**Plant cell fate conversion through epigenetic reprogramming**

**Prof HG Dickinson (Plant Sciences)**

***Description***

Modification of the epigenetic ’landscape’ has been shown to alter cell fate in animals (1). Although plant cells are more pleuripotent than those of animals, epigenetic tools have yet to be devised to reprogramme developmentally-committed plant cells to alternative fates. However, it has long been known that plant microspores (the male meiotic products of higher plants) are developmentally labile and in some species, stress can be used to switch these cells from a reproductive to a somatic cell fate – dramatically forming embryos and eventually haploid plants (2-4). Importantly, these haploid plants can be converted to diploids, and the production of ‘doubled haploids’ (DHs) currently underpins part of the plant improvement industry. Unfortunately DHs cannot be generated from a number of major crops including wheat, rice, and maize, constituting a serious challenge for the industry.

Microspores have a unique epigenetic landscape (5), and to investigate the possibility that microspore fate is determined epigenetically, we have generated a range of plant lines in which different epigenetic pathways can be inducibly modified in microspores. We shall then determine whether these modifications affect the frequency by which cell fate is converted in culture. Current experiments are focussed on the model plant *Arabidopsis thaliana*, and the crop plant *Brassica napus*. The USTC student will be involved in all facets of this work

***Training will be provided in the following techniques.***

1. Plant genetics and epigenetics
2. Plant cell and tissue culture.
3. Plant molecular genetics including making complex constructs, plant transformation and screening phenotypes.
4. Fluorescence, DIC and confocal microscopy

***Collaboration*** The project is collaborative and the student will interact with colleagues in Berkeley (USA) and Cambridge (UK), and most possibly with Syngenta PLC – a plant biotech multinational.

***References***

1. Obokata, H. *et al* (2014) Stimulus-triggered fate conversion of somatic cells into pleuripotency. Nature, 505, 641-647
2. Boutilier, K. *et al* ( 2002) Ectopic expression of BABY BOOM triggers a conversion from vegetative to embryonic growth. Plant Cell, 14; 1737-49
3. Malik MR, *et al*. (2007) Transcript Profiling and Identification of Molecular Markers for Early Microspore Embryogenesis in *Brassica napus* Plant Physiol. 144(1); 134-54.
4. Solis, M-T *et* al (2012) DNA methylation dynamics and MET1a-like gene expression changes during stress-induced pollen reprogramming to embryogenesis. J.Exp. Bot. 63, 6431-44
5. Calarco, J.P. *et al* (2012) Reprogramming of DNA methylation in pollen guides epigenetic inheritance via small RNA. Cell 151, 194-205.