
Carsten Külheim

College of Forest Resources and
Environmental Science
Michigan Technological University
Houghton, MI USA

Phone: +1-906-487-1615
Email: ckulheim@mtu.edu
Web (Lab): <https://kuelheimlab.org>
Web (MTU): <https://tinyurl.com/y26f5r9h>

SUMMARY

- 68 publications to date (51 peer-reviewed international journal articles), including a first-authored paper in *Science* and major contribution to a paper in *Nature*.
- Steep career trajectory as evidenced by my recent record of 32 peer-reviewed publications since 2016.
- An *h*-index of 24 (i10 index of 43) and over 3,700 citations (google scholar) demonstrates my high level of exposure to the scientific community.
- Awarded over US\$1,900,000 in research funds, including funds from competitive national agencies and programs, and from the Industry sector.
- Scientific consultant to Industry and Government organisations.
- Diverse experience in a range of practical and theoretical areas of evolution, plant genetics, plant-microbial and other environmental interactions, biotechnology, metabolomics, plant physiology and molecular biology.

RESEARCH POSITIONS

- 2018 – **Associate Professor at Michigan Technological University (MTU).**
- 2010 – 18 **Senior Research Fellow at the Australian National University (ANU).**
- 2008 – 09 **Research Fellow at the ANU.**
- 2006 – 08 **Postdoctoral Research Fellowship at University of British Columbia.**

EDUCATION

- 2000 – 05 **Doctor of Philosophy** (Plant Molecular Biology) awarded October 2005
Department of Plant Physiology, Umeå University, Sweden.
Thesis: “The significance of feedback de-excitation”.
Advisor: Prof Stefan Jansson
- 1999 – 00 **Bachelor of Science** (Biology) awarded June 2000
Department of Plant Physiology, Umeå University, Sweden.
Thesis: “Function and Regulation of the light harvesting like genes”.
Advisor: Prof Stefan Jansson
- 1996 – 99 **‘Vordiplom’** (Biology) awarded May 1999
University of Mainz, Germany

RESEARCH GRANTS

\$980,777 awarded as PI

\$81,000 awarded as co-PI

\$855,000 awarded as Key personnel

Funded:

- 2021 – 24 \$24,000 **USDA NIFA M-S grant** (PI Külheim, MTU) The genetic basis of climate adaptation in red oak
- 2022 – 22 \$6,000 **Ecosystem Science Center** (PI Cavaleri, Co-PIs Külheim, Burton, MTU) Acclimation of *Quercus rubra* root respiration across a Midwest temperature gradient
- 2021 – 22 \$4,383 **MTU internal Pandemic mitigation fund** (PI Külheim, MTU)
- 2020 – 24 \$474,128 **USDA-NIFA, AFRI Foundational Program** (PI Külheim, Co-PIs Schelly, Rouleau (all MTU)) Social implications of genetically improved trees: Assessing public and forest owner attitudes and risk perceptions
- 2020 – 21 \$33,000 **MTU Research Excellence Fund – Research Seed** (PI Külheim (MTU)) Building essential red oak genomic resources for comparative genomics and as a basis for genome-wide association studies
- 2020 \$25,000 **MTU Research Excellence Fund – Infrastructure Enhancement** (PI Cavaleri, Co-PIs Külheim, Burton, Hersch-Green (all MTU)) State-of-the-science plant gas exchange measurements for ecological research
- 2020 \$5,806 **Jurgensen/Hammer teaching equipment fund** (PIs Brzeski, Külheim (both MTU)) Bringing CFRES to the forefront of forestry and wildlife genetics education with wet lab teaching equipment
- 2019 \$4,000 **Ecosystem Science Center** (PI Külheim, MTU) Red oak adaptation to climate change
- 2018 – 21 \$24,000 **USDA NIFA M-S grant** (PI Külheim, Co-PI Cavaleri (both MTU)) Thriving trees for future needs - oak adaptation to climate change
- 2014 – 16 A\$460,000 (ca. \$350,000) **Australian Research Council Discovery project** (PI Foley, Key personnel Külheim (both ANU)) Re-evaluating the nature, origins and roles of terpenes in *Eucalyptus* (DP140101755)
- 2013 – 15 A\$350,000 (ca. \$260,000) **Australian Research Council Discovery project** (PI Crisp (ANU), Co-PI Cook (University of Queensland), Key personnel Külheim (ANU)) Evolution of Australia's globally unique hotspot of floral diversity (DP130101141)
- 2013 – 15 A\$65,000 (ca. \$50,000) **Hermon Slade Foundation** (PI Lanfear, Co-PIs Külheim, Foley (all ANU)) Mosaicism, somatic mutation, and environmental change in long-lived plants
- 2012 – 13 A\$5,000 (ca. \$3,500) **ANU-CSIRO Centre for Biodiversity Analysis Ignition project** (PI Külheim (ANU)) Deep sequencing of *Eucalyptus* series *globulares* to unravel its hybrid history
- 2012 – 14 A\$121,460 (ca. \$90,000) **Plant Health Australia** (PI Külheim, Co-PI Foley (both ANU)) Discovery of genetic markers for resistance to infection by *Uredo rangellii* in species of Myrtaceae (PHA-P214)
- 2011 – 15 A\$379,907 (ca. \$285,000) **RIRDC** (PI Külheim, Co-PI Foley (both ANU)) Discovery of genetic resistance markers to Myrtle rust in Myrtaceae (PRJ-007524)

2011 – 13 A\$323,000 (ca. \$245,000) **Australian Research Council Linkage Grant** (PI Foley, Key personnel Külheim (both ANU)) Improvement of oil yield in essential oil producing Myrtaceae (LP110100184)

Pending:

2023 – 28 \$10,000,000 **USDA NIFA AFRI Sustainable Agricultural Systems** (PI Burton, Co-PI Kuelheim, MTU) From Individual Tree to Ecosystem scales: Applying UAV-based remote-sensing technology for sustaining forest function and productivity.

Grants not selected for funding:

2021 DKK 3,000,000 (ca. \$476,000) **Novo Nordisk Foundation** (PI Neilson (University of Copenhagen), Key personnel: Külheim (MTU); Myburg, Naidoo, Slippers, Hammersbacher (all University of Pretoria)) ExCeed: Exploiting the Chemical Diversity of Trees

2021 \$649,882 **USDA-NIFA, AFRI Foundational Program** (PI Külheim, Co-PIs Cavaleri, Burton, Jarvi (all MTU)) Environmental and genetic influences on range-wide variation in physiology of sugar maple and northern red oak: carbon cycling implications

2021 \$497,752 **USDA-NIFA, AFRI Education and Workforce Development** (PI Webster, Co-PIs Bal, Gagnon, Froese, Key personnel Külheim, Jarvi, Kelly, Brzeski, Burton, Wolfe, Xie (all MTU)) REEU Field Practicum in Sustainable Production Systems in Upper Great Lakes Forests

2020 Service grant **US DoE-JGI Community Science Project** (PI Myburg (University of Pretoria), Co-PIs Borevitz (ANU), Grattapaglia (EMBRAPA), Key personnel Külheim (MTU)) 10,000 Eucalypt Genome Initiative (10KEGI). Letter of intent was successful, full proposal was unsuccessful.

2020 \$499,944 **USDA-NIFA, AFRI Foundational Program** (PI Külheim, Co-PIs Cavaleri, Burton, Jarvi (all MTU)) Environmental and genetic influences on range-wide variation in physiology of sugar maple and northern red oak: carbon cycling implications

2020 Pre-proposal **US DoE (DE-FOA-0002214)** (PI Külheim, Co-PI Burton, Key personnel: Cavaleri, Rudnicki, Kane, Lilleskov (all MTU), Tuskan, Jacobson (both Oak Ridge National Laboratory), Peter (University of Florida)) A systems approach to value-added biofuel feedstock from eucalypts.

