Jiabao Xu

Single-cell Raman spectroscopy · AI-driven bioanalytics · infectious-disease diagnostics

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ACADEMIC POSITIONS

Lecturer / Assistant Professor, Biomedical Engineering, University of Glasgow 2023–now
Visiting Professor, Shanghai East Hospital, Tongji University (同济大学), China 2026–now
Postdoctoral Research Scientist, Engineering Science, University of Oxford 2020–2023
Visiting Research Scholar in Chemistry and Engineering, Boston University May–Dec 2019

EDUCATION

DPhil (PhD) in Engineering Science, University of Oxford, UK 2015–2020
MSci (Master & Bachelor) in Chemistry, Imperial College London, UK 2011–2015

RESEARCH AREAS

Single-Cell Raman Technologies

- Raman-Activated Cell Sorting (RACS) for functional phenotyping and downstream analysis
- Raman Stable Isotope Probing (Raman-SIP) to track metabolic activities at the single-cell level
- Label-free Raman imaging for high-content, non-destructive cellular profiling

Artificial Intelligence and Data-Driven Bioanalytics

- AI pipelines from classical machine learning to deep learning for disease classification
- Multimodal learning frameworks integrating Raman spectra, omics data, images, and clinical metadata
- Denoising autoencoders and explainable AI for clinical translation and biomarker identification

Host--Pathogen Interactions and Infectious Disease

- Single-cell profiling of pathogen–immune cell interactions and intracellular pathogen metabolism
- Rapid pathogen identification, antimicrobial resistance profiling, and drug–pathogen interactions
- Development of culture-free diagnostic tools for bacterial and fungal infections

Immune Cells for Disease Diagnostics

- Raman-based profiling of peripheral blood mononuclear cells (PBMCs) for disease-specific signatures
- Label-free diagnostic tools for cancer, autoimmune disorders (e.g. SLE, PsA), and chronic diseases
- Integration of single-cell metabolism with immune phenotyping for personalized medicine

GRANTS & AWARDS

Lorna & Yuti Chernajovsky Biomedical Research Foundation (PI) 2026 (£190,738)
DECODE-FATIGUE: Deciphering Oxidative and Neurometabolic Drivers of Fatigue in Immune-Mediated Inflammatory Diseases via single-cell Raman spectroscopy (Ref. F2/26)

Royal Society Research Grants (PI) 2025 (£30,000)
Rapid Identification of Bioplastic-Producing Microbes from Waste by Single-cell Raman Sorting (Ref. RGS\R2\252438)

NHS Greater Glasgow & Clyde Endowment Funds (Co-I) 2025 (£11,220)
Investigating Putative Central-Peripheral Metabolic Mechanisms in Psoriatic Arthritis Related Fatigue (Ref. GN24RH463)

ECDP Rewards for Excellence, University of Glasgow (PI) 2024 (£10,000)
A single-cell platform for diagnosis and investigation of unexplained post-infection chronic fatigue syndromes

UK–China Antimicrobial Resistance Initiative, InnovateUK / UKRI (Named researcher) 2020 (£750,000)
ME Research UK (Named researcher) 2019 (£50,000)
ME Association (Named researcher) 2018 (£9,600)

INVITED TALKS & CONFERENCES

Single-Cell Technology and AI for Precision Medicine, Wuhan Third Hospital (武汉市第三医院), Wuhan, China *(invited speaker)* May 2026

PRIME workshop (Patients, Researchers & Industry for ME) *(invited speaker)* Jan 2026
Int. Young Scholars Conf. on "TCM plus" Interdisciplinary, Zhejiang Chinese Medical University, Hangzhou, China *(invited speaker)* 2024
ME/CFS Research Roadmap, National Institute of Neurological Disorders and Stroke, NIH *(invited speaker)* 2023
Int. Lyme and Associated Diseases Society (ILADS) Conference *(keynote speaker)* Oct 2023
OxBacNet, Oxford, UK *(poster)* 2023
Beijing University People's Hospital Rheumatology & Immunology Forum *(invited speaker)* 2022
Single Cell Technology meets Microbiomics, UK *(session chair)* 2021
Light Conference, Changchun, China *(poster)* 2018
ASM Microbe, New Orleans, USA *(oral and poster)* 2017
MitOX, Oxford, UK *(invited speaker)* 2017
RamanFest, West Lafayette, USA *(poster)* 2017
CMRC Conference, Bristol, UK *(travel award)* 2017

