgal growth. **ACS Sustainable Chemistry & Engineering**, 8(2), 939-947.
8. Kubar, A. A., Cheng, J., **Guo, W.**, Kumar, S., & Song, Y. (2020). Development of a single helical baffle to increase CO₂ gas and microalgal solution mixing and *Chlorella* PY-ZU1 biomass yield. **Bioresource Technology**, 307, 123253.
9. Kumar, S., Cheng, J., **Guo, W.**, Ali, K. A., & Song, Y. (2019). Self-rotary propellers with clockwise/counterclockwise blades create spiral flow fields to improve mass transfer and promote microalgae growth. **Bioresource Technology**, 286, 121384.
10. Kumar, S., Cheng, J., Kubar, A. A., **Guo, W.**, Song, Y., Liu, S., . . . Tian, J. (2021). Orange light spectra filtered through transparent colored polyvinyl chloride sheet enhanced pigment content and growth of *Arthrospira* cells. **Bioresource Technology**, 319, 124179.

11. Song, Y., Cheng, J., **Guo, W.**, Liu, S., Zhang, L., Kumar, S., & Ali, K. A. (2020a). Microporous diaphragm aerator improves flue gas CO₂ dissolution and photosynthetic characteristics of *Arthrospira* cells in 660 m² raceway ponds. **ACS Sustainable Chemistry & Engineering**, 8(31), 11558-11568.
12. Song, Y., Cheng, J., **Guo, W.**, Liu, S., Zhang, L., Kumar, S., & Ali, K. A. (2020b). Microporous Diaphragm Aerator Improves Flue Gas CO₂ Dissolution and Photosynthetic Characteristics of *Arthrospira* Cells in 660 m² Raceway Ponds.
13. Song, Y., Cheng, J., Lai, X., **Guo, W.**, & Yang, W. (2021). Developing a three-dimensional tangential swirl plate photobioreactor to enhance mass transfer and flashlight effect for microalgal CO₂ fixation. **Chemical Engineering Science**, 244, 116837.
14. Song, Y., Cheng, J., Miao, Y., **Guo, W.**, & Zhou, J. (2021a). SO₂ Impurity in Simulated Flue Gas with 15% CO₂ Affects Dynamic Bubble Dissolution and *Arthrospira* Photosynthetic Growth. **ACS Sustainable Chemistry & Engineering**, 9(16), 5580-5589.
15. Song, Y., Cheng, J., Miao, Y., **Guo, W.**, & Zhou, J. (2021b). SO₂ Impurity in Simulated Flue Gas with 15% CO₂ Affects Dynamic Bubble Dissolution and *Arthrospira* Photosynthetic Growth.
16. Ye, Q., Cheng, J., **Guo, W.**, Xu, J., Li, H., & Zhou, J. (2018a). Numerical simulation on promoting light/dark cycle frequency to improve microalgae growth in photobioreactor with serial lantern-shaped draft tube. **Bioresource Technology**, 266, 89-96.
17. Ye, Q., Cheng, J., **Guo, W.**, Xu, J., Li, K., & Zhou, J. (2018b). Serial lantern-shaped draft tube enhanced flashing light effect for improving CO₂ fixation with microalgae in a gas-lift circumflux column photobioreactor. **Bioresource Technology**, 255, 156-162.
18. Ye, Q., Cheng, J., Liu, S., Qiu, Y., Zhang, Z., **Guo, W.**, & An, Y. (2020). Improving light distribution and light/dark cycle of 900 L tangential spiral flow column photobioreactors to promote CO₂ fixation with *Arthrospira* sp. cells. **Science of The Total Environment**, 720, 137611.