2019 Service grant **US DoE-JGI Community Science Project** (PI Külheim (MTU), Co-PIs Gailling (University of Göttingen), Romero-Severson (University of Notre Dame), Wegzyn (University of Connecticut), Hipp (Moreton Arboretum), Etersson, Gross (both University of Minnesota), Prasad (USDA), Key Personnel: Cavaleri, Burton (both MTU)) Two red oak genome sequences could reveal mechanisms of adaptive evolution to drought stress (Letter of intent was successful, full proposal declined)

2019 \$12,800 **Animal Welfare Institute** (PI Brzeski, Co-PI Külheim (both MTU)) A noninvasive iDNA methodology to monitor wildlife to facilitate conservation

2018 \$499,854 **US Department of Agriculture** (PI Kelly, Co-PIs Külheim, Schelly (all MTU)) Social implications of genetically improved trees: Assessing public and forest owners attitudes and risk perception to inform forest genetics research

2018 \$199,936 **US Department of Agriculture** (PI Burton, Co-PIs Külheim, Cavaleri (all MTU)) Environmental and genetic influences on latitudinal variation in tree physiology: implication for carbon cycling in a changing climate

2018	A\$807,364 (ca. \$621,050) Australian Research Council Future Fellowship (PI Külheim (ANU)) Jet fuel grows on eucalypt trees
2015	A\$774,891 (ca. \$596,000) Australian Research Council Future Fellowship (PI Külheim (ANU)) Matching trees with future environments
2013	A\$772,000 (ca. \$593,850) Australian Research Council Future Fellowship (PI Külheim (University of Canberra)) Harnessing the Eucalyptus genome to match trees to future environments
2012	A\$5,000 (ca. \$3,500) ANU-CSIRO Centre for Biodiversity Analysis Ignition project (PI Külheim (ANU)) Did Australia's most diverse group of bees diversify in concert with the Eucalypts?
2011	A\$1,292,731 (ca. \$994,500) Australian Research Council Discovery project (PI Foley, Key personnel Külheim (both ANU)) How to be a gum tree – genomic basis of functional traits in eucalypts

Other contributions to research projects:

2020 – 23	Mentor to PI Hersch-Green (MTU) NSF CAREER Grant Can material costs contribute to the structuring of biodiversity patterns from genomes and transcriptomes to multispecies communities?
2019 – 22	Advisory committee on USDA AFRI FACT Grant Enabling Association Mapping And Landscape Genomics Through The Advanced Integration Of Genotype, Phenotype, And Geospatial Data; (PI Wegzyn (University of Connecticut), Co-PI Herndon (University of Massachusetts), Co-PI Staton (University of Tennessee))

ADDITIONAL FUNDS TO SUPPORT RESEARCH AND STUDENTS

2022	\$1,000 Ecosystem Science Center graduate student grant supporting Swapan Chakrabarty (MTU)
2022	\$750 Ecosystem Science Center graduate student travel grant supporting Melanie Ottino (MTU)
2022	\$750 Ecosystem Science Center graduate student travel grant supporting Emily Lindback (MTU)
2022	\$750 Ecosystem Science Center graduate student travel grant supporting Swapan Chakrabarty (MTU)
2022	\$4,000 MTU Summer Undergraduate Student Fellowship supporting Natalie Howard (MTU)
2022	\$750 Ecosystem Science Center undergraduate student grant supporting Natalie Howard (MTU)
2021	\$1,000 Ecosystem Science Center graduate student grant supporting James Rauschendorfer (MTU)
2021	\$1,000 Ecosystem Science Center graduate student grant supporting Emily Lindback (MTU)
2021	\$700 Ecosystem Science Center undergraduate student grant supporting Madalyn Tudor-Duncan (MTU)

2021	\$4,000 MTU Summer Undergraduate Student Fellowship supporting Madalyn Tudor-Duncan (MTU)
2020	\$4,000 MTU Summer Undergraduate Student Fellowship supporting Stephanie Frantti (MTU)
2020	\$4,000 MTU Summer Undergraduate Student Fellowship supporting Victoria Peck (MTU)
2019	\$8,000 Ecosystem Science Center and SFRES Dean Storer supporting infrastructure investments for red oak adaptation study at Kellogg Research Station (MTU)
2019	\$700 Superior Ideas MTU crowd funding platform in support of red oak adaptation study (MTU)
2018	\$1,000 Ecosystem Science Center graduate student grant supporting Shallen Gurtler (MTU)
2018	\$1,000 Ecosystem Science Center graduate student grant supporting James Rauschendorfer (MTU)

SCHOLARSHIPS AND FELLOWSHIPS, HONOURS, SCIENTIFIC AWARDS

2021	Teaching 'Fundamentals of Forest Genetics and Genomics' in spring 2021 received a student evaluation in the top 10% University-wide.
2021	Special Tribute by the State of Michigan for services to the community through setting up and running the MTU COVID-19 testing laboratory
2016	Nominated for ANU Media and Outreach Award
2007	SEK 300,000 (ca. \$35,000) Swedish Research Council Postdoctoral fellowship
2005	Young Scientist award at the conference: 'Photosynthesis and Post Genome Era in honour to Norio Murata', Trois Riviers, Canada
2003	SEK 11,000 (ca. \$1,300) Kempe Foundation travel grant for International Society of Plant Molecular Biology conference in Barcelona, Spain
2002	SEK 50,000 (ca. \$5,900) Faculty of Science, Umeå University for 5 months lab experience with Prof Krishna Niyogi, University of California, Berkeley
2001	SEK 16,000 (ca. \$1,900) Wallenberg Foundation travel grant for 'Photosynthesis 2001' conference in Brisbane, Australia
1999 – 2000	DM 2,000 (ca. \$1,100) Erasmus scholarship for international exchange year (Mainz – Umeå)

TEACHING EXPERIENCE

Classes taught and developed:

2019 –	FW5340 – Population Genetics and Applied Forest Genetics (graduate level course), Course convenor and principal instructor, MTU
2019 –	FW3320 – Fundamentals in Forest Genetics and Genomics, Course convenor and principal instructor, MTU
2012	Developed curriculum for 3 rd year undergraduate course "Bioinformatics and functional genomics", ANU

Guest lectures and class segments:

- 2020 – FW4128 – Conservation Genetics, Guest lecture, MTU
- 2019 – FW1050 – Natural Resources Professional, Guest lecture, MTU
- 2012 – 16 Designed and presented 4 lectures and 1 practical on quantitative genetics in 3rd year undergraduate course 'Bioinformatics and functional genomics', ANU
- 2010 Designed and presented 3 lectures and 1 laboratory on experimental planning, execution and analysis of next-generation sequencing data in 3rd year undergraduate course 'Tools for molecular ecology', ANU
- 2003 – 04 Designed and presented 2 lectures on regulation of light harvesting in C-level (3rd year) undergraduate course 'Plant Molecular Biology', Umeå University

Laboratory assistant and class tutor:

- 2004 (fall) Laboratory Assistant 'Plant Physiology' C-level (3rd year) course, Umeå University
- 2004 (spring) Laboratory Assistant 'Plant Physiology' B-level (2nd year) course, Umeå University
- 2003 (fall) Laboratory Demonstration 'Abiotic Plant Stress' graduate student course, Umeå University
- 2003 (fall) Laboratory Assistant 'Plant Molecular Biology' C-level (3rd year) course, Umeå University
- 2003 (spring) Laboratory Assistant in three A-level (1st year) courses, Umeå University
- 2001 (fall) Laboratory Assistant 'Plant Molecular Biology' C-level (3rd year) course, Umeå University
- 2001 (spring) Laboratory Assistant 'Cell Biology' A/B-level (1st / 2nd year) course, Umeå University
- 2000 (fall) Laboratory Assistant 'Plant Physiology' C-level (3rd year) course, Umeå University
- 2000 (fall) Laboratory Assistant 'Plant Molecular Biology' C-level (3rd year) course, Umeå University
- 1999 (spring) Tutor 'Zoology' (1st year), University of Mainz

STUDENT SUPERVISION**Graduate:***Current**Advisor or co-advisor*

- PhD student Swapan Chakrabarty, advisor (completion 2024; MTU)
- PhD student James Rauschendorfer, advisor (completion 2022; MTU)
- PhD student Amanda Stump, advisor (completion 2026; MTU)
- MS student Melanie Ottino, co-advisor (completion 2023; MTU)
- MS student Nicole Fogut, co-advisor (completion 2024; MTU)

Advisory committee

- PhD student Kath Schneider, advisory committee (completion 2024; MTU)
- PhD student Eileen Reeves, advisory committee (completion 2023; MTU)
- PhD student Rob Tunison, advisory committee (completion 2022; MTU)
- MS student Emma Burke, advisory committee (completion 2023; MTU)
- MS student Isaak Bigcraft, advisory committee (completion 2023; MTU)
- MS student Emma Shedd, advisory committee (completion 2023; MTU)

*Past**Advisor or co-advisor*

- 2020 – 22 MS student Emily Lindback, co-advisor. 'Common garden study reveals frost-tolerant, generalist northern seed sources are best suited to expand range of *Quercus rubra*' (MTU)
- 2018 – 20 MS student Shallen Gurtler, advisor. 'Monitoring mammal community shifts across silvicultural treatments utilizing camera traps and the development of iDNA in hardwood forests of North America' (MTU)
- 2019 – 20 MS student Munkaila Musah, co-advisor. MS by coursework (MTU)
- 2018 PhD student Alexander Apostle, advisor. Transferred (MTU)
- 2014 – 18 PhD student Meredith Cosgrove, co-advisor. 'Biogeography of Myrtaceae' (ANU)
- 2014 – 18 PhD student Sarah Hsieh, advisor. 'Discovery of genetic resistance markers for Myrtle rust in Myrtaceae' (ANU)
- 2013 – 18 PhD student Bokyoung Choi, co-advisor. 'Phylogeny and biogeography of Melaleuceae' (ANU)
- 2014 – 17 PhD student Peri Tobias, co-advisor. 'Molecular Biology of plant defence against Myrtle rust' (University of Sydney)
- 2014 – 17 PhD student David Kainer, advisor. 'Genomic selection for essential oil yield in eucalypts' (ANU)
- 2013 – 16 PhD student Carlos Bustos, co-advisor. 'Intraspecific variation in plant chemistry and implications for ecological interactions' (ANU)
- 2013 – 14 MS student Erik Visser, co-advisor. 'Defence responses in *Pinus patula* to the fungal pathogen *Fusarium circinatum*' (University of Pretoria)
- 2010 – 15 PhD student Bee Gunn, co-advisor. 'Biogeography of coconuts' (ANU)
- 2010 – 15 PhD student Hamish Webb, advisor. 'The genetics of oil yield in *Melaleuca alternifolia* and *Eucalyptus loxophleba*' (ANU)
- 2010 – 13 PhD student Amanda Padovan, co-advisor. 'Mosaic eucalypts: Chemical variation and differential gene expression within a *Eucalyptus melliodora* and a *Eucalyptus sideroxylon* tree' (ANU)
- 2007 – 12 PhD student Suat Hui Yeoh, co-advisor. 'Population genetics and essential oil yield in *Eucalyptus globulus*' (ANU)