EDITORIAL & PEER-REVIEW ROLES

Editorial Roles

- Associate Editor: *Frontiers in Cellular and Infection Microbiology* (Antibiotic Resistance and New Antimicrobial Drugs section)
- Editorial Board Member: *iMetaMed*
- Editorial Board Member: *Heliyon*
- Guest Editor: *Frontiers in Cellular and Infection Microbiology*, special issue "Integrative Physics-Informed AI for Multi-Scale Modeling of Host–Pathogen and Microbiome Interactions" (2026)
- Guest Editor: *Frontiers in Cellular and Infection Microbiology*, special issue "Advances in Combating Antimicrobial Resistance: Focus on Diagnosis, Therapy, and Prevention" (2025)
- Guest Associate Editor: *Frontiers in Microbiology*, special issue "Single-cell Tools to Combat Antimicrobial Resistance" (2023)
- Guest Editor: *Cancers*, special issue "Single-Cell Toolkits in Cancer Research" (2023)

Peer Review & Panels

- Leverhulme Trust ECF Internal Selection Panel, University of Glasgow (2025)
- Fellowship application reviewer, Daphne Jackson Trust (2025)
- Grant reviewer, UKRI EPSRC Access to High Performance Computing facilities (2024)
- Conference review panel, BioMedEng (2025)
- ACS Peer Review Recognition (American Chemical Society), 2025
- Regular reviewer for international journals including *Nature Communications*, *Nature Microbiology*, *Science Advances*, *Analytical Chemistry*, *Talanta*, and *Microbial Biotechnology*

SUPERVISION & TEACHING

Certificate: Fellowship of Recognising Excellence in Teaching (PSF D2), University of Glasgow, 2025.

Student Supervision

- PhD students: 3 currently supervised; 2 graduated | Master's students: 16 graduated

Examining & Assessment

- External Examiner, MSc in Clinical Embryology, University of Oxford (2026)
- Internal examiner and marker: MSc, MEng and BEng projects, dissertations and written examinations, University of Glasgow (2023–present)

Course Teaching

- Advanced Artificial Intelligence and Machine Learning 5: Level 5 and Masters students (University of Glasgow)
- Introduction to Artificial Intelligence and Machine Learning: Level 4 engineering undergraduates (University of Glasgow)
- Engineering Maths 1: $>$300 first-year students, 2$\times$14 lecture modules annually (University of Glasgow)

- Business Planning and Management for Engineers: fourth-year undergraduates across all engineering disciplines (University of Glasgow)
- Overseas Immersion Programme (OIP): ∼400 first-year engineering & computer science students (SIT–UoG Joint Degree Programmes)
- Lab demonstrator and tutor: practical and tutorial sessions in chemistry and engineering science (University of Oxford)

PATENTS

- Image-guided cell sorting and uses (U.S. Patent Provisional Application No. 63/542,652)
- Rapid identification instrument and identification method for pathogenic microorganisms (CN111220589A)

PUBLICATIONS

Total citations: 1438 (1323 since 2021) | *h-index: 23* | *i10-index: 29*

First & Corresponding Authored Papers

(*corresponding author; #co-first author)

W. Tu, **J. Xu***, Y. Ma, C. Katsimpouras, G. Stephanopoulos. Machine learning-driven optimization of metabolic balance for β-carotene production. *Metabolic Engineering* (2026).

Y. Li, **J. Xu#**, X. Yi, Y. Luo, A. Glidle, S. Allen, T. Ryan, X. Liu, W. Yu, X. Chu, S. Chen, Q. Zhang, X. Xu, X. Hua, Q. Yang, J. Reboud, J.M. Cooper, Y. Yu, W.E. Huang, H. Yin. Rapid culture-free diagnosis of clinical pathogens via integrated microfluidic–Raman micro-spectroscopy. *Nature Communications* (2026).

