Mengjun Shu

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EDUCATION

University of California, Merced, CA
Ph.D. Environmental Systems (Population Genetics) 2015 – 2020
Dissertation: "Association genetics of drought tolerance in ponderosa pine"

Sun Yat-Sen University (SYSU), Guangzhou, China
B.S. Geography Science 2009 – 2013

RESEARCH EXPERIENCES

R&D Associate Staff Member, Oak Ridge National Laboratory 2024 – present
Postdoctoral Research Associate, Oak Ridge National Laboratory 2021 – 2024
Postdoctoral Scholar, University of California, Merced 2020 – 2021
Graduate Student Researcher, University of California, Merced 2015 – 2020
Lab Assistant, Prof. Liang Hu's lab in SYSU, China 2014 – 2015
Lab Volunteer, Prof. Ingrid Parker's lab in University of California, Santa Cruz 2014
Lab Assistant, Research Center of Forest Ecosystem in Tropics and Subtropics, China 2013
Undergraduate Student Researcher, Prof. Liang Hu's lab in SYSU, China 2011 – 2013

PUBLICATIONS

1. M. Klein, Z, Meng, J. Bailey-Bale, S. Milner, P. Shi, W. Muchero, JG. Chen, T. J. Tschaplinski, D. Jacobson, J. Lagergren, M. Lane, C. OBrien, H. Chhetri, **M. Shu**, P. Freer-Smith, T. Buckley, T. Magney, G. Monro, G. A. Tuskan, G. Taylor. Climate adaptation in *P. trichocarpa*: key adaptive loci identified for stomata and leaf traits. *New Phytologist.* (2025) (in production)
2. A. R. Devireddy, T. Yao, K. De, W. P. Bewg, J. Zhang, B. A. Feyissa, R. Ployet, S. Jawdy, N. Engle, M. Rodriguez, M. Martin, D. J. Weston, CJ. Tsai, Y. Yoshinaga, C. Daum, **M. Shu**, T. J. Tschaplinski, K. Barry, A. Lipzen, J. Schmutz, G. A. Tuskan, JG. Chen, W. Muchero. A cation/H^+ antiporter promotes stomatal conductance and carbon assimilation in water-deficit plants. *Plant, Cell & Environment* (2025) (under review)
3. **M. Shu**, A. L. Harfouche, M. Trtílek, K. Panzarová, O. F. Alasia, J. H. Lagergren, A. Labbé, N. L. Engle, M. M. Clark, JG. Chen, G. A. Tuskan, T. J. Tschaplinski. Leveraging hyperspectral phenotyping for accurate, non-destructive prediction of metabolite profiles in poplar under drought stress. *Environmental and Experimental Botany* (2025) (under review)
4. W. Zhu, J. Zhang, P. K. Prabhakar, Y. O. Chan, R. A. Weber, **M. Shu**, G. Panzade, C. J. Cooper, R. B. Davidson, J. M. Parks, B. R. Urbanowicz, G. A. Tuskan, T. Joshi, R. A.

Dixon, W. Muchero, J. Barros. A latitudinal gradient in S/G lignin monomer ratio driven by laccase in natural poplar variants. *Proceedings of the National Academy of Sciences* (2025) (under review)

5. B. A. Feyissa, E. M. de Becker, C. E. Salesse-Smith, **M. Shu**, J. Zhang, T. B. Yates, M. Xie, K. De, D. Gotarkar, M. S.S. Chen, S. S. Jawdy, D. L. Carper, K. Barry, J. Schmutz, D. J. Weston, P. E. Abraham, CJ. Tsai, J. L. Morrell-Falvey, G. Taylor, JG. Chen, G. A. Tuskan, S. P. Long, S. J. Burgess, W. Muchero. An orphan gene BOOSTER enhances photosynthetic efficiency and plant productivity. *Developmental Cell*. 60, 723-734.e7 (2025)
6. **M. Shu**, T. B. Yates, C. John, A. E. Harman-Ware, R. M. Happs, N. Bryant, S. S. Jawdy, A. J. Ragauskas, G. A. Tuskan, W. Muchero, JG. Chen. Providing Biological Context for GWAS Results using eQTL Regulatory and Co-expression Networks in *Populus*. *New Phytologist.* 244 (2), 603-617. (2024)
7. **M. Shu**, E.V. Moran. Identifying genetic variation associated with environmental variation and drought-tolerance phenotypes in ponderosa pine. *Ecology and Evolution.* 13(10), e10620. (2023)
8. N. Bryant, J. Zhang, K. Feng, **M. Shu**, R. Ployet, JG. Chen, W. Muchero, C. Yoo, T. J. Tschaplinski, Y. Pu, A. J. Ragauskas. Novel candidate genes for lignin structure identified through genome-wide association study of naturally varying *Populus trichocarpa*. *Frontiers in Plant Science*. 14, 1153113. (2023)
9. T. Yao, J. Zhang, T. B. Yates, H. K. Shrestha, N. L. Engle, R. Ployet, C. John, K. Feng, W. P. Bewg, M. S. Chen, H. Lu, S. A. Harding, Z. Qiao, S. S. Jawdy, **M. Shu**, W. Yuan, K. Mozaffari, A. E. Harman-Ware, R. M. Happs, L. M. York, B. M. Binder, Y. Yoshinaga, C. Daum, T. J. Tschaplinski, P. E. Abraham, CJ. Tsai, K. Barry, A. Lipzen, J. Schmutz, G. A. Tuskan, JG. Chen, W. Muchero. Expression quantitative trait loci mapping identified PtrXB38 as a key hub gene in adventitious root development in *Populus*. *New Phytologist*. 239(6), 2248-2264. (2023)
10. D. Wu, **M. Shu**, E.V. Moran. Heritability of plastic trait changes in drought-exposed ponderosa pine seedlings. *Ecosphere*. 14(3), e4454. (2023)
11. Moran, E.V., J. Lauder, C. Musser, A. Stathos, **M. Shu**. Genetics of drought tolerance in conifers and its implications for adaptation to climate change. *New Phytologist*. 216(4), 1034-1048. (2018)