Advisory committee

- 2019 – 22 PhD student Angela Walczyk, advisory committee (MTU)
- 2018 – 21 PhD student Ryan Ghannam, advisory committee (MTU)
- 2019 – 20 PhD student Olufemi Ifeoluwa Afolami, advisory committee (Transferred) (MTU)

Undergraduate:

- 2022 Natalie Howard (spring – fall), Madalyn Tudor-Duncan (summer) (all MTU)
- 2021 Stephanie Frantti (spring), Anna Pike (summer), Madalyn Tudor-Duncan (summer) (all MTU)
- 2020 Victoria Peck (spring, summer), Rebecca Rooney (summer), Stephanie Frantti (spring, summer) (all MTU)
- 2019 Victoria Peck (spring-fall), Allie Johnson (summer) Stephanie Frantti (summer-fall) (all MTU)
- 2009 – 14 Five Special Topics students (4 credit research projects; all ANU)

2012 – 14	PhB student Helen Kennedy (ANU)
2009	Honours student Hamish Webb, <u>advisor</u> . 'The genetic basis of quantitative variation in terpene traits in <i>Melaleuca alternifolia</i> ' Honours First class. (ANU)
2009	German exchange student Samira Samtleben (9 months; ANU)
2008	German Diploma thesis Jens Maintz (12 months; ANU)

PUBLICATION LIST

Citation metrics:

h-index of 24; *i10*-index of 43

Total 3,763 citations; 2,454 since 2017; and 471 citations during 2021 (google scholar 08/15/2022)

10 most significant publications:

Δ indicates undergraduate student in my lab * indicates graduate student in my lab § indicates postdoc in my lab

- Külheim C**, Ågren J, Jansson S (2002) Rapid Regulation of light harvesting and Plant fitness in the field. ***Science* 297**: 91-93

Impact data: Journal impact factor (JIF): 31.48 *Citations:* 618

Significance: This study found that an *Arabidopsis* mutant unable to regulate photosynthesis had reduced fitness in the field, while performing equal to wild type under controlled conditions. I contributed to the design, conducted all experiments, and co-wrote the first draft.
- Frenkel M, **Külheim C**¹, Jankanpaa HJ, Skogstrom O, Dall'Ostro L, Agren J, Bassi R, Moritz T, Moen J, Jansson S (2009) Improper excess light dissipation in *Arabidopsis* results in metabolic reprogramming. ***BMC Plant Biology* 9**: 12 (¹shared first author)

Impact data: JIF: 4.38 *Citations:* 77

Significance: In this study we examined changes in global transcript, protein and metabolite abundance in *Arabidopsis* mutants unable to regulate light-harvesting. It sparked my interest in plant-herbivore interactions through field observations. SJ and I conceived the study; I performed ca. half the experiments, analyzed data and wrote the first draft. I read, edited and approved the final manuscript.
- Külheim C**, Yeoh SH*, Maintz J^Δ, Foley WJ, Moran GF (2009) Comparative SNP diversity among four *Eucalyptus* species for genes from secondary metabolism biosynthetic pathways. ***BMC Genomics* 10**: 452

Impact data: JIF: 4.4 *Citations:* 113

Significance: The first study to investigate allelic variants in biosynthetic pathway genes of plant secondary metabolites in eucalypts. In four species we found a genetic variant every 16 to 33 bp. I designed the study, contributed to experiments, did all analysis and wrote the first draft of the paper.
- Külheim C**, Yeoh SH*, Wallis IR, Laffan S, Moran GF, Foley WJ (2011) The molecular basis of quantitative variation in foliar secondary metabolites in *Eucalyptus globulus*. ***New Phytologist* 191**: 1041-1053

Impact data: JIF: 7.43 *Citations:* 97

Significance: Here we showed which allelic variants associate with quantitative variation in plant secondary metabolites. Geographic distributions of allele frequencies can influence the ecosystem ('Genes to Ecosystem'). I conceived the study, performed experiments, analyzed most of the data and wrote the first draft of the paper.

5. Padovan A*, Lanfear R, Keszei A, Foley WJ, **Külheim C** (2013) Differences in gene expression within a striking phenotypic mosaic *Eucalyptus* tree that varies in susceptibility to herbivory. ***BMC Plant Biology* 13: 29**

Impact data: JIF: 4.38

Citations: 53

Significance: Transcriptome analysis of a single tree with two ecotypes. This paper was the editor's pick and has been accessed 7,094 times since publication. I conceived and designed the experiments. AP and I performed the experiments, analyzed the data and wrote the first draft. I read, edited and approved the final manuscript.

6. Moore B, Andrew R, **Külheim C**, Foley WJ (2014) Explaining intraspecific diversity in plant secondary metabolites in an ecological context. ***New Phytologist* 201: 733-750**

Impact data: JIF: 7.43

Citations: 392

Significance: Invited review that provides a synthesis on the evolution of plant secondary metabolite diversity. It spans a bridge from evolution to ecology. I wrote about a third of the manuscript and contributed all 4 figures. I led sections 'Genes and biosynthetic pathways underlying PSM variation', 'Mechanisms for diversification of PSMs' and 'Examples of Diversity from specific biosynthetic pathways'. I read, edited and approved the final manuscript.

7. Myburg AA, Grattapaglia D, Tuskan GA, ... , **Külheim C**, Foley WJ, ... , Van de Peer Y, Rokhsar DS, Schmutz J (2014) The genome of *Eucalyptus grandis*. ***Nature* 510: 356-362**

Impact data: JIF: 42.35

Citations: 722

Significance: Annotation and analysis of the *Eucalyptus* genome. I analysed genome data and annotated genes in plant secondary metabolism resulting in Figure 4 (1 out of 4 figures) and section 'secondary metabolites and oils'. I read, edited and approved the final manuscript.

8. **Külheim C**, Padovan A*, Hefer C, Krause ST, Köllner TG, Myburg AA, Degenhardt J, Foley WJ (2015) The *Eucalyptus* terpene synthase gene family. ***BMC genomics* 16: 450**

Impact data: JIF: 3.99

Citations: 123

Significance: In depth analysis of the gene family that produces the diversity of terpenes in eucalypts. We discuss gene family evolution, genome organization and gene expression. I conceived the project, conducted the data acquisition and analysis, produced figures and tables (with the exception of functional characterisation of genes) and wrote the first draft.

9. Bustos-Segura C*, Padovan A^S, Kainer D*, Foley WJ, **Külheim C** (2017) Transcriptome analysis of terpene chemotypes of *Melaleuca alternifolia* across different tissues. ***Plant, Cell & Environment* 40: 2406-2425**

Impact data: JIF: 6.17

Citations: 12

Significance: Two tea tree chemotypes differed by only a handful of differentially expressed genes, all involved in the biosynthesis of the compounds that cause the chemotypical difference, while a third chemotype differed greatly in gene expression, which may be the result of recent introgression. I designed and co-ordinated the study, conducted the expression analysis and writing. All authors read and approved the final manuscript.

10. Kainer D*, Padovan A[§], Degenhardt J, Krause S, Mondal P, Foley WJ, **Külheim C** (2019) High marker density GWAS provides novel insights into the genomic architecture of terpene oil yield in *Eucalyptus*. ***New Phytologist* 223**: 1489-1504

Impact data: JIF: 7.43

Citations: 17

Significance: The first whole-genome resequencing study in eucalypts leading to genome-wide association of genetic markers with variation in terpenes. I designed and co-ordinated the study, conducted and/or supervised workflow from the field to the final analysis. All authors read and approved the final manuscript.

