



PhD Research Studentship

Project Title: *Exploiting yeast diversity in whisky fermentations for biocatalysis of desirable flavour compounds*

Abertay University / Scotch Whisky Research Institute

Supervisors:

Prof Graeme Walker – Abertay University
Dr Frances Jack – Scotch Whisky Research Institute

PhD Studentship: The Industrial Biotechnology Innovation Centre (IBioIC) with funding from the Biotechnology and Biological Sciences Research Council (BBSRC) Collaborative Training Partnership (CTP) has awarded a fully-funded PhD studentship to Abertay University in collaboration with the Scotch Whisky Research Institute (SWRI). The project involves aspects of yeast, fermentation, distilling, and sensory analytical research. The doctoral program includes a full stipend and the prospective PhD student would benefit from supervisory teams from Abertay and SWRI and access to facilities at both institutes. The two partners in this project have complementary skills: Abertay University in the sourcing of new yeast strains and evaluating fermentation performance in the laboratory; SWRI in distillation, sensory evaluation and the analysis of flavour compounds in spirit. Although based at Abertay in Dundee, the student will have the opportunity to conduct aspects of the project during an industrial placement period (minimum 3 months) at SWRI in Edinburgh.

Abertay University is one of just six universities in across the UK and the only one in Scotland to receive the nomination as the “University of the Year” in 2016 Time Higher Education (THE) Awards. According to the results of the Research Excellence Framework 2014 (REF2014) published on 18 December 2014, Abertay was the highest ranked modern university in Scotland for 'research intensity'. The School of Science, Engineering and Technology at Abertay University is equipped with modern laboratories and staff with exceptional skills, knowledge, and experience in the fields of yeast biotechnology, fermentation, distilling and sensory analysis.

The Scotch Whisky Research Institute is a Research & Technology Organisation dedicated to the needs of the Scotch Whisky Industry. SWRI's remit is to ensure sustainability of the supply chain, improve process efficiency and help protect the Scotch Whisky category. This is achieved by carrying out a comprehensive programme of pre-competitive and applied research and exploring new technologies. SWRI are funded by the Scotch Whisky industry and as such provide a route to the industrial application of any positive outcomes from this project.

Project Aim: To investigate the potential of biologically diverse yeasts to create desirable flavours during whisky fermentation, while also giving the efficient alcohol production required by the industry.

Research Outline: Scotch Whisky legislation prohibits the addition of any flavourings, with all sensory characteristics (aroma and taste) being naturally generated during the production process. A wide range of flavour compounds, or *congeners*, are created during fermentation. Examples of these compounds include: higher alcohols (such as isoamyl alcohol), esters (such as ethyl acetate), acids (such as succinic acid), vicinal diketones (such as diacetyl), sulphur compounds (such as dimethyl sulphide), and phenolics (such as 4-vinyl guaiacol). The choice of yeast strain is crucially important in dictating the level of these congeners in the new-make spirit prior to whisky maturation. However, the industry is currently very conservative in terms of yeast use. A limited range of yeast supply companies provide the whisky production sector in Scotland with all *Saccharomyces cerevisiae* distilling yeasts. Nevertheless, whisky producers are increasingly interested in diversifying flavour in response to changing consumer demands, though production targets (alcohol yields) still need to be met. This project will address industry aspirations by providing a fundamental understanding of the potential of a wide range of diverse

yeast species to catalyse desirable flavour reactions. Work will focus on non-*Saccharomyces* yeasts, which have not previously been investigated in cereal-based, whisky fermentations. Such yeasts have been shown to produce a range of interesting flavour-active metabolites including esters, terpenols, lactones, higher alcohols and acids and some strains have applications in other fermented beverages (wine, rum etc).

Based on findings from other industries, such as wine producers, it is anticipated that the project will identify several non-*Saccharomyces* yeasts with the potential to influence whisky flavour. It is unlikely that these yeasts could be used as direct replacements of existing distilling yeast strains of *S. cerevisiae*. This is because the current strains used have been primarily selected based on their ability to efficiently convert cereal-based substrates to alcohol. Therefore, this study will additionally explore the potential of using co-cultures (i.e. distilling strains of *S. cerevisiae* together with a non-*Saccharomyces* strain), either concurrently or sequentially, to give desired flavour in tandem with required alcohol yield.

Entry requirements: A related Masters level qualification is desirable but not essential, but candidates must have, or expect to obtain a first class or upper second-class honours degree in a relevant discipline; for example, brewing, distilling, food science/technology, microbiology, biotechnology.

Applicants who are non-native speakers of English, the University requires IELTS of 6.5 (with no band less than 6.5) or an equivalent qualification accepted by the Home Office.

The Studentship is available for an October 2017 start for a period up to 4 years.

Further details on this project can be obtained from Prof Graeme Walker (g.walker@abertay.ac.uk).

Further information on Abertay University may be obtained from the Graduate School, University of Abertay Dundee, Bell Street, Dundee, DD1 1HG, Tel:+44 (0)1382 308150, email: GraduateSchool@abertay.ac.uk

Applicants should submit through HIREWIRE submitting a CV (including references) and a personal statement of application detailing why you are interested in undertaking this project. Please also ensure that you complete the Equal Opportunities information requested on Hirewire, and for demographic data gathering purposes we also require your postcode, or address, time of entering undergraduate study. (*NOTE: HIREWIRE ONLY ALLOWS YOU TO SUBMIT ONE DOCUMENT, PLEASE MERGE YOUR SUPPORTING DOCUMENTS*).

If you are selected for interview you will be required to complete an online Research Student Application Form which includes the submission of a research proposal. Guidance on how to write the proposal can be found here: <https://www.abertay.ac.uk/studying/postgraduate-research-degrees/>, under 'how to apply'. Applicants are also encouraged to contact Professor Walker (G.Walker@abertay.ac.uk) for advice on developing a proposal prior to submitting it.

The deadline for applications is May 19, 2017 with interviews for candidates in Dundee between June 15-16, 2017