Specialized Skills

Cryo-Electron Tomography:

FIB milling (Aquilos 1 and 2, ThermoFisher), cryo-correlative light and electron microscopy (cryo-CLEM, Leica), data collection (FEI Polara, Krios, Glacios), cryo-ET data processing, subtomogram averaging (i3, EMAN2), 3D modeling (Chimera, Amira, IMOD, EMAN2)

Technology of flue gas CO₂ fixation by microalgae:

Microalgae cultures, photobioreactor design, computational fluid dynamics (CFD) simulation (FLUENT, Ansys)

Honors and Awards

2021 Zhejiang Province Award for Excellent Doctoral Graduate, China

2020 Zhejiang University Academic Award for Outstanding Doctoral Candidates, China

2019 Zhejiang University Outstanding Graduate Student, China

Talks and Posters

01/24 **Discussion leader:** Gordon Research Conference, Sensory Transduction in Microorganisms, CA

10/23 **Selected Speaker:** 10th Semi-Annual New England Cryo-EM Symposium, Yale, "Capturing and modeling the structural dynamics of the bacterial flagellar motor"

10/23 **Host Invited Speaker,** Yale Microbiology Seminar Series, Benjamin Engel, "Exploring the molecular architecture of photosynthesis and carbon fixation with cryo-electron tomography"

09/23 Poster: Annual Microbiology Retreat, Yale School of Medicine "*In-situ* structural basis of flagellar motility"

06/23 Poster: 3rd Yale Microbial Sciences Institute Retreat, Yale "*In-situ* structural basis of flagellar motility"

05/23 Poster: 8th Annual Yale Biophysics and Structural Biology Symposium, Yale, "Towards near-atomic resolution: A high-throughput and automated cryo-focused ion beam milling protocol for diverse biological samples"

03/23 Speaker: Yale Microbial Sciences Institute Talk, Yale, "*In situ* structural basis of flagellar swimming and surface motility by pathogenic bacteria"

11/22 **Invited Speaker:** 9th International Conference on Energy Engineering and Environmental Engineering (ICEEEE2022), Zoom, "Is technology of flue gas CO₂ fixation by microalgae a carbon-negative technology?"

- 11/22 **Selected Speaker:** 9th Semi-Annual New England Cryo-EM Symposium, Harvard Medical School, "Capturing the structural dynamics of the bacterial flagellar motor"
- 10/22 Speaker: Postdoctoral Research in Progress Seminar Series, Department of Microbial Pathogenesis, Yale School of Medicine, "*In-situ* structural basis of flagellar-based motility"
- 09/22 **Selected speaker:** Gordon Research Conference, Sensory Transduction in Microorganisms, CA, "*In-situ* structural basis of how bacteria control flagellar motility"
- 09/22 Poster: Annual Microbiology Retreat, Yale School of Medicine, "*In-situ* structural basis of how bacteria control flagellar motility"
- 04/22 Speaker: Yale Microbial Sciences Institute Retreat, "How do spirochetes swim?"
- 11/21 **Selected Speaker:** 7th Semi-Annual New England Cryo-EM Symposium (virtual), "Combination of FIB-SEM and cryo-FIB/cryo-ET achieves *in-situ* 3D imaging of the subcellular architecture in *Chlorella pyrenoidosa*"
- 11/20 **Best Presentation Award:** 2nd Beihang International Forum for Young Scientists, Ningbo, China, "Photobioreactor development for improving CO₂ fixation from coal-fired power plant flue gas by microalgae"

Ad hoc journal reviewer and editor

- 2019-22 Chemical Engineering Journal, Bioresource Technology, Water Management, Algal Research, ACS Sustainable Chemistry & Engineering, Energy
- 02/22 Guest Associate Editor, *Frontiers in Marine Science*
- 10/22 Guest Associate Editor, *Frontiers in Bioengineering and Biotechnology*

Membership and Service

- 2023 Committee, Yale Annual Microbiology Retreat
- 2023 Committee, Yale Microbial Sciences Institute Annual Retreat
- 2022 Committee, Yale Microbiology Seminar Series
- 2022 Committee, Yale Microbial Sciences Institute Annual Postdoctoral Retreat
- 2022 Student member, International Society of Photosynthesis Research

Complete List of Published Work in MyBibliography

<https://www.ncbi.nlm.nih.gov/myncbi/wangbiao.guo.1/bibliography/public/>