W. Xiong, A. Sun, T. Gui, Y. Xiao, X. Wang, J. Zhen, Q. Yu, C. Deng, H. Wang, **J. Xu***. Age-dependent metabolic signatures in mouse oocytes revealed by single-cell Raman spectroscopy and high-resolution imaging. *iMetaMed* (2025).

Y. Wang, Y. Qu, H. Wang, Y. Xue, P. Liang, Y. Ge, H. Peng, Y. Wang, Z. Song, X. Bao, **J. Xu***, B. Li. Microwell-assembled aluminum substrates for enhanced single-cell analysis: a novel approach for cancer cell profiling by Raman spectroscopy. *Talanta* (2025).

J. Zhang, H. Lin, **J. Xu***, M. Zhang, X. Ge, C. Zhang, W. E. Huang, J. X. Cheng. High-throughput single-cell sorting by stimulated Raman-activated cell ejection. *Science Advances* (2024).

Q. Peng, Y. Dong, Y. Chen, A. Glidle, L. Kong, H. Yin, **J. Xu***, K. Yang. Rapid profiling of fish cell nitrogen metabolism with single-cell Raman spectroscopy: unveiling the enzyme's role in ammonia detoxification. *Talanta* (2024).

J. Xu* & K. J. Morten. Raman micro-spectroscopy as a tool to study immunometabolism. *Biochemical Society Transactions* (2024).

J. Xu#, D. Chen#, W. Wu, X. Ji, X. Dou, X. Gao, J. Li, X. Zhang, W. E. Huang, D. Xiong. A metabolic map and artificial intelligence-aided identification of nasopharyngeal carcinoma via a single-cell Raman platform. *British Journal of Cancer* (2024).

J. Xu, T. Lodge, C. Kingdon, J. W. L. Strong, J. Maclennan, E. Lacerda, S. Kujawski, P. Zalewski, W. E. Huang, K. Morten. Developing a blood cell-based diagnostic test for myalgic encephalomyelitis/chronic fatigue syndrome using peripheral blood mononuclear cells. *Advanced Science* (2023).

J. Xu*, L. Cui, Y. Song. Editorial: Single-cell tools to combat antimicrobial resistance. *Frontiers in Microbiology* (2023).

J. Xu, Y. Luo, J. Wang, W. Tu, X. Yi, X. Xu, Y. Song, Y. Tang, X. Hua, Y. Yu, Q. Yang, W. E. Huang. Artificial intelligence-aided rapid and accurate identification of clinical fungal infections by single-cell Raman spectroscopy. *Frontiers in Microbiology* (2023).

T. Yu, A. C. Jadhav, **J. Xu***, A. L. Harris, V. Nair, W. E. Huang. Metabolic reprogramming in persistent colon cancer cells infected by Newcastle disease virus. *Cancers* (2023).

J. Xu, J. Yi, G. Jin, D. Peng, G. Fan, G. X. Xu, X. Chen, H. Yin, J. M. Cooper, W. E. Huang. High-speed diagnosis of bacterial pathogens at the single cell level by Raman microspectroscopy with machine learning filters and denoising autoencoders. *ACS Chemical Biology* (2022).

J. Xu*, T. Yu, C. E. Zois, J. Cheng, Y. Tang, A. L. Harris, W. E. Huang. Unveiling cancer metabolism

through spontaneous and coherent Raman spectroscopy and stable isotope probing. *Cancers* (2021).

C. Hsu, **J. Xu**#, B. Brinkhof, H. Wang, Z. Cui, W. E. Huang, H. Ye. A single-cell Raman-based platform to identify developmental stages of human pluripotent stem cell-derived neurons. *Proceedings of the National Academy of Sciences* (2020).

J. Xu, X. Li, Z. Guo, W. E. Huang, J. X. Cheng. Fingerprinting bacterial metabolic response to erythromycin by Raman-integrated mid-infrared photothermal microscopy. *Analytical Chemistry* (2020).