GRANTS AWARDED and UNDER CONSIDERATION

1. High risk high rewarding (HRHR) project within The Center for Bioenergy Innovation (CBI), "Genomic insights into woody tissue photosynthesis in poplar trees: unraveling the genetic basis of chlorophyll retention for enhanced stress resilience", $361,872 for two years. Role: PI (2025-2027).
2. HRHR project within CBI, "Graph-enabled GWAS method development and application to leaf metabolite networks in *Populus trichocarpa*", $200,000 for 1 year. Role: PI (2025-2026).

3. HRHR project within CBI, “Developing Eucalyptus as a new perennial, dual-purpose feedstock for production of both lignocellulosic biofuels and terpene-based aviation fuels”, $598,387 for two years. Role: Co-PI (2025-2027).
4. HRHR project within CBI, “Identifying plant trait and genomic targets for enhanced soil carbon sequestration”, $723,269 for two years. Role: Co-PI (2025-2027).
5. HRHR project within CBI, “Single cell genomics for poplar”, $929,000 for two years. Role: Co-PI (2025-2027).
6. DE-FOA-0003452, Genomics - Enabled Understanding and Advancing Knowledge on Plant Gene Function(s), "Multiomics-enabled understanding of drought resiliences and lignin optimization for sustainable bioenergy production in *populus*”, $2,999,046 for three years. Role: Co-PI. (Under review)
7. 2024 SC Distinguished Scientist Fellows Program for Dr. Gerald Tuskan. “Optimizing Eucalyptus for Terpene Production and Sustainable Aviation Fuel Across Diverse U.S. Climates”, $1M FWP for three years. Role: Co-PI. (2024-2027).
8. Pilot Laboratory Directed Research and Development (LDRD) Project, “Pioneering multi-scale biological and environmental solutions for a sustainable Earth”, $700,000. Role: Co-Project lead (2024-2025)
9. The XSEDE Research Project, “Association genetics of drought tolerance in ponderosa pine (*Pinus ponderosa*)”, 30,000 SUs in Bridges Large and 4000 GB in Bridges Storage ($20,340). Role: Co-PI (2019 – 2020)
10. The XSEDE Startup Project, “Association genetics of drought tolerance in ponderosa pine (*Pinus ponderosa*)”, 9000 SUs in Bridges Large and 2000 GB in Bridges Storage. Role: Co-PI (2018 – 2019)

AWARDS & FELLOWSHIPS

1. The Team Excellence Award in Biosciences Division at ORNL (2025)
2. The Best Science Highlight Award in Biosciences Division at ORNL (2025)
3. CBI Early Career Fellowship, $15,000 (2024)
4. UC Merced Graduate Student Opportunity Program Fellowship, $42,747 (2018 – 2019)
5. UC Merced Summer Travel Fellowship, $1000 (2018)
6. UC Merced Peer Mentor Fellowship, $500 (2017 – 2018)
7. UC Merced Environmental Systems Summer Graduate Fellowship, $7500 (2017)
8. UC LA Conservation Genomics Consortium Catalyst Grant, $250 (2017)
9. SYSU Undergraduate Honors Thesis (2013)
10. SYSU Third-level Scholarship, CNY: 2000 (2011)

