

SYLLABUS
MIXED MODELS IN QUANTITATIVE GENETICS
SISG, Seattle, 19 - 21 July 2023

INSTRUCTORS:

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LW = Lynch & Walsh: *Genetics and Analysis of Quantitative Traits* (1998)

LVW = Lynch, Visscher, Walsh: *Revision of Genetics and Analysis of Quantitative* (expected 2024)

WL = Walsh & Lynch: *Evolution and Selection of Quantitative Traits* (2018)

*** = pdf in class folder**

LECTURE SCHEDULE

Wednesday, 19 July

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| 1:30 | 3:00 pm | 1) Introduction to matrix algebra and calculus (Walsh)
Background reading: LVW Chapter 9* |
| 3:00 | 3:30 pm | Break |
| 3:30 | 5:00 pm | 2) The General Linear Model (Walsh)
Background reading: LVW Chapter 10* |

Thursday, 20 July

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| 8:30 | 10:00 am | 3) Overview and Derivation of the mixed model (Rosa)
Additional reading: LW Chapters 26, 27 |
| 10:00 | 10:30 am | Break |
| 10:30 | 12:00 | 4) Application: BLUP breeding values (Rosa) |
| 12:00 | 1:30 pm | Lunch |
| 1:30 | 3:00 pm | 5) Estimation of Variance Components (Rosa) |
| 3:00 | 3:30 pm | Break |
| 3:30 | 5:00 pm | 6) MCMC - Gibbs Sampling (Rosa)
Additional reading: LVW Appendices 7* and 8* |

Friday, 21 July

- 8:30 10:00 am 7) QTL/association mapping (Walsh)
Additional reading: LVW Chapters 18*, 20*, 21*
- 10:00 10:30 am Break
- 10:30 12:00 8) Genomic Selection (Rosa)
Additional reading: WL Chapter 18
- 12:00 1:30 pm Lunch
- 1:30 3:00 pm 9) Multiple traits, Repeatability, Maternal Effects (Rosa)
- 3:00 3:30 pm Break
- 3:30 5:00 pm 10) Associative effects (Walsh)
Additional reading: WL Chapter 22*

ADDITIONAL BOOKS ON MIXED MODELS IN QUANTITATIVE GENETICS

- Bernardo, R. (2010) *Breeding for Quantitative Traits in Plants*, 2nd Edition, Stemma Press.
- Christou, P., Savin, R., Costa-Pierce, B. A., Misztal, I. and Whitelaw, C. B. A. (eds.) 2013. *Sustainable Food Production*, Vol 1. Springer.
- Gondro, C., van der Werf, J and Hayes, H. (eds.) 2013. *Genome-wide Association Studies and Genomic Prediction*. Humana Press.
- Henderson, C. R. 1984. *Applications of Linear Models in Animal Breeding*. University of Guelph Press.
- Lynch, M. and B. Walsh. 1998. *Genetics and Analysis of Quantitative Traits*. Sinauer.
- Mrode, R. A. 2014. *Linear Models for the Prediction of Animal Breeding Values*, 3rd Edition, CAB International.
- Searle, S. R., Casella, G. and McCulloch, C. E. (2006) *Variance Components*. Willey.
- Sorensen, D. and Gianola, D. (2002) *Likelihood, Bayesian and MCMC Methods in Quantitative Genetics*. Springer.
- VanVleck, L. D. (1993) *Selection Index and Introduction to Mixed Model Methods*. CRC Press.
- Walsh, B., and M. Lynch. 2018. *Evolution and Selection of Quantitative Traits*. Oxford.