Philipp **Bayer**

DECRA Fellow

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About me

I use computers and large data sets to answer biological questions, especially in crops. I use genomics, pangenomics, k-mer/SNP/QTL-association studies, biostatistics, and interpretable machine learning to find new approaches to breed climate change-ready crops.

Education

2012 to 2016	**PhD**, University of Queensland, Brisbane, Australia Pure bioinformatics PhD in the Edwards group. Developed computational pipeline SkimGBS for cheaper genotyping. Worked extensively with industry (Bayer CropScience, later BASF).
2010 to 2012	**Master of IT**, Bond University, Gold Coast, Australia Focused on coding and business IT. 5x Top of class, 3x Vice-Chancellor List of Academic Excellence, 1x IT Award Academic Excellence. Graduated with High Distinction. John Oglethorpe Medal for highest GPA of all IT students graduating.
2006 to 2009	**Bachelor of Life Sciences**, University of Muenster, Muenster, Germany Studied general life sciences with a focus on microbiology. In my final project I worked on EST-based differential gene expression in seagrasses.

Employment

2021 to 2023	**DECRA Fellow** My first step towards an independent lab. I am modeling mechanisms of gene loss and birth in crops to learn where new genes come from, and how to avoid loss of agronomically important genes.
2017 to 2020	**Forrest Fellow** One of three inaugural Forrest Fellows. Worked on genomics of complex plants with Forrest Foundation support.
2015 to 2017	**Postdoctoral researcher** Researched genetics of complex plants with a focus on canola and wheat in Edwards lab.

Current roles

2021	**Member, Scientific Advisory Panel Machine Learning** Member of the scientific advisory panel for ongoing machine learning projects supported by the ARDC.
2017	**Hacky Hour Founder** Founded a weekly get-together of researchers and staff working with programming and data, doubles as a help-desk for students with programming problems.
2013	**Certified Carpentries Instructor** Certified Software Carpentry and Data Carpentry instructor
2011	**Co-founder openSNP.org** Partially wrote and maintain the Ruby on Rails code-base

Current awards and funding

2020 **Grant: ARC Discovery Early Career Research Award**
Awarded DECRA for 2021-2023. Total funding: AUSD 448,781 and ASUD 418,772 in UWA funding.

2020 **Grant: Identifying genetic contributors to canola blackleg resistance in the presence of environmental effects using Machine Learnin**
With Prof. Dave Edwards, Prof. Mohammed Bennamoun, Prof. Farid Boussaid, Prof. Jacqueline Batley. Total funding: AUSD 309,524.

2020 **Grant: Machine Learning - Project E: Deep Learning for early detection and classification of crop disease and stress**
With Prof. Mohammed Bennamoun, Prof. Farid Boussaid, Prof. Dave Edwards, Dr. Nic Taylor. Total funding: AUSD 344,971.

Recent presentations

2021 **CCDM/Curtin University** - Machine learning in bioinformatics – where are we and what's next?
2021 **Cinvestav/online** - Machine learning in plant breeding and bioinformatics
2021 **UWA DVCR Forrest Fellow series** - Future-ready crops for a changing climate: the role of bioinformatics
2021 **Pawsey Supercomputing Centre** - Bioinformatics at scale Q and A
2021 **ABACBS online seminars** - Interpretable Machine Learning in Bioinformatics
2020 **GRDC Tech Seminars** - Our machine learning technical stack
2020 **PAG Conference, San Diego** - Predicting Gene Loss in Plants: Lessons Learned from Laptop-Scale Data
2019 **Bayliss Seminar Series** - Eukaryotic pangenomics: where we've been, where we're going
2019 **AGRF Seminar Series** - Assembling complex plant genomes – things I wish someone would have told me earlier
2019 **PAG Conference, San Diego** - Helping Biologists Make Sense of Plant Variant and Annotation Data

Recent publications

2021 P Li *et al.*, **Assembly of the non-heading pak choi genome and comparison with the genomes of heading Chinese cabbage and the oilseed yellow sarson**, Plant biotechnology journal
2021 PE Bayer *et al.*, **Machine learning in agriculture: from silos to marketplaces**, Plant Biotechnology Journal
2021 Y Yuan *et al.*, **Current status of structural variation studies in plants**, Plant Biotechnology Journal
2021 S Vranken *et al.*, **Genotype-environment mismatch of kelp forests under climate change**, Molecular Ecology
2021 H Rijzaani *et al.*, **The pangenome of banana highlights differences between genera and genomes**, The Plant Genome
2021 RK Varshney *et al.*, **Fast-forward breeding for a food-secure world**, Trends in Genetics
2021 PE Bayer *et al.*, **The application of pangenomics and machine learning in genomic selection in plants**, The Plant Genome
2021 B Valliyodan *et al.*, **Genetic variation among 481 diverse soybean accessions, inferred from genomic re-sequencing**, Scientific data
2021 PE Bayer *et al.*, **Sequencing the USDA core soybean collection reveals gene loss during domestication and breeding**, The Plant Genome (TSI)
2021 MF Danilevicz *et al.*, **Resources for image-based high-throughput phenotyping in crops and data sharing challenges**, Plant physiology
2021 PE Bayer *et al.*, **Modelling of gene loss propensity in the pangenomes of three Brassica species suggests different mechanisms between polyploids and diploids**, Plant biotechnology journal
2021 L Ramsay *et al.*, **Genomic rearrangements have consequences for introgression breeding as revealed by genome assemblies of wild and cultivated lentil species**, bioRxiv
2021 H Hu *et al.*, **Amborella gene presence/absence variation is associated with abiotic stress responses that may contribute to environmental adaptation**, New Phytologist
2021 SF Zanini *et al.*, **Pangenomics in crop improvement—from coding structural variations to finding regulatory variants with pangenome graphs**, The Plant Genome, e
2021 O Schliebs *et al.*, **Daisychain: Search and Interactive Visualisation of Homologs in Genome Assemblies**, Agronomy