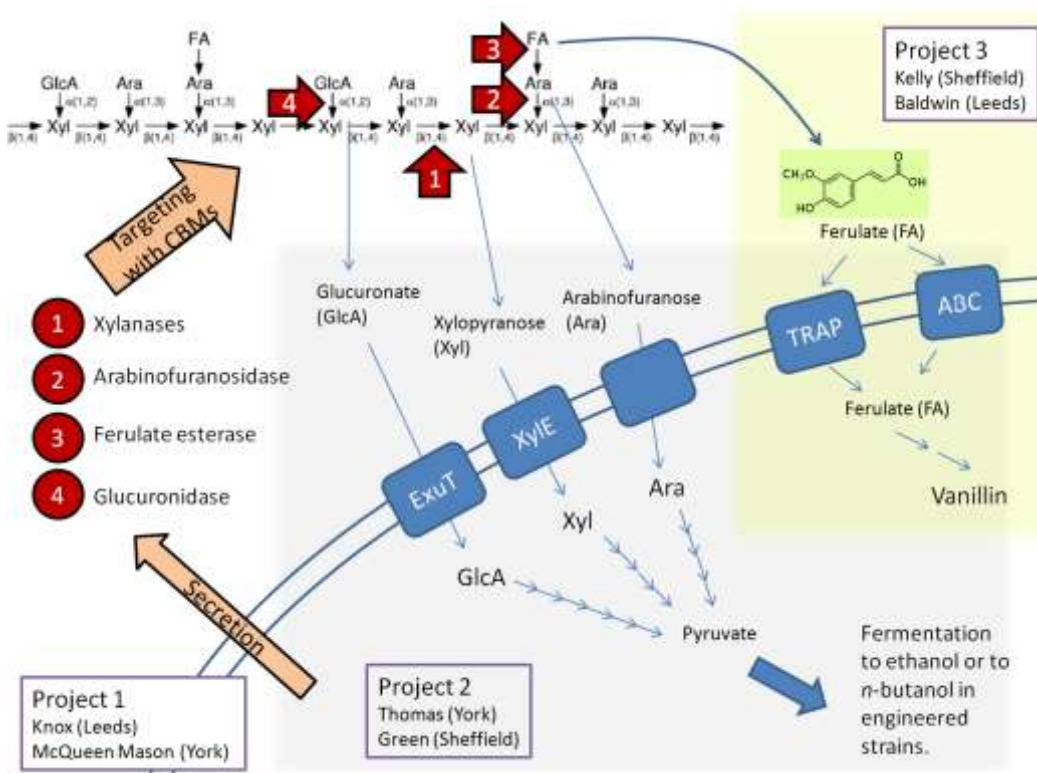


Teaching bacteria to eat grass: genetic engineering of *Escherichia coli* for complete degradation and utilisation of *Miscanthus* hemicellulose (3 studentships).

The **HUB network** (Hemicellulose Utilisation by Bacteria) project provides a unique opportunity to bring together three separate pieces of research ongoing in the White Rose Universities to engineer the model bacterium *Escherichia coli* for use in consolidated bioprocessing through the complete degradation and utilisation of carbon from lignocellulosic feedstocks. The improved utilisation of such feedstocks by bacteria for biofuel biosynthesis is an active area of current RCUK-funded research and Green Biologics, a UK-based manufacturer of lignocellulosic biobutanol are partners in the network.

The hemicellulose component of *Miscanthus* consists of xylan chains highly substituted with arabinofuranose and glucuronic acid with additional cross links between the strands mediated by hydroxycinnamic acids (see figure). Our aim is to create an *E. coli* strain that is engineered to degrade this hemicellulose completely and then to utilise fully the resultant products for anaerobic fermentation and biofuel production. The network is based around 3 fundamental scientific breakthroughs that are united by the particular biology of *Miscanthus* hemicellulose. The first

Closing date for applications
Friday 8th
February 2013



(project 1) builds on the extensive expertise of Paul Knox and Simon McQueen Mason on the structure and degradability of plant cell walls and we build on expertise of the Knox lab in understanding cell wall heterogeneity and also the targeting of enzymes to hemicelluloses within cell wall contexts for enzymatic degradation. We will characterise a full set of the enzymes that are required for complete and efficient breakdown of *Miscanthus* hemicellulose molecules and engineer these to be surface located or secreted by *E. coli*. In **project 2**, we will engineer *E. coli* to efficiently transport the sugars and uronic acids released from the hemicellulose, building on the recent discovery in the Thomas lab of a novel transporter specific for the furanose form of arabinose (the only form found exclusively in the hemicellulose) and expertise in the Green lab in using gene regulatory circuits to couple these genes to expression in fermentative conditions. In **project 3** we will use the recent discovery in the Kelly lab of the transporters and genes responsible for catabolism of the hydroxycinnamic acids ferulate and coumarate and will use the expertise of Baldwin and Kelly to engineer these into *E. coli*.

There will be regular physical meetings of partners across the network and also virtual journal club sessions for the students and staff to keep abreast of recent literature.

Network Leader: Gavin Thomas (York)			
Host University (i.e. the Uni providing the studentship and where the student will be registered)	Studentship Topic (with link to advert on FindaPhD.com)	Principal Supervisor	Secondary Supervisor
Leeds	Enzyme action and hemicellulose substrate heterogeneity in cell wall contexts	Paul Knox (<i>Leeds</i>)	Simon McQueen-Mason (<i>York</i>)
York	Transport of hemicellulose-derived sugars and uronic acids by <i>Escherichia coli</i>.	Gavin Thomas (<i>York</i>)	Jeff Green (<i>Sheffield</i>)
Sheffield	Engineering <i>Escherichia coli</i> to transport and efficiently metabolise ferulate	David Kelly (<i>Sheffield</i>)	Steve Baldwin (<i>Leeds</i>)

The network is aligned to the White Rose DTP in Mechanistic Biology funded by the BBSRC.

Each studentship is tenable for four years from Session 2013/14 (starting around October 2013) and will provide Home/EU tuition fees, a maintenance grant paid at standard Research Council rates for the first year of study (renewable for a second, third and fourth year of study subject to satisfactory academic progress). The stipend and fees will be provided by the host university.

Closing date for applications is the 8th February 2013.

For further information contact the principle supervisors for the individual projects to learn more about the details of the particular PhD studentships on offer. Contact details are Gavin Thomas (gavin.thomas@york.ac.uk), David Kelly (d.kelly@sheffield.ac.uk) and Paul Knox (j.p.knox@leeds.ac.uk). The [York project](#) is advertised on FindaPhD.com as is the [Leeds project](#).

Applications should be directed through the usual route for postgraduate study for the different Universities stating that the application of for the White Rose PhD studentship network (which is distinct from the White Rose Mechanistic Biology DTP PhD program).