Peer-reviewed Journal Publications (complete list):

- Ghirado A, Blande J, Ruehr NK, Balestrini RM, **Külheim C** (2022) Adaptation of Trees to Climate Change: Mechanisms Behind Physiological and Ecological Resilience and Vulnerability ***Frontiers in Forests and Global Change* 4**: 831701 [*Journal impact factor*: 4.33; citations: 0]
- Mhoswa L, Slipper B, Myburg AA, **Külheim C**, Naidoo S (2022) Genome-wide association study identifies SNP markers and putative candidate genes for terpene profiles in *Eucalyptus grandis*. Resubmission in preparation after major revision requested by **G3: Genes Genome Genetics** 12: jkac004 [*Journal impact factor*: 2.86; citations: 0]
- Rauschendorfer J*, Rooney R^Δ, **Külheim C** (2022) Strategies to mitigate shifts in red oak (*Quercus* sect. *Lobatae*) distribution under a climate change. ***Tree Physiology*** in print [*Journal impact factor*: 4.20; citations: 0]
- Hsieh S*, Krause S, Kainer D*, Degenhardt J, Foley WJ, **Külheim C** (2021) Terpene profiling and functional characterization of terpene synthases responsive to myrtle rust in *Melaleuca quinquenervia*. ***Plant Environment Interactions* 2**: 177-193 [*Journal impact factor*: NA; citations: 0]
- Orr AJ, Padovan A[§], Kainer D*, **Külheim C**, Bromham L, Bustos-Segura C*, Foley WJ, Haff T, Hsieh J-F*, Morales-Suarez A, Cartwright RA, Lanfear R (2020) A phylogenomic approach reveals a low somatic mutation rate in a long-lived plant. ***Proceeding of the Royal Society B* 287**: 20192364 [*Journal impact factor*: 4.85; citations: 23]
- Rauschendorfer J*, Yordanov Y, Dobrev P, Vankova R, Sykes R, **Külheim C**, Busov V (2020) Overexpression of a developing xylem cDNA library in transgenic poplar generates high mutation rate specific to wood formation. ***Plant Biotechnology Journal* 18**: 1434-1443 [*Journal impact factor*: 6.84; citations: 2]
- Marsh KJ, Wallis IR, **Külheim C**, Clark R, Nicolle D, Foley WJ, Salminen J-P (2020) New approaches to tannin analysis of leaves explain biological activity associated with herbivore defence. ***New Phytologist* 225**: 488-498 [*Journal impact factor*: 7.43; citations: 29]
- Choi B*, Crisp MD, Cook LG, Edwards BD, Toon A, **Külheim C** (2019) Identifying genetic markers for a range of phylogenetic utility – from species to family level. ***PLoS One* 14**: e0218995 [*Journal impact factor*: 3.53; citations: 5]
- Kainer D*, Padovan A[§], Degenhardt J, Krause S, Mondal P, Foley WJ, **Külheim C** (2019) High marker density GWAS provides novel insights into the genomic architecture of terpene oil yield in *Eucalyptus*. ***New Phytologist* 223**: 1489-1504 [*Journal impact factor*: 7.43; citations: 17]
- Thornhill AH, Crisp MD, **Külheim C**, Lam KE, Nelson LA, Yeates DK, Miller JT (2019) A dated molecular perspective of eucalypt taxonomy, evolution, and diversification. ***Australian Systematic Botany* 32**: 29-48 [*Journal impact factor*: 0.65; citations: 52]
- Kanagendran A, Pazouki L, Bichele R, **Külheim C**, Niinemets Ü (2018) Temporal regulation of terpene synthase gene expression in *Eucalyptus globulus* leaves upon ozone and wounding stresses:

- relationships with stomatal ozone uptake and emission responses. *Environmental and Experimental Botany* **155**: 552-565 [Journal impact factor: 3.67; citations: 13]
12. Kainer D*, Stone E, Padovan A[§], Foley WJ, Külheim C (2018) High accuracy genomic prediction for foliar terpene traits in *Eucalyptus polybractea*. *G3 – Genes, Genomes, Genetics* **8**: 2573-2583 [Journal impact factor: 2.86; citations: 24]
 13. Naidoo S, Christie N, Acosta JJ, Mphahlele M, Payn K, Myburg AA, Külheim C (2018) Terpenes associated with resistance against the gall wasp, *Leptocybe invasa*, in *Eucalyptus grandis*. *Plant, Cell & Environment* **41**: 1840-1851 [Journal impact factor: 6.17; citations: 16]
 14. Hsieh J-F*, Chuah A, Patel H, Sandhu K, Foley WJ, Külheim C (2018) Transcriptome profiling of resistant and susceptible *Melaleuca quinquenervia* reveals defense mechanisms against the exotic pathogen myrtle rust (*Austropuccinia psidii*). *Phytopathology* **108**: 495-509 [Journal impact factor: 2.90; citations: 12]
 15. Tobias PA*, Guest DI, Külheim C, Park RF (2018) Identification of candidate genes involved in resistance to *Austropuccinia psidii* (myrtle rust) in *Syzygium luehmannii* (riberry). *Phytopathology* **108**: 627-640 [Journal impact factor: 2.90; citations: 15]
 16. Ranjard L, Wong TKF, Külheim C, Rodrigo AG, Ragg NLC, Dunphy BJ (2018) Complete mitochondrial genome of the green-lipped mussel, *Perna canaliculus* (Mollusca: Mytiloidea), from long nanopore sequencing reads. *Mitochondrial DNA Part B: Resources* **3**: 175-176 [Journal impact factor: 0.89; citations: 12]
 17. Padovan A[§], Keszei A, Hassan Y, Krause ST, Köllner TG, Degenhardt J, Gershenzon J, Külheim C, Foley WJ (2017) Four terpene synthases contribute to the generation of different chemotypes in tea tree (*Melaleuca alternifolia*). *BMC Plant Biology* **17**: 160 [Journal impact factor: 4.38; citations: 18]
 18. Bustos-Segura C*, Padovan A[§], Kainer D*, Foley WJ, Külheim C (2017) Transcriptome analysis of terpene chemotypes of *Melaleuca alternifolia* across different tissues. *Plant, Cell & Environment* **40**: 2406-2425 [Journal impact factor: 6.17; citations: 12]
 19. Padovan A[§], Webb H*, Mazenek R, Grayling P, Foley WJ, Külheim C (2017) Association genetics of essential oil traits in *Eucalyptus loxophleba*: explaining variation in oil yield. *Molecular Breeding* **37**: 73 [Journal impact factor: 2.11; citations: 8]
 20. Bustos-Segura C*, Dillon S, Keszei A, Foley WJ, Külheim C (2017) Intraspecific diversity of terpenes of *Eucalyptus camaldulensis* at a continental scale. *Australian Journal of Botany* **65**: 257-269 [Journal impact factor: 1.87; citations: 23]
 21. Tobias PA*, Christie N, Naidoo S, Külheim C (2017) Identification of the *Eucalyptus grandis* chitinase gene family and expression characterization under different biotic stress challenges. *Tree Physiology* **37**: 565-582 [Journal impact factor: 4.20; citations: 18]
 22. Kainer D*, Bush D, Foley WJ, Külheim C (2017) Components of oil yield in a commercial plantation of *Eucalyptus polybractea* (blue malee). *Industrial Crops and Products* **102**: 32-44 [Journal impact factor: 3.45; citations: 13]
 23. Marsh KJ, Külheim C, Thornhill AH, Miller JT, Wallis IR, Nicolle D, Sakminen J-P, Foley WJ (2017) Genus-wide variation in foliar polyphenolics in eucalypts: Phylogenetic constraints and evidence for selection on functional traits of tannins. *Phytochemistry* **144**: 197-207 [Journal impact factor: 3.21; citations: 22]
 24. Mewalal R, Rai DK, Kainer D*, Chen F, Külheim C, Peter GF, Tuskan GA (2017) Plant-derived terpenes: A feedstock for speciality biofuels. *Trends in Biotechnology* **35**: 227-240 [Journal impact factor: 12.0; citations: 124]
 25. González-Orozco CE, Pollock LJ, Thornhill AH, Mishler BD, Knerr N, Laffan SW, Miller JT, Rosauer DF, Faith DP, Nipperess DA, Kujala H, Linke S, Butt N, Külheim C, Crisp MD, Gruber B (2016) Phylogenetic approaches reveal biodiversity threats under climate change. *Nature Climate Change* **6**: 1110-1114 [Journal impact factor: 17.2; citations: 124]

