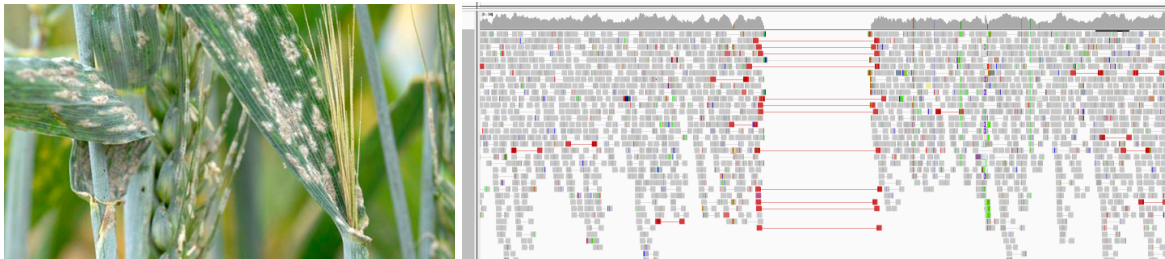


## Master thesis project



### Genomic determinants of presence-absence polymorphisms in *Blumeria graminis*

*Blumeria graminis f. sp. tritici* is an obligate biotrophic fungal pathogen causing world wide yield losses in wheat production, threatening food security.

An effective and environmentally friendly way to decrease the pathogen load of *Blumeria* is so called resistance breeding relying on resistance (R) genes. The basis of the efficacy of resistance breeding is the ability of R genes to recognize fungal proteins following the gene-for-gene model. The fungal proteins potentially recognized by resistance genes are so called effectors (Avrs if they are recognized).

One way to escape such recognition is selective loss of a recognized effector (for example by deletion). Although it is generally known that effector gene loci show presence-absence polymorphisms (PAVs), the extent of this phenomenon in *Blumeria* and more importantly the mechanism guiding these events is currently not studied. The aims of this project are:

1. Characterization of the extent of PAVs in a worldwide population of 400 *Blumeria* isolates, using multiple reference genomes and extensive re-sequencing data.
2. Comparison of PAV frequencies between effector and other genomic loci.
3. Detailed analysis of genomic boundaries of PAV sites to identify underlying genomic determinants.
4. Cot-based cloning and sequencing (CBCS, see:10.1101/gr.2438004) to identify genomic loci potentially predisposed to genomic rearrangements.

Based on the outlined aims, the project is expected to involve around 80% bioinformatics work and 20% wet lab work, but is flexible according to the students needs and project outcomes.

The MSc Thesis project will be integrated in the lab of Prof. Dr. Thomas Wicker a leading expert in comparative genomics of crops and their fungal pathogens, as well as transposable elements. Our group is part of the Department of Plant and Microbial Biology (UZH), located in the Botanical Garden (Zollikerstrasse 107, 8008 Zurich). We are also flexible and open to suggestions for project ideas.

Prerequisites: Programming skills are not required, but it is of advantage if the thought of programming does not scare you.

Suited for: Master students in biology or agricultural sciences.

Supervision: Matthias Heuberger ([matthias.heuberger@botinst.uzh.ch](mailto:matthias.heuberger@botinst.uzh.ch));  
Prof. Dr. Thomas Wicker ([wicker@botinst.uzh.ch](mailto:wicker@botinst.uzh.ch))

*For ETH students: an additional supervisor from ETH is needed. This can be arranged by asking a professor/group leader; we already had MSc students from ETH in the past, and we are ready to help with this organizational aspect.*

Starting date: Open

Language: English or German

Please contact us if you are interested or have any further questions!