J. Xu, L. P. Llanes, A. Aulicino, C. M. Decker, M. Depke, M. G. Salazar, F. Schmidt, A. Simmons, W. E. Huang. Single-cell and time-resolved profiling of intracellular *Salmonella* metabolism in primary human cells. *Analytical Chemistry* (2019).

J. Xu, M. Potter, C. Tomas, J. L. Elson, K. J. Morten, J. Poulton, N. Wang, H. Jin, Z. Hou, W. E. Huang. A new approach to find biomarkers in chronic fatigue syndrome/myalgic encephalomyelitis (CFS/ME) by single-cell Raman micro-spectroscopy. *Analyst* (2018).

J. Xu, D. Zhu, A. D. Ibrahim, C. C. R. Allen, C. M. Gibson, P. W. Fowler, Y. Song, W. E. Huang. Raman-DIP (deuterium isotope probing) reveals microbial metabolism at the single-cell level. *Analytical Chemistry* (2017).

J. Xu, I. Webb, P. Poole, W. E. Huang. Label-free discrimination of rhizobial bacteroids and mutants by single-cell Raman microspectroscopy. *Analytical Chemistry* (2017).

Other Co-Authored Papers

D. Patel, K. Shabestary, **J. Xu**, C. Klemm, W. E. Huang, R. Ledesma-Amaro. Promoter selection reduces phenotypic heterogeneity and improves bioproduction. *Trends in Biotechnology* (2026).

Y. Yu, **J. Xu**, B. Lin, T. V. Priputnevich, M. U. Munir, S. C. Nang, Z. Zhang. Editorial: Advances in combating antimicrobial resistance: focus on diagnosis, therapy, and prevention. *Frontiers in Cellular and Infection Microbiology* (2026).

A. Lin, M. Xiong, A. Jiang, L. Huang, H. Z. H. Wong, S. Feng, C. Zhang, Y. Li, L. Chen, H. Chi, P. Zhang, B. Ye, H. Zhang, N. Zhang, L. Zhu, W. Mou, J. Shen, K. Li, W. Xu, H. Ying, C. Zhang, D. Zeng, J. Xie, X. Deng, Q. Wang, J. Xu, W. Shi, C. Qi, C. Qu, X. Huang, A. Hajdu, C. Li, C. Peng, X. Cao, G. Pei, L. Zhang, Y. Huo, **J. Xu**, A. Glaviano, A. G. Szöllősi, S. Bian, Z. Li, H. Tang, B. Tang, Z. Liu, J. Zhang, K. Miao, Q. Cheng, T. Wei, S. Yuan, P. Luo. The microbiome in cancer. *iMeta* (2025).

Q. Peng, H. Sun, L. Neilson, S. Maknitikul, **J. Xu**, L. Kong, S. Zanivan, H. Yin. Single-cell analysis reveals the impact of tumour-derived matrix on cancer-associated fibroblasts. *Proc. 2024 9th Int. Conf. on Biomedical Imaging, Signal Processing* (2025).

T. A. Tabish, M. Z. Hussain, S. Zervou, W. K. Myers, W. Tu, **J. Xu**, I. Beer, W. E. Huang, R. Chandrawati, M. J. Crabtree, P. G. Winyard, C. A. Lygate. S-nitrosocysteamine-functionalised porous graphene oxide nanosheets as nitric oxide delivery vehicles for cardiovascular applications. *Redox Biology* (2024).

T. A. Tabish, M. Z. Hussain, Y. Zhu, **J. Xu**, W. E. Huang, M. Diotallevi, R. J. Narayan, M. J. Crabtree, A. Khademhosseini, P. G. Winyard, C. A. Lygate. Synthesis and characterization of amine-functionalized graphene as a nitric oxide-generating coating for vascular stents. *Applied Physics Reviews* (2024).

W. Tu, **J. Xu**, I. P. Thompson, W. E. Huang. Engineering artificial photosynthesis based on rhodopsin for CO_2 fixation. *Nature Communications* (2023).

P. A. Davison, W. Tu, **J. Xu**, S. D. Valle, I. P. Thompson, C. N. Hunter, W. E. Huang. Engineering a rhodopsin-based photo-electrosynthetic system in bacteria for CO_2 fixation. *ACS Synthetic Biology* (2022).

