BEN MILLER

I first became interested in plant science when I was at University and I am now particularly interested in the area of calcium signalling in plants.

First Degree	BSc (Hons) Molecular Biology & Biochemistry University of Durham Graduated June 2008
PhD	Sainsbury PhD Studentship Defining the mechanisms of specificity in the symbiosis signalling pathway of legumes John Innes Centre Supervisor – Professor Giles Oldroyd Started October 2008

Summary of Research Project

The model legume *Medicago truncatula* is able to engage in symbiotic relationships with the arbuscular mycorrhizal fungus *Glomus intraradices* and the nitrogen-fixing bacterium *Sinorhizobium meliloti*. The establishment of both of these symbioses depends upon a common early signalling pathway. A central part of this signalling pathway is the rapid oscillation of cytosolic calcium concentration; this so-called calcium spiking has been associated with both nodulation and mycorrhization, although the nature of the calcium signature is different for each symbiosis.

Immediately downstream of calcium spiking lies a Ca^{2+}- and Ca^{2+}/CaM-dependent protein kinase (CCaMK) and this protein is believed to be directly involved in decoding calcium spiking. Certain mutations of CCaMK result in the spontaneous development of nodules in the complete absence of rhizobia. I am assessing whether other mutated CCaMKs, in addition to these gain-of-function CCaMKs, are able to complement for nodulation or mycorrhization. I am also investigating whether these mutant and gain-of-function CCaMKs are able to induce the expression of marker genes specific for either nodulation or mycorrhization. This approach will provide insight into how CCaMK decodes different calcium spiking signatures and translates this into the activation of either a nodulation- or mycorrhization-specific signalling pathway.