PRESENTATIONS

1. “Providing Biological Context for GWAS Results using eQTL Regulatory and Co-expression Networks in *Populus*”, WFGA-SFTIC-NFGA Joint Conference in Forest Genetic, University Park, PA. *Talk* (2025)
2. “Leveraging hyperspectral imaging for non-destructive prediction of metabolite profiles in poplar under drought stress”, CBI annual meeting, Asheville, NC. *Talk & Poster* (2025)

3. "Providing Biological Context for GWAS Results using eQTL Regulatory and Co-expression Networks in *Populus*", American Society of Plant Biologists conference (ASPB), Honolulu, Hawaii. *Talk* (2024)
4. "Combined GWAS and eQTL analysis uncovers a genetic regulatory network for lignin and carbohydrate traits in *Populus trichocarpa*", American Society of Plant Biologists conference (ASPB), Savannah, Georgia. *Poster* (2023)
5. "Combined GWAS and eQTL analysis uncovers genetic regulatory networks for lignin and carbohydrate biosynthesis in *Populus trichocarpa*", Southern Forest Tree Improvement Committee Conference (SFTIC), Knoxville, TN. *Talk* (2023)
6. "Combined GWAS and eQTL analysis uncovers a genetic regulatory network for lignin and carbohydrate traits in *Populus trichocarpa*", CBI annual meeting, Asheville, NC. *Poster* (2023)
7. "Combined GWAS and eQTL analysis uncovers genetic regulatory networks for lignin and carbohydrate biosynthesis in *Populus trichocarpa*", Plant & Animal Genome Conference (PAG 30), San Diego, CA. *Invited Talk* (2023)
8. "Combined GWAS and eQTL analysis uncovers a genetic regulatory network for lignin and carbohydrate traits in *Populus trichocarpa*", American Society of Plant Biologists conference (ASPB), Portland, OR. *Poster* (2022)
9. "Combined GWAS and eQTL analysis uncovers a genetic regulatory network for lignin and carbohydrate traits in *Populus trichocarpa*", CBI annual meeting, Asheville, NC. *Poster* (2022)
10. "Association genetics of drought tolerance in ponderosa pine (*Pinus ponderosa*)", Forest Genetics Student Symposium, online meeting. *Talk* (2021)
11. "Testing pipelines for genome-wide SNP calling from Genotyping-by-Sequencing data for *Pinus ponderosa*", IUFRO Tree Biotechnology Meeting, Raleigh, NC. *Poster* (2019)
12. "Responses to water and soil conditions in ponderosa pine seedlings", Ecological Society of America, New Orleans, LA. *Talk* (2018)

WORKSHOPS ORGANIZED

1. "From Orbit to Orchard: The Power of Proximal Hyperspectral Imaging for High-Throughput Plant Phenotyping", European Environmental Plant Spectroscopy (EEPS) Meeting, 2025 (Co-organizer)

RESEARCH SKILLS

1. **Statistical and Computational Analysis:**
   - Expertise in Genome-Wide Association Studies (GWAS), genotype-by-environment analysis, population structure analysis, long-sequence and short-read sequence analysis, and Expression Quantitative Trait Loci (eQTL) analysis
2. **Professional Training and Workshops:**
   - UCLA/La Kretz Workshop in Conservation Genomics (2017)
   - 22nd Summer Institute in Statistical Genetics, UW (2017)
   - C for Everyone: Programming Fundamentals, Coursera (2021)
   - Python Data Structures, Coursera (2021)

- Introduction to Data Science in Python, Coursera (2022)
- Crash Course on Python, Coursera (2022)
- 28th Summer Institute in Statistical Genetics, UW (2023)

3. **Programming**: Proficiency in R, Python, High-performance computing (HPC)
4. **Field and Experimental Techniques**: Greenhouse and common-garden experiments, Forest ecology measurements
5. **Molecular Biology and Genetics**: Genotyping-by-sequencing, PCR, Bioanalyzer operation, DNA extraction

TEACHING EXPERIENCE

1. Environmental Plant Ecophysiology. *Guest lecture for population genetics in poplar*. UTK (Fall 2024)
2. Nutrition. *Teaching Assistant*. UC Merced (Spring 2020)
3. Evolution. *Teaching Assistant*. UC Merced (Summer & Fall 2019)
4. Global Change Biology. *Guest lecture*. UC Merced (Fall 2018)
5. Plant Biology. *Teaching Assistant*. UC Merced (Spring 2018)
6. Biodiversity and Conservation. *Teaching Assistant*. UC Merced (Spring & Fall 2017)
7. Introductory Biology Labs. *Teaching Assistant*. UC Merced (Spring 2016 & Summer 2017)