A. González-Cebrián, A. Eloy, **J. Xu**, T. Yu, W. E. Huang, K. Giménez-Orenga, S. Hutchinson, T. Lodge, L. Nathanson, K. J. Morten, A. Ferrer, E. Oltra. Diagnosis of myalgic encephalomyelitis/chronic fatigue syndrome with partial least squares discriminant analysis: relevance of blood extracellular vesicles. *Frontiers in Medicine* (2022).

Y. Wang, **J. Xu**, D. Cui, L. Kong, S. Chen, W. Xie, C. Zhang. Classification and identification of archaea using single-cell Raman ejection and artificial intelligence: implications for investigating uncultivated microorganisms. *Analytical Chemistry* (2021).

I. Webb, **J. Xu**, S. Carmen, R. Karunakaran, V. Ramachandran, P. Rutten, A. East, W. E. Huang, P. Poole. Regulation and characterization of mutants of *fixABCX* in *Rhizobium leguminosarum*. *Molecular Plant-Microbe Interactions* (2021).

Y. Wang, **J. Xu**, L. Kong, B. Li, H. Li, W. E. Huang, C. Zheng. Raman-activated sorting of antibiotic-resistant bacteria in human gut microbiota. *Environmental Microbiology* (2020).

C. K. Ng, **J. Xu**, Z. Cai, L. Yang, I. Thompson, W. E. Huang, B. Cao. Elevated intracellular cyclic-di-GMP level in *Shewanella oneidensis* increases expression of c-type cytochromes. *Microbial Biotechnology* (2020).

Y. Wang, **J. Xu**, L. Kong, T. Liu, L. Yi, H. Wang, W. E. Huang, C. Zheng. Raman–deuterium isotope probing to study metabolic activities of single bacterial cells in human intestinal microbiota. *Microbial Biotechnology* (2019).

B. Liang, Y. Gao, **J. Xu**, Y. Song, L. Xuan, T. Shi, N. Wang, Z. Hou, Y. Zhao, W. E. Huang. Raman profiling of embryo culture medium to identify aneuploid and euploid embryos. *Fertility and Sterility* (2019).

J. X. Chen, H. Steel, Y. H. Wu, Y. Wang, **J. Xu**, C. P. N. Rampley, I. P. Thompson, A. Papachristodoulou, W. E. Huang. Development of aspirin-inducible biosensors in *Escherichia coli* and SimCells. *Applied and Environmental Microbiology* (2019).

Y. Wang, Z. Zhang, X. Xu, C. Chen, **J. Xu**, L. Kong, P. Xie, C. Zheng, N. Ren, D. Lee. Effective removal of methyl siloxane from water by sewage activated sludge microbes: biodegradation behaviour and characteristics of microbial community. *Bioresource Technology Reports* (2019).

X. Yuan, Y. Song, Y. Song, **J. Xu**, Y. Wu, A. Glidle, M. Cusack, U. Z. Ijaz, J. M. Cooper, W. E. Huang, H. Yin. Effect of laser irradiation on cell function and its implications in Raman spectroscopy. *Applied and Environmental Microbiology* (2018).

Y. Song, L. Cui, J. A. S. Lopez, **J. Xu**, Y. G. Zhu, I. P. Thompson, W. E. Huang. Raman-deuterium isotope probing for in-situ identification of antimicrobial-resistant bacteria in the Thames River. *Scientific Reports* (2017).

Book Chapters

E. Gan, M. Stoker, E. Guo, K. J. Morten & **J. Xu**. Using single-cell Raman microspectroscopy to profile human peripheral blood mononuclear cells. In *Myalgic Encephalomyelitis/Chronic Fatigue Syndrome (ME/CFS): Methods and Protocols* (eds. Tate, W. & Peppercorn, K.) 29–37 (Springer US, New York, NY, 2025).

Raman-integrated optical photothermal infrared microscopy (Chapter 8). In *Molecular and Laser Spectroscopy: Advances and Applications*, Vol. 3, pp. 281–300 (2022).