

# Mengjun Shu

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R&D Associate Staff Member  
Biological and Environmental Systems Science Directorate  
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## RESEARCH INTERESTS

Leveraging multidisciplinary approaches in genetics, biochemistry, and multi-omics to elucidate the fundamental mechanisms of plant responses to environmental challenges. Dedicated to advancing our understanding of tree adaptation and resilience through cutting-edge genomic and biochemical analyses, with a focus on improving tree performance and sustainability under diverse environmental conditions.

## 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. 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)
2. 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*. (2024) (under review)

3. 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, C.J. Tsai, Y. Yoshinaga, C. Daum, **M. Shu**, T. J. Tschaplinski, K. Barry, A. Lipzen, J. Schmutz, G. A. Tuskan, J.G. Chen, W. Muchero. A cation/H<sup>+</sup> antiporter promotes stomatal conductance and carbon assimilation in water-deficit plants. *Global Change Biology* (2024) (under review)
4. **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)
5. N. Bryant, J. Zhang, K. Feng, **M. Shu**, R. Ployet, J.G. 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)
6. 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, C.J. Tsai, K. Barry, A. Lipzen, J. Schmutz, G. A. Tuskan, J.G. 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)
7. D. Wu, **M. Shu**, E.V. Moran. Heritability of plastic trait changes in drought-exposed ponderosa pine seedlings. *Ecosphere*. 14(3), e4454. (2023)
8. 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. Advanced Scientific Computing Research (ASCR) and Biological and Environmental Research (BER) Project, “Multimodal foundation models for exascale plant phenomics”, \$2M per year for a total of \$4M. Role: Co-PI. (Under consideration).
2. 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).
3. 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)
4. 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)
5. 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. CBI Early Career Fellowship, \$15,000 (2024)
2. UC Merced Graduate Student Opportunity Program Fellowship, \$42,747 (2018 – 2019)
3. UC Merced Summer Travel Fellowship, \$1000 (2018)
4. UC Merced Peer Mentor Fellowship, \$500 (2017 – 2018)
5. UC Merced Environmental Systems Summer Graduate Fellowship, \$7500 (2017)
6. UC LA Conservation Genomics Consortium Catalyst Grant, \$250 (2017)
7. SYSU Undergraduate Honors Thesis (2013)
8. SYSU Third-level Scholarship, CNY: 2000 (2011)

## PRESENTATIONS

1. “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)
2. “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)
3. “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)
4. “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)
5. “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)
6. “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)
7. “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)
8. “Association genetics of drought tolerance in ponderosa pine (*Pinus ponderosa*)”, Forest Genetics Student Symposium, online meeting. *Talk* (2021)
9. “Testing pipelines for genome-wide SNP calling from Genotyping-by-Sequencing data for *Pinus ponderosa*”, IUFRO Tree Biotechnology Meeting, Raleigh, NC. *Poster* (2019)
10. “Responses to water and soil conditions in ponderosa pine seedlings”, Ecological Society of America, New Orleans, LA. *Talk* (2018)

## 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)
  - 22<sup>nd</sup> 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)
  - 28<sup>th</sup> 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)