**Project title:** Mechanistic radical chemistry in hair damage  
**Supervisor name(s):** Dr Victor Chechik  
**Supervisor(s) contact email:** victor.chechik@york.ac.uk

**Project Description:**
Hair is a protein filament easily damaged by chemical reactions. Such reactions can be triggered when people bleach, dye, blow dry, iron their hair or simply go out on a sunny day. Damaged hair often becomes dry and brittle. Vast majority of reactions in hair involve free radical intermediates but the mechanisms of these processes are poorly understood.

This project aims at unravelling the mechanisms of radical reactions in hair, with particular focus on the combination of several external triggers (e.g., consecutive exposure to peroxides (used in dyeing/bleaching) and sunlight). There is evidence that such combinations have synergistic effect, significantly increasing hair damage. This could be due to a number of possible factors. For instance, one trigger could result in accumulation of organic peroxides in hair, while the other trigger could initiate peroxide decomposition.

The mechanistic studies will start with simple model systems which mimic hair constituents (e.g., amino acids, lipids, simple peptides, gels). We will analyse the composition of products and intermediates and use radical detection techniques (such as spin trapping and EPR spectroscopy, and a new MS spectrometry based method recently developed in our laboratory) to determine reaction mechanism and potential synergistic radical pathways. We will then confirm that these mechanisms operate in hair and will explore the feasibility of reducing hair damage by applying radical scavengers and other additives.

The project will involve some organic synthesis, mechanistic organic chemistry, EPR spectroscopy and other analytical techniques. The project is co-sponsored by Procter and Gamble and will greatly benefit from the industrial collaboration. We have a strong track record of successful collaborative projects with Procter and Gamble.

**Training:**
All research students follow our innovative Doctoral Training in Chemistry (iDTC): cohort-based training to support the development of scientific, transferable and employability skills. All research students take the core training package which provides both a grounding in the skills required for their research, and transferable skills to enhance employability opportunities following graduation. Core training is progressive and takes place at appropriate points throughout a student's higher degree programme, with the majority of training taking place in Year 1. In conjunction with the Core training, students, in consultation with their supervisor(s), select training related to the area of their research.

The successful candidate will also be trained in project-specific techniques such as analytical methods (EPR spectroscopy, MS), synthetic/mechanistic methods, free radical chemistry.

**Equality and Diversity:**
The Department of Chemistry holds an Athena SWAN Gold Award and is committed to supporting equality and diversity for all staff and students. The Department strives to provide a working environment which allows all staff and students to contribute fully, to flourish, and to excel. Chemistry at York was the first academic department in the UK to receive the Athena SWAN Gold award, first attained in 2007 and then renewed in October 2010 and in April 2015.
Funding:

Value: This studentship is funded 50% by Procter&Gamble and 50% by a Department of Chemistry Teaching Studentship. It covers: (i) a tax-free annual stipend at the standard Research Council rate (£14,777 for 2018-19), (ii) tuition fees at the UK/EU rate.

Eligibility: Studentships are available to any student who is eligible to pay tuition fees at the home rate.

Details of 50% Chemistry Teaching Studentship:

Role and Responsibilities:
To assist with undergraduate practical Chemistry teaching for 3 years. This is likely to equate to:

Undergraduate term time:
• 37 hours of demonstrating per year in the undergraduate teaching laboratories. Most of your teaching duties will take place in Autumn and Spring term
• 2.5 hours per year of departmental tours for UCAS visit days in the Autumn Term

Undergraduate vacations:
Other teaching related duties to enable you to develop your skills, e.g. development of laboratory/Virtual Learning Environment material, assisting with workshops, as well as personal training and development sessions. You will complete a timesheet each term and during the summer vacation and submit them to the Chemistry Graduate Office to record your teaching activities

Training:
In common with all graduate students, you will receive training provided by the Chemistry Department and the University’s Research Excellence Training Team (RETT). The Chemistry Department has a Graduate Teaching Assistant (GTA) Training Programme for assisting in laboratory practicals. You will receive additional training specific to developing teaching material online and assessing practical work.

You will have the opportunity to take courses offered by the RETT via the Postgraduates Who Teach programme; e.g. Introduction to Learning and Teaching, Teaching Small Groups, Demonstrating in Science. Further development is possible through engagement with the HEA accredited ‘Preparing Future Academics’ programme.

This training will be complemented by research training integral to your PhD programme. Collectively, experience of research and teaching methods should place you in a strong position for future employment in teaching, academia or other related fields.

Supervision and Mentoring:
Your research will be supervised by your academic supervisor, and you will also be mentored by a second or third year PhD Teaching Student, with overview and input from the Teaching Laboratory Coordinator.

At your Thesis Advisory Panel meetings you will produce a brief one page overview of your teaching activity, and reflect on your skills development in the teaching area. Your Independent Panel Member will take a role in guiding teaching skills development, in consultation with your mentor and the Chair of the Board of Studies.

Candidate selection process:
• You should submit an application for a PhD in Chemistry and a Teaching Studentship Application by 30 April 2018
• The supervisor may contact their preferred candidates either by email, telephone, web-chat or in person
• The supervisor may nominate up to two candidates to the assessment panel
• Shortlisted candidates will be invited to a panel interview at the University of York on a date TBC
• The Awards Panel will award studentships following the panel interviews
• Candidates will be notified of the outcome of the panel’s decision by email

For more information contact chemgrad@york.ac.uk or see our web page: http://www.york.ac.uk/chemistry/postgraduate/