26. Tobias PA*, Guest DI, Külheim C, Hsieh J-F*, Park RF (2016) A curious case of resistance to a new encounter pathogen: myrtle rust in Australia. *Molecular Plant Pathology* **17**: 783-788 [Journal impact factor: 4.72; citations: 27]
27. Christie N, Tobias PA*, Naidoo S, Külheim C (2015) The *Eucalyptus grandis* NBS-LRR gene family: Physical Clustering and Expression hotspots. *Frontiers in Plant Science* **6**: 1238 [Journal impact factor: 3.6; citations: 50]
28. Bustos-Segura C*, Külheim C, Foley WJ (2015) Effects of terpene chemotypes of *Melaleuca alternifolia* on two specialist leaf beetles and susceptibility to myrtle rust. *Journal of Chemical Ecology* **41**: 937-947 [Journal impact factor: 2.75; citations: 27]
29. Kainer D*, Lanfear R, Foley WJ, Külheim C (2015) Genomic approaches to selection in outcrossing perennials: Focus on essential oil crops. *Theoretical and Applied Genetics* **128**: 2351-2365 [Journal impact factor: 3.79; citations: 23]
30. Külheim C, Padovan A*, Hefer C, Krause ST, Köllner TG, Myburg AA, Degenhardt J, Foley WJ (2015) The *Eucalyptus* terpene synthase gene family. *BMC Genomics* **16**: 450 [Journal impact factor: 3.99; citations: 123]
31. Padovan A*, Patel HR, Chuah A, Huttley GA, Krause ST, Degenhardt J, Foley WJ, Külheim C (2015) Transcriptome sequencing of two phenotypic mosaic *Eucalyptus* trees reveals large scale transcriptome re-modelling. *PLoS One* **10**: e0123226 [Journal impact factor: 3.53; citations: 15]
32. Thornhill AH, Ho SYW, Külheim C, Crisp MD (2015) Interpreting the modern distribution of Myrtaceae using a dated molecular phylogeny. *Molecular Phylogenetics and Evolution* **93**: 29-43 [Journal impact factor: 3.92; citations: 142]
33. Tobias PA*, Park RF, Külheim C, Guest DI (2015) Wild-sourced *Chamelaucium uncinatum* have no resistance to *Puccinia psidii* (myrtle rust). *Australasian Plant Disease Notes* **10**: 15 [Journal impact factor: NA; citations: 13]
34. Visser EA, Mangwanda R, Becker JW, Külheim C, Foley WJ, Myburg AA, Naidoo S (2015) Foliar terpenoid levels and corresponding gene expression are systemically and differentially induced in *Eucalyptus grandis* clonal genotypes in response to *Chrysosporthe austroafricana* challenge. *Plant Pathology* **64**: 1320-1325 [Journal impact factor: 2.12; citations: 5]
35. Oates CN, Külheim C, Myburg AA, Slippers B, Naidoo S (2015) The transcriptome and terpene profile of *Eucalyptus grandis* reveals mechanisms of defence against the insect pest *Leptocybe invasa*. *Plant and Cell Physiology* **56**: 1418-1428 [Journal impact factor: 4.93; citations: 52]
36. Naidoo S, Külheim C, Zwart L, Mangwanda R, Oates C, Visser E, Wilken FE, Mamni TB, Myburg AA (2014) Uncovering the defence response of *Eucalyptus* to pests and pathogens in the genomics age. *Tree Physiology* **34**: 931-943 [Journal impact factor: 3.66; citations: 47]
37. Myburg AA, Grattapaglia D, Tuskan GA, ... , Külheim C, Foley WJ, ... , Van de Peer Y, Rokhsar DS, Schmutz J (2014) The genome of *Eucalyptus grandis*. *Nature* **510**: 356-362 [Journal impact factor: 42.35; citations: 722]
38. Webb H*, Foley WJ, Külheim C (2014) The genetic basis of foliar terpene yield: Implications for breeding and profitability of Australian essential oil crops. *Plant Biotechnology* **31**: 363-376 [Journal impact factor: 1.06; citations: 22]
39. Külheim C, Jones CG, Plummer JA, Ghisalberti EL, Barbour L, Bohlmann J (2014) Foliar application of methyl jasmonate does not increase terpenoid accumulation, but weakly elicits terpenoid pathway genes in sandalwood (*Santalum album* L.) seedlings. *Plant Biotechnology* **31**: 585-591 [Journal impact factor: 1.06; citations: 10]
40. Padovan A*, Keszei A, Külheim C, Foley WJ (2014) The evolution of foliar terpene diversity in Myrtaceae. *Phytochemistry Reviews* **13**: 695-716 [Journal impact factor: 4.15; citations: 72]

41. Moore B, Andrew R, **Külheim C**, Foley WJ (2014) Explaining intraspecific diversity in plant secondary metabolites in an ecological context. **New Phytologist** **201**: 733-750 [Journal impact factor: 7.43; citations: 392]
42. Webb H*, Lanfear R, Hamill J, Foley WJ, **Külheim C** (2013) The yield of essential oils in *Melaleuca alternifolia* (Myrtaceae) is regulated through transcript abundance of genes in the MEP pathway. **PLoS One** **8**: e60631 [Journal impact factor: 3.53; citations: 35]
43. Padovan A*, Lanfear R, Keszei A, Foley WJ, **Külheim C** (2013) Differences in gene expression within a striking phenotypic mosaic *Eucalyptus* tree that varies in susceptibility to herbivory. **BMC Plant Biology** **13**: 29 [Journal impact factor: 3.96; citations: 58]
44. Grattapaglia D, Vaillancourt RE, Sheperd M, Thumma BR, Foley WJ, **Külheim C**, Potts BM, Myburg A (2012) Progress in Myrtaceae genomics: *Eucalyptus* as the pivotal genus. **Tree Genetics and Genomes** **8**: 463-508 [Journal impact factor: 2.4; citations: 256]
45. **Külheim C**, Yeoh SH*, Wallis IR, Laffan S, Moran GF, Foley WJ (2011) The molecular basis of quantitative variation in foliar secondary metabolites in *Eucalyptus globulus*. **New Phytologist** **191**: 1041-1053 [Journal impact factor: 7.43; citations: 97]
46. **Külheim C**, Yeoh SH*, Maintz J^Δ, Foley WJ, Moran GF (2009) Comparative SNP diversity among four *Eucalyptus* species for genes from secondary metabolism biosynthetic pathways. **BMC Genomics** **10**: 452 [Journal impact factor: 3.99; citations: 113]
47. Philippe RN, Ralph SG, **Külheim C**, Jancsik SI, Bohlmann J (2009) Poplar defense against insects: genome analysis, full-length cDNA cloning and transcriptome and protein analysis of the poplar Kunitz-type protease inhibitor family. **New Phytologist** **184**: 865-884 [Journal impact factor: 7.43; citations: 50]
48. Frenkel M, **Külheim C**¹, Jankanpaa HJ, Skogstrom O, Dall'Ostro L, Agren J, Bassi R, Moritz T, Moen J, Jansson S (2009) Improper excess light dissipation in Arabidopsis results in metabolic reprogramming. **BMC Plant Biology** **9**: 12 [Journal impact factor: 3.96; citations: 77] (¹: shared first author)
49. **Külheim C**, Jansson S (2005) What leads to reduced fitness in non-photochemical quenching mutants? **Physiologia Plantarum** **125**: 202-211 [Journal impact factor: 3.14; citations: 30]
50. Ganeteg U, **Külheim C**¹, Andersson J, Jansson S (2004) Is each light-harvesting complex protein important for plant fitness? **Plant Physiology** **134**: 502-509 [Journal impact factor: 8.03; citations: 99] (¹: shared first author)
51. **Külheim C**, Ågren J, Jansson S (2002) Rapid regulation of light harvesting and plant fitness in the field. **Science** **297**: 91-93 [Journal impact factor: 31.48; citations: 618]

Refereed conference papers:

52. Rauschendorfer J*, Lindback E*, Rooney R^Δ, Frantti S^Δ, Peck V^Δ, Cavaleri M, **Külheim C** (2022) Seed source climatic variables determine *Quercus rubra* provenance growth and environmental responses. In review: **Northern Hardwood Conference** in print
53. Naidoo S, Oates C, Mhoswa L, O'Neil M, Acosta J, Christie N, Mphahlele M, Payn K, Myburg A, Slippers B, **Külheim C** (2020) Factors underpinning resistance against the galling pest, *Leptocybe invasa* in *Eucalyptus grandis*. **Proceedings of the Sixth International Workshop on the Genetics of Host-Parasite Interactions in Forestry**
54. Gurtler S*, Brzeski KE, **Külheim C** (2019) Developing multiple invertebrate iDNA methodology in the Keweenaw Peninsula, Michigan to monitor mammal communities. **Proceedings of the American Fisheries Society & The Wildlife Society 2019 Joint Annual Conference**
55. Tobias P*, Guest D, **Külheim C**, Park RF (2017) Identification of genes involved in resistance to *Austropuccinia psidii* (myrtle rust) in *Syzygium luehmannii* (Riberry). **Science Protecting Plant Health**

56. Kainer D*, Lanfear R, Penalba JV, Foley W, Külheim C (2016) Targeted repeat reduction in whole tree genomes prior to sequencing. *Proceedings of the IUFRO Tree Biotechnology 2015 Conference S3*: O15
57. Gunn B*, Külheim C, Crisp M, Peakall R, Prebble M, Baudouin L, Olsen KM, Miller J (2012) Genomic studies of the coconut (*Cocos nucifera* L.). *Plant and Animal Genome Conference*. **20**: P0225
58. Külheim C, Webb H*, Yeoh SH*, Wallis IR, Moran GF, Foley WJ (2011) Using the *Eucalyptus* genome to understand the evolution of plant secondary metabolites in the Myrtaceae. *BMC Proceedings* **5**: O11
59. Webb H*, Külheim C, Lanfear R, Hamill J, Foley WJ (2011) The regulation of quantitative variation of foliar terpenes in medicinal tea tree *Melaleuca alternifolia*. *BMC Proceedings* **5**: O20
60. Foley WJ, Moran GF, Keszei A, Külheim C (2009) Chemicogenomics of plants. *Integrative and Comparative Biology* **49**: E57
61. Jansson S, Andersson J, Ganeteg U, Klimmek F, Külheim C, Boekema E, Dekker J, Horton P, Agren J (2004) Reverse Genetics of the plant light-harvesting antenna. *Cellular and Molecular Biology Letters* **9**: 34

