

A role for lncRNAs in the transcriptional co-ordination of neighbouring genes

This project is one of a number that are in competition for funding from the [South West Biosciences Doctoral Training Partnership \(SWBio DTP\)](#) which is a [BBSRC](#)-funded PhD training programme in the biosciences, delivered by a consortium comprising the Universities of Bath, Bristol, Cardiff and Exeter, along with the Rothamsted Research Institute. The partnership has a strong track record in advancing knowledge through high quality research and teaching, in collaboration with industry and government.

Studentships are available for entry in September/October 2019.

All SWBio DTP projects will be supervised by an interdisciplinary team of academic staff and follow a structured 4-year PhD model, combining traditional project-focussed studies with a taught first year which includes directed rotation projects.

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Collaborator: Dr Selene Lizbeth Fernández Valverde (LANGEBIO, National Laboratory of Genomics for Biodiversity, Irapuato, Mexico)

Project description

How is co-ordinate regulation between neighbouring eukaryotic genes accomplished? How is the coregulation of groups of genes affected by non-coding genetic elements?

These are the questions at the heart of this PhD project that combines chromatin genetics, bioinformatics, research on non-coding RNAs and plant sciences to improve our fundamental understanding of eukaryotic gene regulation.

While prokaryotes have well described multicistronic transcripts (i.e. operons), in eukaryotes, such structures are the exception that prove the rule. Indeed, diverse examples for co-localised and coregulated functionally related genes have been identified in eukaryotes that resemble gene order in prokaryotes. Such eukaryotic gene clusters are associated with essential biological processes, from imprinting and embryonic development to antibiotic production. Co-ordinated expression is central to the activity of these clusters. But how is it that coordinated expression is achieved in eukaryotic gene clusters?

Here we will address this question by investigating the role of long noncoding RNAs in the regulation of clusters of genes in the model plant *Arabidopsis thaliana*. lncRNAs have emerged as important modulators of transcriptional activity across the eukaryotes. They have been shown to induce changes to chromatin modifications and three-dimensional chromosome structure.

In this interdisciplinary project, we will analyse the role of lncRNA in the transcriptional co-ordination on three levels. Firstly, the student will be trained in the bioinformatic analysis of large-scale datasets to generate a map of co-expressed neighbouring genes and their associated lncRNAs in *A. thaliana*. Secondly, the student will perform a focused functional analysis of the molecular role of lncRNAs at described gene clusters in *A. thaliana*. This will involve chromatin immunoprecipitation, RNA-DNA binding assays, chromosome conformation and gene expression analysis. Thirdly, a comprehensive

evolutionary analysis of cluster-associated lncRNAs will be implemented. LncRNAs will be analysed on sequence, RNA structure and positional level across closely related plant species and animals. A machine learning approach will be devised to identify signatures that may define cluster associated lncRNAs.

The doctoral researcher will be based at the newly established Milner Centre for Evolution at the University of Bath and integrated into an ongoing collaboration between the Milner Centre and the National Laboratory of Genomics for Biodiversity (LANGEBIO), Irapuato, Mexico.

We are looking for an applicant who is curious about genetics and gene regulation and excited to apply both molecular and bioinformatics techniques. Practical skills in plant molecular biology/chromatin genetics and bioinformatics/coding are advantageous but not required and specialised training will be provided.

Funding

Studentships provide funding for a stipend at the standard UKRI rate (currently £14,777 per annum, 2018/19 rate), research and training costs and UK/EU tuition fees for 4 years.

UK and EU applicants who have been residing in the UK since September 2016 will be eligible for a full award; a limited number of studentships may be available to EU applicants who do not meet the residency requirement. Applicants who are classed as Overseas for tuition fee purposes are not eligible for funding.

Applications

Applicants must have obtained, or be about to obtain, a First or Upper Second Class UK Honours degree, or the equivalent qualifications gained outside the UK, in an appropriate area of science or technology.

Applications should be submitted on the [University of Bath's online application form for a PhD in Biosciences](#). Please ensure that you quote the supervisor's name and project title in the 'Your research interests' section. You may apply for more than one project if you wish but you should submit a separate personal statement relevant to each one.

The deadline for the receipt of applications is Monday 3 December 2018.