

SPITFIRE Doctoral Training Partnership (DTP)

Research Experience Placement Project 2019

Lead Supervisor:	Mark Chapman
Email:	m.chapman@soton.ac.uk
University/Research Organisation:	University of Southampton
Department:	Biological Sciences
Project Title:	Comparative genomics for food security – targeted genome sequencing and use of big data

Total Student Support Costs: £	Student will receive an hourly pay of £8.44 p.h. and is required to work for 30 hours a week over an 8 week period.
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Proposed Start Date: 8 th July 2019	Proposed End Date: 2 nd September 2019
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Projects should run over the summer vacation and we recommend that projects will have terminated by 25 September 2019.

Brief Summary

This should include:

- *Project outline;*
- *Links to staff/School/Centre activity as appropriate;*
- *Supervisory arrangement;*
- *How space/equipment/supporting resource demands will be met;*
- *Elements of the project that will incorporate elements other than computer/modelling e.g. fieldwork and data collection;*
- *How the project will enhance the skills of the appointed student;*
- *Any intellectual property rights concerns that may arise from the work.*

Feeding a growing population under a warmer climate will require breeding fast growing (i.e. drought avoiding) crop varieties. We have identified populations of wild *Brassica rapa* (the progenitor of pak choi, Chinese cabbage, turnip) that are very early flowering and could provide clues to the genetic basis of early flowering. To this end, this project will combine genome sequencing of three early-flowering *B. rapa* individuals (which will be paid for from lab funds) with ca. 100 published and unpublished genome sequences of both wild and domesticated *B. rapa* to generate the data necessary to understand the genomics of early flowering in *Brassica*.

In the Chapman lab we are carrying out research into the genomics of phenotypic and gene expression plasticity, with the outputs being relevant to crop resilience to climate change. The SPITFIRE REP project will fit within this overall goal, taking on a new aspect utilising the large amounts of genome sequence data we have generated, but in a novel manner. It is anticipated this analysis will be incorporated into a future publication, and therefore authorship for the student. IP is not an issue as data will be made publicly available after the project ends. The project will be based in Biological Sciences, supervised by Mark Chapman and the project postdoc. The lab is set up ready for all portions of the project.

The project will allow training in plant growth under controlled conditions and DNA extraction. The analytical portion will use the University supercomputer to identify genes exhibiting the hallmarks of adaptive divergence between early- and late-flowering *Brassica rapa*. The student will learn these aspects of the research as well as be immersed in a busy lab working on diverse

projects, and will be expected to join into lab meetings, present their data, and will be given the option of helping out with related lab work.

Please give an indicative timescale for the student's work over the length of the project:

This should include:

- *The broad tasks the student will undertake;*
- *An indicative timescale for these tasks.*

Weeks 1 – 8: The student will grow a range of *Brassica rapa* accessions under controlled conditions to determine the effect of rapid-flowering on overall biomass (a key yield trait).

Week 1: DNA extraction from representatives of the rapid flowering *Brassica* accessions, DNA quality control, and samples sent for genome sequencing.

Week 2: Identification and download of relevant data from the 100s of *Brassica rapa* genomes available (published and unpublished). Basic training in command line computing.

Week 3: New genome data returned and quality control takes place.

Week 4 – 7: Comparative genomic training and analysis.

Week 7 – 8: Key results from greenhouse and genome data summarised and presented to the lab.

Proposed procedure for appointing students, including selection criteria:

Please identify specific criteria that should be considered for the selection of placement students e.g. specific quantitative skills that may be required, subject knowledge etc. If a student has been pre-selected, or the research area has been led by the student, please provide the student's contact details, and a summary of their suitability for the SPITFIRE DTP REP programme.

We would anticipate that the successful applicant is maintaining 2:1 or higher marks on average, and with a clear interest in evolutionary biology or genetics. Some computational background would be highly desirable, although training will be given. The cover letter, CV and letters of reference will jointly be used to assess the selection criteria.