Other publications:

62. Li T, Kainer D*, Foley WJ, Rodrigo AG, Külheim C (2021) The draft genome sequence of *Eucalyptus polybractea* based on hybrid assembly with Oxford Nanopore and Illumina reads. *bioRxiv*: <https://doi.org/10.1101/2021.05.18.444652>
63. Kainer D*, Külheim C (2016) Renewable jet fuel could be growing on Australia's iconic gum trees. *The Conversation* (<https://theconversation.com/renewable-jet-fuel-could-be-growing-on-australias-iconic-gum-trees-59377>)
64. Külheim C, Hsieh S*, Tobias P*, Foley WJ (2015) Discovery of genetic resistance markers to Myrtle rust in Myrtaceae. *RIRDC* (RIRDC report)
65. Webb H*, Padovan A*, Külheim C, Foley WJ (2013) Genetic markers for yield improvement in tea tree. *RIRDC* (RIRDC report)
66. Webb H*, Padovan A*, Külheim C, Foley WJ (2013) Application of molecular genetics to improvement of yield in oil mallees. *RIRDC* (RIRDC report)
67. Külheim C (2010) Applying second-generation sequencing to non-model species. *Australian Biochemist* **41**: 10-13 (invited non-peer reviewed review paper)
68. Keszei A, Webb H*, Külheim C, Foley WJ (2010) Genetic tools for improving tea tree oils. *RIRDC* **10-189** (RIRDC report)

Submitted Manuscripts (available upon request):

Manuscripts in advanced preparation (available upon request):

69. Crisp MD, Bui M, Choi B, Edwards RD, Külheim C, Lin YP, Meusemann K, Slee AD, Thornhill AH, Toon A, Cool LG – Perianth evolution and implications for generic delimitation in the Eucalypts (Myrtaceae)
70. Padovan A*, Webb H*, Wright LP, Baker G, Foley WJ, Külheim C – Association genetics of essential oil traits in *Melaleuca alternifolia*: explaining variation in foliar terpene concentration.
71. Chakrabarty P*, Hsieh J-F*, Chakraborty S*, Foley WJ, Külheim C – Molecular mechanisms of defence against myrtle rust in medicinal tea tree (*Melaleuca alternifolia*).
72. Chakrabarty P*, Hsieh J-F*, Foley WJ, Külheim C – Phylogeny of *NBS-LRR* genes among species of *Melaleuca* and *Eucalyptus*.

CONFERENCE AND INVITED PRESENTATIONS (Presenter in bold)

1. **Lindback E**, Cavaleri M, Külheim C. Northern red oak growth, phenology, and physiology across a latitudinal gradient. Ecological Society of America, Montreal, Canada; August 2022
2. **Külheim C**. Provenance trials in the genomic era – novel tools to mitigate climate change. North American Forest Genetic Conference, Pacific Grove, CA; June 2022
3. **Chakrabarty S**, Li T, Kainer D, Foley WJ, Rodrigo A, Külheim C. Using the *Eucalyptus polybractea* reference genome improved genetic variant identification compared to using a pseudo-reference. Population, Evolutionary, and Quantitative Genetics Conference, Pacific Grove, CA; June 2022
4. **Rauschendorfer J**, Lindback E, Rooney R, Frantti S, Peck V, Cavaleri M, Külheim C. Quantifying drought adaptation in red oak species: linking physiology to gene expression. Northern Hardwood Conference, Green Bay WI (virtual); June 2021
5. **Külheim C**. The genomic architecture of oil yield in *Eucalyptus*. National Renewable Energy Laboratory, Golden CO; July 2019
6. **Külheim C**. Genes to Ecosystems: The problem of complex traits. Oak Ridge National Laboratories, Oak Ridge TN; July 2019
7. **Külheim C**. The genomic architecture of oil yield in *Eucalyptus*. IUFRO Tree Biotechnology bi-annual conference, Raleigh NC; June 2019
8. **Külheim C**. Genes to Ecosystems: The problem of complex traits. University of Minnesota, Department of Biology seminar, Duluth MN; April 2019
9. **Külheim C**. The genomic architecture of oil yield in *Eucalyptus*. Eucalypt genetics: fundamental and applied research in a post-genome era. Hobart Australia; February 2019
10. **Külheim C**. Genes to Ecosystems: The problem of complex traits. Michigan State University, Biochemistry and Molecular Biology, East Lansing MI; November 2018
11. **Külheim C**. Genes to Ecosystems: The problem of complex traits. Michigan Technological University, Department of Biology, Houghton MI; November 2018
12. **Tobias P**, Jones B, Guest D, Park R, Külheim C. Molecular markers for resistance to myrtle rust in Australian Myrtaceae. Queenstown Molecular Biology Meeting, Queenstown New Zealand; August 2018
13. **Naidoo S**, Oates C, Mhoswa L, O'Neil M, Acosta J, Christie N, Mphahlele M, Payn K, Myburg A, Slippers B, Külheim C. Factors underpinning resistance against the galling pest, *Leptocybe invasa* in *Eucalyptus grandis*. Sixth International Workshop on the genetics of host-parasite interactions in Forestry, Mt. Sterling OH; August 2018
14. **Külheim C**. Genes to Ecosystems: The problem of complex traits. University of Copenhagen, Department of Plant Biochemistry, Copenhagen Denmark; June 2018
15. **Külheim C**. Genes to Ecosystems: The problem of complex traits. University of New England, School of Environmental and Rural Science, Armidale Australia; April 2018
16. **Külheim C**. Genes to Ecosystems: The problem of complex traits. Michigan Technological University, School of Forest Resources and Environmental Science, Houghton MI; February 2018
17. **Külheim C**. How genomics may transform forestry and conservation. Michigan Technological University, School of Forest Resources and Environmental Science, Houghton MI; February 2018
18. **Külheim C**, Tobias P, Hsieh J-F. Myrtle rust resistance in Australian species – Studies in progress. Myrtle Rust Environmental Impacts Workshop, Canberra Australia; December 2017
19. **Külheim C**. Genes to Ecosystems: The problem of complex traits. Macquarie University, Department of Biology, Sydney Australia; November 2017

20. **Külheim C.** Terpene variation in the world's major hardwood plantation tree: Genomics, health and applications to biofuels. North Carolina State University, Forestry and Environmental Resources, Raleigh NC; August 2017
21. **Foley W, Külheim C, Kainer D, Hsieh J-F, Padovan A, Krause S, Degenhardt J.** Genomics of variation in yield of terpenes from Australian Myrtaceae. The 13th International Meeting on Biosynthesis, Function and Synthetic Biology of Isoprenoids, Dalian China; July 2017
22. **Külheim C.** Terpene variation in the world's major hardwood plantation tree: Genomics and applications to biofuels. Northern Arizona University, School of Forestry, Flagstaff AZ; April 2017
23. **Külheim C.** How genomics may transform forestry and conservation. Northern Arizona University, School of Forestry, Flagstaff AZ; April 2017
24. **Hsieh J-F, Chuah A, Patel H, Sandhu K, Foley WJ, Külheim C.** Transcriptome Profiling of Broad-leaf Paperbark (*Melaleuca quinquenervia*) challenged by Myrtle Rust (*Puccinia psidii*) Revealed Variation in Defence Responses among Resistant Individuals. National Myrtle Rust Symposium, Brisbane Australia; March 2017
25. **Foley W, Strauss S, Yantchuk A, Attard G, Külheim C.** Opportunities and Constraints on Biotechnology in Forest Trees for Combating Pests and Disease. Beijing Forestry University, Beijing China; March 2017
26. **Külheim C.** Transcriptome sequencing of resistant individuals from two species of Myrtaceae reveal varying resistance mechanisms to Myrtle rust. University of Florida, Plant Pathology, Gainesville FL; February 2017
27. **Külheim C.** Genome-wide associations with essential oil yield in blue mallee. University of Florida, School of Forest Resources and Conservation, Gainesville FL; February 2017
28. **Külheim C.** Transcriptome sequencing of resistant individuals from two species of Myrtaceae reveal varying resistance mechanisms to Myrtle rust. North Carolina State University, Forestry and Environmental Resources, Raleigh NC; February 2017
29. **Külheim C.** From genes to Ecosystems – How variants affect Pest and Pathogen defence in Trees. State University of New York, College of Environmental Science and Forestry, Syracuse NY; February 2017
30. **Külheim C.** Evolutionary and Population genetics. State University of New York, College of Environmental Science and Forestry, Syracuse NY; February 2017
31. **Külheim C.** Genome-wide associations with essential oil yield in blue mallee. University of Connecticut, Department of Ecology and Evolutionary Biology, Storrs CT; February 2017
32. **Külheim C.** Transcriptome sequencing of resistant individuals from two species of Myrtaceae reveal varying resistance mechanisms to Myrtle rust. Northern Arizona University, Department of Biological Sciences, Flagstaff AZ; January 2017
33. **Külheim C.** Transcriptome sequencing of resistant individuals from two species of Myrtaceae reveal varying resistance mechanisms to Myrtle rust. Oregon State University, Botany and Plant Pathology, Corvallis OR; January 2017
34. **Külheim C.** Genome-wide associations with essential oil yield in blue mallee. Oregon State University, Forest Engineering, Resources & Management, Corvallis OR; January 2017
35. **Kainer D, Padovan A, Foley WJ, Külheim C.** Genome-wide association of essential oil traits in *Eucalyptus polybractea* using a low-depth WGS pipeline. Plant & Animal Genome XX, San Diego CA; January 2017
36. **Külheim C.** High Energy Biofuels derived from *Eucalyptus* oil. ANU Energy Change Institute Open Day, Canberra Australia; November 2016
37. **Külheim C.** Genome-wide associations with essential oil yield in blue mallee. Joint South African Society of Bioinformatics and South African Genetics Society Annual Conference, Durban South Africa; September 2016

