General Introduction

Christian Werner

(Computational biologist and quantitative geneticist) **EiB, CIMMYT**, Texcoco (Mexico)

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(Biostatistician, bioinformatician and quantitative geneticist) **CNR-IBBA**, Milan (Italy)

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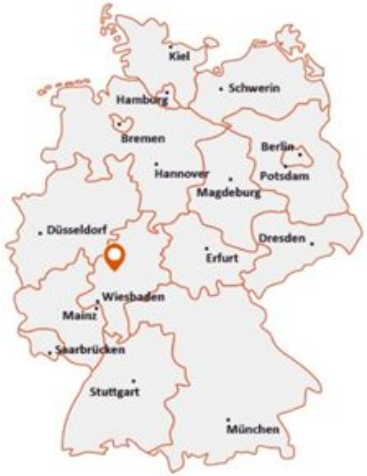
(Computational biologist and quantitative geneticist) **INIA-UPM**, Madrid (Spain)

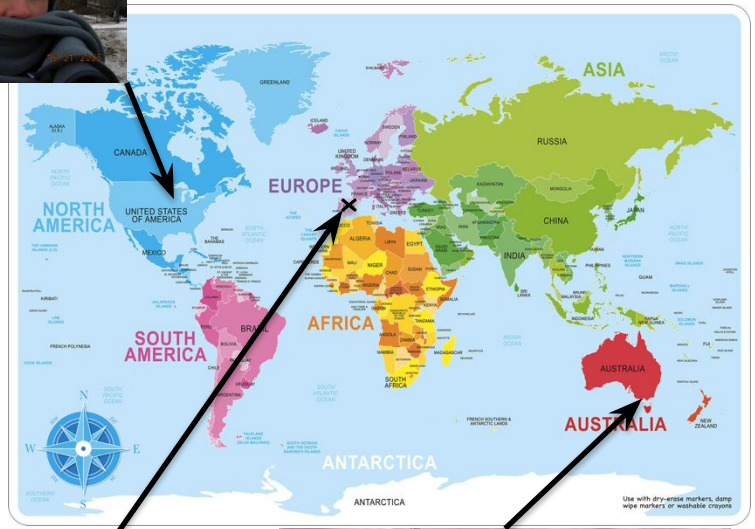
Christian - in a slide

- **University of Gießen** (*BSc Agricultural Science)*
- **University of Gießen** (*MSc Crop Production*)
- **University of Gießen** (*PhD Plant Breeding*)
- **University of Edinburgh** (*Post-doc*)
- **Excellence in Breeding CIMMYT** (*QG Scientist*)



Oscar- in a slide

- **Agricultural Engineer** (*Madrid*)
- **Animal Science** (*MSc degree, Madrid*)
- **Animal Genetics & Quantitative Genetics** (*UPM-Madrid & UW-Madison*)
- **University of Wisconsin-Madison** (*Post-doc*)
- **Dept. Environment and Primary Industries-Melbourne, Australia** (*Senior Research Scientist*)
- **INIA - Madrid** (*Senior Research Scientist*)



Filippo - in a slide

- **Roma** (*born*)
- **Perugia** (*MSc degree*)
- **Cork, ICBF** (*Web-design & Database*)
- **Cremona, ANAFI** (*Quantitative Genetics*)
- **Guelph, CGIL** (*Visiting Scientist*)
- **Wageningen, WUR** (*PhD*)
- **Göttingen University** (*post-doctoral researcher*)
- **Lodi, PTP** (*'omics in animals, plants, humans*)
- **Milan - CNR** (*tenured researcher*)
- **Cardiff University** (*biostatistician*)
- **Milan - CNR** (*senior researcher*)
- **Bruxelles - ERC** (*seconded national expert*)

now you – round of introduction

- who
- where from
- type of research / work
- what's your interest on GWAS / motivation

outline of this lecture

1. Laying out the topic
2. Overview and intuition on GWAS

course - in a slide

the course website:

- Introduction to GWAS
- Advanced R libraries
- Basic GWAS models
- Data exploration preprocessing
- Imputation of missing genotypes
- Experimental design
- Building a pipeline for GWAS
- Collaborative exercise
- GWAS model extensions
- post-GWAS analysis

Flexibility!

laying out the topic

Day 1

- **GWAS**: background and intuition
- Linkage disequilibrium
- Linear ‘or’ logistic regression
- **Practicalities** and set up
- Linux
- Advanced R libraries

laying out the topic

Day 2

- **Exploratory Data Analysis**
- Data Preprocessing
- **Imputation** - theory
- **Experimental design**
- Statistical Power
- Population stratification
- **Multiple testing**

laying out the topic

Day 3

- **Practical Imputation**
  - Beagle
  - KNNI
- **The full model**
- **Getting prepared for the pipeline**
  - the stand-alone GWAS script(s)
  - revising the steps

laying out the topic

Day 4

- **Bioinformatic pipelines**
- Introduction
- Snakemake
- Continuous phenotype
- Binary phenotype
- **Collaborative exercise**

laying out the topic

Day 5

- **GWAS model extensions**
- **post-GWAS analysis**
- **Kahoot quiz**