

Research and Innovation Overview 2024

Department of Chemistry

The Department of Chemistry at Maynooth University continues to excel in interdisciplinary research, with 13.5 permanent academic staff members contributing to a wide range of research outputs. In 2023, the department published 47 articles and reviews in international peer-reviewed journals, collaborating with researchers from Irish and international institutions. The department's research spans multiple fields, including, material science, energy storage, and pharmaceutical chemistry, environmental science, neuroscience, and more, reflecting the diverse expertise of its faculty.

Head of Department: Professor Denise Rooney



Research Themes and Focus Areas

The department's research covers a broad spectrum of chemistry-related topics, with key focus areas including:

- **Material Science and Energy:** Research in this area focuses on the development of new materials for energy storage and production, including renewable hydrogen and electrocatalysis.
- **Chemistry for Health:** Faculty members contribute to research on the molecular mechanisms of health and disease, including collaborative projects on drug development and disease biomarkers.
- **Electrochemistry and Sensors:** The department leads significant work in electrochemistry, contributing to innovations in sensor technologies and industrial applications.



Significant Research Outputs

In 2023, the Department of Chemistry produced several high-impact research publications and secured prestigious research grants:

Publications

- Dr Roisin O'Flaherty co-authored a paper on breast milk sugars, published in *Nature Communications*, as part of a national study.
- Dr Tobias Krämer was a co-author on 'Stability and C-H Bond Activation Reactions of Palladium(I) and Platinum(I) Metalloradicals', published in *Journal of the American Chemical Society*.
- Dr Robert Elmes published a multidisciplinary study on stimuli-responsive material behaviour in *Chinese Chemical Letters*, continuing his collaboration with Changzhou University in China.

Awards

- Professor Carmel Breslin was named in Stanford University's Top 2% of Scientific Researchers Worldwide in 2023 for her contributions to renewable energy research.
- Professor Breslin also secured €689,324 from the Sustainable Energy Authority of Ireland to research next-generation electrocatalysts for renewable hydrogen production.



Collaborations and Partnerships

The department maintains extensive national and international collaborations, working with industry partners and academic institutions worldwide. Key partnerships include:

- **Enterprise Collaborations:** Professor John Stephens supervises an IRC Enterprise Partnership Scholarship with Pfizer, focusing on the development of more efficient processes for producing fluorescence quenchers, which are critical for PCR testing.
- **International Collaborations:** Faculty members, including Dr Robert Elmes and Professor John Lowry, work with industry leaders such as Merck, Boehringer Ingelheim, and W.L. Gore & Associates on projects related to pharmaceuticals and neuroscience.
- **European Collaborations:** Dr Eithne Dempsey was awarded a Visiting Professorship at the University of Sassari in Italy, fostering collaborations through advanced lectures and Erasmus mobility exchange visits.



Research Impact and Societal Contributions

The department's research has far-reaching implications, particularly in the fields of energy and healthcare. Professor Carmel Breslin's work on renewable hydrogen production contributes to global efforts to transition to sustainable energy sources. Professor John Stephens' collaboration with Pfizer aims to streamline chemical manufacturing processes, offering potential cost savings and environmental benefits.



Future Directions

The department plans to continue its pioneering research in material science, energy storage, and pharmaceutical chemistry. Upcoming projects include expanding collaborations with international institutions and industry partners to develop innovative solutions to global challenges in health, energy, and the environment.

The Department of Chemistry at Maynooth University is committed to producing high-quality research that addresses critical global challenges. Through its interdisciplinary approach, strong network of collaborators, and success in securing competitive research funding, the department continues to make impactful contributions to both academic knowledge and societal needs.