38. **Külheim C.** Plant pathogen recognition – Myrtle rust as a case study. University of Pretoria, Forestry and Agricultural Biotechnology Institute, Pretoria South Africa; September 2016
39. **Külheim C.** Eucalyptus: Australia's resource for the future. ANU-RSB Public Forum, Canberra Australia; August 2016
40. **Külheim C.** Harnessing genetic resources to enhance unimproved crops. ANU- Industry Relations discussion, Canberra Australia; April 2016
41. **Külheim C.** Chemical and transcriptome analysis of resistant and susceptible *Eucalyptus* genotypes to the insect pest *Leptocybe invasa*. ANU-RSB Early-Mid Career Researcher Conference, Canberra Australia; February 2016
42. **Külheim C, Kainer D, Foley WJ.** Terpene biosynthesis in Myrtaceae. US DOE Biofuel Roundtable discussion, ORNL, Oak Ridge TN; October 2015
43. **Külheim C, Kainer D, Foley W, Padovan A, Lanfear R, Bustos-Segura C.** Terpenes... to turbojets. RSB HDR conference 2015, Australian National University, Canberra Australia; August 2015
44. **Külheim C.** 1003 Eucalyptus genomes. Australian National University, Canberra Australia; August 2015
45. **Külheim C, Oates C, Naidoo S.** Chemical and transcriptome analysis of resistant and susceptible Eucalyptus genotypes to the insect pest *Leptocybe invasa*. International Society of Chemical Ecology, Stockholm Sweden; June - July 2015
46. **Külheim C.** Molecular basis of resistance to myrtle rust (*Puccinia psidii*) in *Melaleuca quinquenervia*. 2015 IUFRO Tree Biotechnology Conference, Florence Italy; June 2015
47. **Külheim C.** Plant pathogen recognition - Myrtle rust as a case study. Australian National University, Canberra Australia; May 2015
48. **Külheim C.** Genetic control of quantitative and qualitative variation of plant secondary metabolites in Australian Myrtaceae. Forestry and Agricultural Biotechnology Institute PhD student conference FABI, Pretoria South Africa; October 2014
49. **Külheim C, Hsieh J-F*, Foley W.** Discovering the molecular basis of resistance in Australian Myrtaceae to exotic fungal pathogen Myrtle rust (*Puccinia psidii*). 2014 AGTA annual conference, AGTA/AMATA, Melbourne Australia; October 2014 *received prize for student presentation
50. **Külheim C.** Genetic control of quantitative and qualitative variation of plant secondary metabolites in Australian Myrtaceae. University of Canberra, Canberra Australia; March 2014
51. **Külheim C.** Genetic tools for improvement of tea tree plants. ATTIA annual meeting, Lismore Australia; February 2014
52. **Külheim C.** Genetic resistance markers for breeding purposes. Native Food Industries Conference, RIRDC, Lismore Australia; February 2014
53. **Külheim C.** Genetic control of quantitative and qualitative variation of plant secondary metabolites in Australian Myrtaceae. Deep impact of Plant Metabolism; Going beyond diversity, Nara Japan; November 2013
54. **Külheim C.** Comparative association genetics: finding the genetic control for terpene yield in Australian Myrtaceae. Deep impact of Plant Metabolism; Going beyond diversity, Nara Japan; November 2013
55. **Külheim C.** Myrtle rust resistance in tea tree. ATTIA Field Day, Casino Australia; October 2013
56. **Külheim C.** Tea tree genetics for oil yield and myrtle rust. ATTIA Field Day, Casino Australia; October 2013
57. **Külheim C.** Genetic control of quantitative and qualitative variation of plant secondary metabolites in Australian Myrtaceae. Australian National University, Canberra Australia; October 2013
58. **Külheim C.** Genetic control of quantitative and qualitative variation of plant secondary metabolites in Australian Myrtaceae. AGTA Annual conference, AMATA/AGTA, Gold Coast Australia; October 2013

59. **Külheim C.** Discovery and comparison of genetic resistance markers in multiple Myrtaceae. Annual Myrtle rust conference, Australian Government, Sydney Australia; July 2013
60. **Külheim C, Foley W, Padovan A, Webb H.** Comparative association genetics: finding the genetic control for terpene yield in Australian Myrtaceae. IUFRO Tree Biotech Conference, Asheville NC; June – July 2013
61. **Külheim C.** Eucalypts: genes to ecosystems; small genetic changes that shape the Australian landscape. Center for Biodiversity Australia first annual conference, CBA, Canberra Australia; April 2013
62. **Külheim C.** Population (to genus) phylogenomics. Australian National University, Canberra Australia; December 2012
63. **Külheim C.** From genes to environment: small genetic changes that shape the Australian landscape. University of Queensland, Brisbane Australia; June 2012
64. **Külheim C.** Population and Landscape genomics of Eucalyptus globulus. Australian National University, Canberra Australia; June 2012
65. **Külheim C.** Discovery and comparison of genetic resistance markers in multiple Myrtaceae. Annual Myrtle rust conference Australian Government, Brisbane Australia; May 2012
66. **Külheim C.** Population and Landscape genomics of Eucalyptus globulus. Australian National University, Canberra Australia; May 2012
67. **Külheim C.** Genomics of essential oil biosynthesis in Myrtaceae. Southern Cross University, Lismore Australia; November 2011
68. **Külheim C, Padovan A, Foley W, Keszei A, Wallis I.** Terpene variation in mosaic Eucalyptus. AMATA Annual Conference, AMATA/AGTA, Canberra Australia; October 2011
69. **Külheim C, Foley W, Wallis I, Keszei A, Webb H, Padovan A, Moran G.** Using the Eucalyptus genome to understand the evolution of plant secondary metabolites in Myrtaceae. AMATA Annual Conference, AMATA/AGTA, Canberra Australia; October 2011
70. **Külheim C, Foley W, Padovan A, Webb H, Hammill J.** How chemical and genetic variation in trees influences reproductive success in leaf eating marsupials. COMBIO 2011, COMBIO, Cairns Australia; September 2011
71. **Külheim C, Webb H, Wallis I, Moran G, Foley W.** Using the Eucalypt genome for understanding the evolution of plant secondary metabolites in the Myrtaceae. International Botanical Congress, IBC, Melbourne Australia; July 2011
72. **Külheim C, Webb H, Yeoh S-H, Wallis I, Moran G, Foley W.** Using the Eucalyptus genome to understand the evolution of plant secondary metabolites in Myrtaceae. IUFRO Tree Biotech Conference, IUFRO, Arraial d'Ajuda Brazil; June - July 2011
73. **Külheim C.** Next-generation sequencing analysis for dummies. Australian National University, Canberra Australia; June 2011
74. **Külheim C.** The genetic basis of variation in foliar plant secondary metabolites in Australian Myrtaceae. Australian National University, Canberra Australia; May 2011
75. **Külheim C.** Research presentation Overview projects. Australian National University, Canberra Australia; June 2010
76. **Külheim C.** Combining next-generation high throughput sequencing and population genomics in Australian Myrtaceae. AMATA annual conference, AMATA/AGTA, Katoomba Australia; October 2009
77. **Külheim C.** Gene and SNP discovery of two secondary metabolism pathways from four Eucalypt species utilizing Next-generation large scale sequencing. Australian National University, Canberra Australia; December 2008
78. **Külheim C.** Early defense responses to caterpillars in poplar. Forest Tree Molecular Biology and Genomics workshop, ISPMB, Adelaide Australia; August 2006

