

# Fully funded 4-year PhD Studentship in Catalysis and Organic Chemistry

Department of Chemistry, Durham University, United Kingdom

**Research Project: Merging organocatalysis and metal catalysis for asymmetric synthesis**

**Primary supervisor: Dr Allegra Franchino**

The ability of chemists to invent new transformations is at heart of our modern society, as methods to forge bonds with increased precision and selectivity enable a more efficient preparation of materials, medicines, agrochemicals and fine chemicals. Catalysis is a powerful tool to devise new reactions and render the existing ones more selective, thus contributing to a more sustainable use of natural resources. In this context, our [young research group](#) pursues a research program that merges in original ways elements taken from both organo- and transition-metal catalysis, to open new paths for stereoselective reactions of unsaturated feedstock substrates and for sustainable synthesis oriented to medicinally relevant scaffolds.

In this project, you will design, prepare and test chiral organocatalysts capable of engaging with common metal halide (pre)catalysts via non-covalent interactions, using an anion-binding approach. These binary catalytic systems will then be screened combinatorially in several reactions, including with a high-throughput experimentation setup, to achieve increased rate, unusual regio- and stereoselectivity and/or unprecedented levels of enantiocontrol.

The mode of action of the binary catalytic systems will be investigated experimentally and explored computationally. Improved second-generation catalysts will be designed following mechanistic insights, with the help of structure-activity relationships and computational predictions.

During your PhD, you will receive hands-on training on a wide variety of technical aspects:

- synthetic organic and organometallic chemistry (synthesis, purification and characterisation of substrates, products, ligands and catalysts using several techniques);
- enantioselective catalysis (with both transition metals and organocatalysts, and using HTE);
- supramolecular chemistry (study of non-covalent interactions in solution and in the solid state);
- mechanistic elucidation using experimental and computational tools (e.g., kinetic studies and DFT calculations for homogeneous catalytic reactions);
- written and oral scientific literacy.

You will participate in weekly group meetings and problem sessions, and have the chance to attend group and departmental social activities. You will also benefit from our regular departmental seminar programme, and present your work at national and international conferences, in this way refining your communication skills and engaging with other scientists from academia and industry. Tailored mentoring and enthusiastic support to reach your career goals and improve your skill set will be provided by your primary supervisor, the whole Franchino group, the Chemistry Department and the University (e.g., Durham Centre for Academic Development, Careers & Enterprise Hub).

## References

- Silver-free Au(I) catalysis enabled by bifunctional urea- and squaramide-phosphine ligands via H-bonding. A. Franchino, À. Martí, S. Nejrótti, A. M. Echavarren, *Chem. Eur. J.* **2021**, *27*, 11989–11996.
- H-bonded counterion-directed enantioselective Au(I) catalysis. A. Franchino, À. Martí, A. M. Echavarren, *J. Am. Chem. Soc.* **2022**, *144*, 3497–3509.
- H-bonded counterion-directed catalysis: enantioselective Au(I)-catalyzed additions to enones as a case study. À. Martí, M. Montesinos-Magraner, A. M. Echavarren, A. Franchino, *Eur. J. Org. Chem.* **2022**, *38*, e202200518.
- Enantioselective transition-metal catalysis via an anion-binding approach. J. M. Ovían, P. Vojáčková, E. N. Jacobsen, *Nature* **2023**, *616*, 84–89.

## Details

- Fully funded PhD scholarship for 48 months, including tuition fees, at EPSRC rate (i.e., you will not pay university fees, and will receive a non-taxable stipend of £19,237 per year).
- Open to UK, EU and international candidates, all nationalities welcome.
- Ideal starting date January 2025, with a later start also possible.

## How to apply

You must hold a Master degree or equivalent in Chemistry or a related subject, or obtain it before the end of October 2024.

To apply, please send to Dr Allegra Franchino ([franchinolab@gmail.com](mailto:franchinolab@gmail.com)) by **Friday 27<sup>th</sup> September 23:59 CET** (1) a cover letter detailing your profile and motivation, (2) a CV including contact details of 2 academic referees, (3) transcripts of marks from Bachelor and Master degrees (or equivalent). Online interviews will be held on 10<sup>th</sup> and 11<sup>th</sup> October 2024.

## Durham University, the Department of Chemistry and the Franchino group

[Durham University](#), in the North of England, is a world top 100 university (QS World University Rankings 2025) with a global reputation for teaching and research. Our Chemistry degree is among the best ones in the UK (5<sup>th</sup> in the Complete University Guide 2024, 10<sup>th</sup> in The Times and Sunday Times Good University Guide 2023, and 11<sup>th</sup> in the Guardian University Guide 2024).

Durham University is one of the UK's most historic universities, sitting in a beautiful, hilly city whose Romanesque Cathedral is recognised as a UNESCO World Heritage Site. Durham's unique college system creates a strong sense of belonging, offers several social activities and provides students with additional pastoral care. As a PhD student in Durham, you will become part of a dynamic, friendly and international community, and benefit from cutting-edge facilities.

The [Department of Chemistry](#) is well equipped, with state-of-the-art instrumentation and facilities, and is located at the Science Campus, a 10-minute walk away from Durham old town. 96% of our research outputs were rated world-leading or internationally excellent in the latest UK-wide review (REF 2021). The Department has close research links with industrial partners and other universities in the UK and abroad.

The [Franchino laboratory](#) is currently undergoing a floor-to-ceiling refurbishment to the highest standards, so you will be able to work in a shiny, efficient and modern environment from day one. Alongside standard equipment for synthetic organic and inorganic chemistry, the Franchino lab benefits from dedicated, brand new glovebox, HPLC instrument and microwave synthesizer. Additionally, group members have access to departmental NMR, MS, XRD, EA and spectroscopic support units, mechanical, electrical and glassblowing workshops, and the University supercomputer Hamilton.

The University provides a working and teaching environment that is inclusive and welcoming, where everyone is treated fairly with dignity and respect. We actively encourage applicants with diverse career paths and backgrounds, regardless of age, disability, ethnicity, gender, sexual orientation and religious beliefs. The Chemistry Department holds an Athena Swan Silver Award. The Franchino group is keen on increasing diversity, and actively seeks to attract and nurture the best and most motivated co-workers, regardless of their protected characteristics. Applications from women and underrepresented groups are especially encouraged.