79. **Külheim C.** The significance of feedback de-excitation. Australian National University, Canberra Australia; August 2006
80. **Külheim C.** The significance of feedback de-excitation. University of British Columbia, Vancouver Canada; December 2005
81. **Külheim C.** The significance of feedback de-excitation. York University, Toronto Canada; December 2005
82. **Külheim C.** The significance of feedback de-excitation. University of Western Ontario, London Canada; December 2005
83. **Külheim C.** Poplar mutants lacking PsbS. IUFRO Tree Biotech Conference, IUFRO, Pretoria South Africa; December 2005
84. **Külheim C.** Reduced fitness due to impaired light harvesting. 7th Nordic Photosynthesis Congress, Turku Finland; November 2004
85. **Külheim C.** Light-harvesting mutants and fitness in the field. 2nd SPPS PhD student conference, Scandinavian Plant Physiology Society, Turku Finland; August 2002

POSTER PRESENTATIONS (Presenter in bold)

1. **Gurtler S**, Külheim C, Brzeski K. Developing multiple Invertebrate iDNA methodology in the Keweenaw Peninsula, Michigan to monitor Mammal Communities. The Wildlife Society Annual Conference, Reno NV; September – October 2019
2. Külheim C, **Kainer D**, Foley W. Towards Genomic selection for essential oil yield in Eucalyptus and Melaleuca. AGTA annual conference, AMATA/AGTA, Melbourne Australia; October 2014
3. Külheim C, **Kainer D***, Foley W. A bioinformatics pipeline for SNP calling in next generation genotyping-by-sequencing. AMATA Annual conference, AMATA/AGTA, Gold Coast Australia; October 2013
*student received prize for best poster
4. Külheim C, **Padovan A**, Foley W. The value of transcriptomic approaches in terpenoid research. Gordon Plant Volatile Conference, Ventura CA; January 2012
5. Külheim C, **Webb H**, Lanfear R, Hamill J, Foley W. The yield of essential oils in *Melaleuca alternifolia* (Myrtaceae) is regulated through transcript abundance of genes in the methylerythritol phosphate pathway. AMATA Annual Conference, AMATA/AGTA, Canberra Australia; October 2011
6. Külheim C, **Webb H**, Lanfear R, Hamill J, Foley W. The expression of genes within the MEP pathway explains variation in both mono- and sesquiterpenes in *Melaleuca alternifolia*. Terpnet 2011: 10th International Meeting - Biosynthesis and function of isoprenoids in plants, microorganisms and parasites, Terpnet, Kalmar Sweden; June 2011
7. **Külheim C.** Light-harvesting mutants and fitness in the field. XIIIth International Congress on Photosynthesis Montreal Canada; August 2004
8. **Külheim C.** Light-harvesting mutants and fitness in the field. Photosynthesis and the post-genomic era, Trois-Riviere Canada; August 2004
9. **Külheim C.** Fitness effects of mutants deficient in light-harvesting regulation. 29th FEBS Congress, FEBS, Warsaw Poland; June 2004
10. **Külheim C.** Regulation of light-harvesting in the field. FEBS Forum for Young Scientists, FEBS, Warsaw Poland; June 2004
11. **Külheim C.** Fitness effects of mutants deficient in light-harvesting regulation. 7th International Congress on Plant Molecular Biology, Barcelona Spain; June 2003

12. **Külheim C.** Fitness of npq4 mutants in the field. XIIIth International Congress on Photosynthesis, Brisbane Australia; August 2001
13. **Külheim C,** Jansson S. Expression of Early light inducible proteins under varying light. SPPS PhD student Conference, Scandinavian Plant Physiology Society, Tanum Strand Sweden; August 2000

CONFERENCE, SOCIETIES AND WORKSHOP RESPONSIBILITIES

- 2022 **Organizing committee** of the 2022 bi-annual conference IUFRO Tree Biotechnology to be held in Harbin, China
- 2019 – **Deputy coordinator** IUFRO working party 2.04.06 – Molecular Biology of Forest Trees
- 2015 **Convenor** of Australasian Genomic Technologies Association annual conference, Hunter Valley Australia
- 2013 – 17 **Vice President** of the Australasian Genomic Technologies Association (AGTA)
- 2013 **Presenter** at next generation sequencing workshop of the ANU-CSIRO Centre for Biodiversity
- 2013 **Presented** postgraduate ‘scientific writing’ workshop at Australian National University
- 2013 **Organizing committee** of Australasian Microarray and Associated Technologies Association annual conference, Gold Coast Australia
- 2012 **Presenter** at Bioinformatics workshop at Australian National University
- 2011 **Convenor** of Australasian Microarray and Associated Technologies Association annual conference, Canberra Australia
- 2010 – 17 **Member of the executive Board** of the Australasian Genomic Technologies Association (AGTA) former Australasian Microarray and Associated Technologies Association (AMATA)

EDITORIAL EXPERIENCE

- 2020 – 21 Special Topics editor for *Frontiers in Forests and Global Change*. Topic: Adaptation of Trees to Climate Change: Mechanisms Behind Physiological and Ecological Resilience and Vulnerability.
- 2018 - Associate Editor of *Tree Genetics and Genomes*
- 2018 - Review Editor of *Frontiers in Plant Science*
- 2013 - Member of the Editorial Board of *AIMS Genetics*

REVIEWING EXPERIENCE

Reviewed over 70 manuscripts for more than 20 journals in the last 10 years, including:

New Phytologist

Nature Climate Change

Genetics

BMC Genomics

BMC Plant Biology

BMC Molecular Biology

Mol Biology and Evolution

Molecular Ecology

Int Journal of Biological Science

Reviewed USDA-NIFA grants (2019)

Reviewed internal MTU REF-RS grant proposals (2019, 2020)

Reviewed various internal MTU grants, including undergraduate and graduate student grants (2019 – 2021)

Reviewed grant applications for National Natural Environmental Research Council (NERC), UK (2011, 2021)

Reviewed grant applications for National Research Foundation of South Africa (2017)

Reviewed grant applications for Genome Canada (2015)

Reviewed grant applications for the Binational Agricultural Research and Development Fund US-Israel (2013)

External reviewer for promotion to Associate Professor (University of Pretoria, RSA 2021)

External reviewer for PhD thesis (University of Pretoria, RSA 2019)

External reviewer for MS thesis (University of Pretoria, RSA 2014; University of Pretoria, RSA 2017; University of New England, AUS 2018)

External reviewer for Honours thesis (ANU, AUS 2011; ANU, AUS 2017)

PhD opponent for Mette Sorensen (University of Copenhagen, DEN 2018)

ACADEMIC AND INDUSTRY SERVICE

2020	Planning, organization and execution of COVID-19 testing facility at MTU including supervision and training of student and other employees (over 20,000 tests between May and December 2020)
2019 – 20	Member of the MTU CFRES hiring committee for remote sensing faculty position
2019 –	Member of the MTU Global and Community Engagement Group - IDEA Hub
2019 –	Chair of the CFRES Diversity committee
2018	External member of the Australian National University John Curtin School of Medical Research hiring committee (3 technicians, 2.6 FTE)
2015	Member of the Genomic and Bioinformatics Planning Group, Australian National University
2013 – 18	Member of the Tea Tree Breeding Committee (RIRDC)
2001 – 05	Member of the Board of the Department of Plant Physiology, Umeå University, Sweden

SCIENTIFIC CONSULTANCY

2015	Consultant for the US Department of Energy on production of biofuels from eucalypts
2011 – 18	Consultant to the Australian Tea Tree Industry Association (ATTIA) tea tree breeding programme

2009 – 18 Consultant to researchers from ANU, University of Canberra, and CSIRO on design of next-generation sequencing experiments, methodology of preparing samples for next-generation sequencing, and analysis of next-generation sequencing data.

PUBLIC OUTREACH AND COMMUNITY SERVICE

Interaction with essential oil producers (eucalyptus and tea tree oil) on how genomic methods may aid the improvement of their crops.

Interaction with essential oil producers, Native food Industries, Cut-flower Industries and nurseries on Myrtle rust mitigation.

MEDIA COVERAGE AND EXPERIENCE

- 2022 **Newspaper interview:** ABC Science – Eucalypts are icons of the Australian landscape, but their family tree is shrouded in mystery <https://www.abc.net.au/news/science/2022-07-31/eucalyptus-native-trees-evolution-dominate-australia-landscape/101229092>
- 2020 **Television interview:** TV6 - Cause of autumn colors in northern hardwood trees <https://www.uppermichiganssource.com/2020/09/25/opening-week-of-autumn-delivers-peek-time-for-peak-fall-colors/>
- 2020 **Radio interview:** Radio Michigan (NPR) – COVID-19 testing lab at MTU <https://www.michiganradio.org/post/how-michigan-tech-brought-covid-testing-upper-peninsula>
- 2017 **Radio interview:** ABC National – Forest fires in Portugal in relation to eucalypt plantations
- 2016 **Radio interviews:** ABC Canberra, ABC National – Climate change impacts on eucalypts
- 2014 **Radio interviews:** ABC Canberra, ABC Rural, ABC National – The Eucalyptus genome publication
Newspaper and popular magazines: over 30 articles, including:
 ABC Science, The Scientist, Science Daily, Science World Report, Zeit Online, Sci-News, Neue Züricher Zeitung, The Australian, Nature World News, Spiegel Online and Sky News.
- 2013 **Television:** Scope, Channel 10, Australia – A mosaic eucalypt tree