A position is available in the research team of Prof. Stephen Dooley at the School of Physics, Trinity College Dublin, in collaboration with Prof. Kim McKelvey at the School of Chemistry, Trinity College Dublin. The project investigates the physical and chemical processes controlling the selective electrochemical catalysis of carbon dioxide to methanol by the creation of an advanced multiphysics simulation.

**Background:** Electricity-to-Fuels, in which electrical energy generated from renewable sources is used as energy source for the synthesis of fuels from carbon dioxide (CO₂) and water, is a technology that could interrupt the anthropogenic carbon cycle and significantly reduce net greenhouse gas emissions as required by the 2016 Paris Climate Agreement. Electricity-to-Fuels technologies (also known as Power-to-X or Electro-fuels) are fast-evolving but face several fundamental science challenges in their operation and market viability. Particularly, the production costs of an Electricity-to-Fuels approaches are highly dependent...
on the capital costs of the electrolyser and the electricity price. The design of the electrolyser is thus critical.

**Project:** This project will provide an experimental and computational platform with which to test, model and optimise the performance of CO$_2$ electrolysis cells. A sophisticated multiphysics simulation of a CO$_2$ electrolysis cell will be developed, incorporating electrochemical reaction kinetics, fluid mechanics, and transport of chemical species.

**Role:** A postdoctoral researcher is sought to join the research team comprising two Principal Investigators and two dedicated post-graduate students. With the other team members, the successful candidate will:

- Design and construct a CO$_2$ electrolysis cell and characterisation facility.
- Characterise the operation of the CO$_2$ electrolysis cell in a number of different electrolyte, electrode and operating parameter configurations.
- Contribute to the development of a multiphysics simulation to describe the essential physical processes occurring in the cell in the form of an open-access numerical model.
- Analyse the multiphysics simulation to identify performance limitations, propose design modifications, and computationally optimise cell design to improve performance.
- Contribute to identification and engagement with relevant industry and societal stakeholders.
- Contribute to day-today supervision of two PhD students.
- Lead report, scientific paper and IP writing.
- Lead the delivery of oral research presentations at international conferences.

**Research Environment:** You will work in a close collaboration with both Dr. Stephen Dooley and Dr. Kim McKelvey. You will be part of a supportive research group in the School of Physics at Trinity College Dublin where your research will primarily be undertaken offering a vibrant research community with world-class research facilities. You will have opportunities to interact with other research groups within Trinity, Ireland and Internationally. Your
professional development is important to us. You will receive specific training; in communication, project management and reporting appropriate for the remote-age; the commercialising of your research; the engagement of industry actors; supervision and management, and other areas of importance to your career.

**Essential Requirements: The successful application will have:**

- A PhD in Chemistry, Physics, Chemical Engineering or related field.
- Knowledge of electrolysis, electrocatalysis or other catalysis.
- Experience in the design and operation of electrolysis cells.
- Skills and experience of impedance spectroscopy and other electrochemical current-voltage characterisation techniques.
- Excellent communication skills.

**Advantaged Requirements: Skills and experience in the following will be a definite advantage:**

- Experience with the use of simulation techniques for the physics-based modelling of electrochemical or other chemical reaction and transport processes, application of machine learning tools, construction of complex partial/ordinary differential equations.
- Good working knowledge of Matlab, COMSOL, Python, Cantera.
- Knowledge of catalysts for CO$_2$ electrochemical reduction and of high surface area materials for electrode design.

**Application:** Prospective candidates should send a two page CV, a covering letter outlining their educational background, research track-record, interest in the position and the names and contact details of two referees to Prof. Stephen Dooley (stephen.dooley@tcd.ie). Please quote the entire job title in the subject line of your email. The research is expected to continue for 24 months and the position is available immediately. Applications will be evaluated as received and candidates of all levels of experience possessing appropriate skillsets will be considered.
Further Information for Applicants

The School of Physics, Trinity College Dublin

The School of Physics, Trinity College Dublin has been awarded Institute of Physics Juno Practitioner and Athena SWAN Bronze Award status for taking action to address gender inequities across its student and staff body. It is committed to promoting better working practices for men and women. See https://www.tcd.ie/Physics/womeninphysics/. The School welcomes applications from all qualified applicants, and applications are particularly encouraged from traditionally under-represented groups in Physics.

The School of Physics (www.tcd.ie/physics) is the leading physics department in Ireland as well as being the largest and oldest. Its history stretches back to the appointment of its first professor in 1724. It is now characterized by its vibrant and dynamic teaching and research programme. It runs two undergraduate physics degree programmes (in Physics and Physics & Astrophysics) and two joint degrees with the Schools of Mathematics and Chemistry in Theoretical Physics and Nanoscience, respectively.

The School’s research programme is impressive with over 60 postdoctoral researchers and over 100 postgraduate research students working along with the 28 academics. These principal investigators raise considerable research funding from Irish, EU and international funding agencies. The areas of research in the School are:

- Astrophysics
- Energy Science
- Magnetism and spintronics
- Nanobiophysics/soft matter
- Nanoelectronics and nanotechnology
- Photonics
- Theoretical and computational physics
Staff in the School of Physics have significant collaborations with the best international scientists and publish extensively in leading peer-reviewed journals. The School of Physics is also one of the founding Schools of the CRANN Institute (www.tcd.ie/crann), Ireland premier Nanoscience Institute. CRANN provides access to a large suit of shared research infrastructure and runs large collaborative research programs at the interface between University research and Industry. CRANN is the host of the AMBER Centre (ambercentre.ie), Ireland’s Materials Science and Biotechnology Centre.

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**Trinity College Dublin, the University of Dublin**

Trinity is Ireland’s leading university and is ranked 108th in the world (QS World University Rankings 2020). Founded in 1592, the University is steeped in history with a reputation for excellence in education, research and innovation.

Located on an iconic campus in the heart of Dublin’s city centre, Trinity has 18,000 undergraduate and postgraduate students across our three faculties – Arts, Humanities, and Social Sciences; Engineering, Mathematics and Science; and Health Sciences.

Trinity is ranked as the 17th most international university in the world (Times Higher Education Rankings 2020) and has students and staff from over 120 countries.

The pursuit of excellence through research and scholarship is at the heart of a Trinity education, and our researchers have an outstanding publication record and strong record of grant success. Trinity has developed 19 broad-based multidisciplinary research themes that cut across disciplines and facilitate world-leading research and collaboration within the
University and with colleagues around the world. Trinity is also home to 5 leading flagship research institutes:
- Trinity Biomedical Sciences Institute (TBSI)
- Trinity College Institute of Neuroscience (TCIN)
- Trinity Translational Medical Institute (TTMI)
- Trinity Long Room Hub Arts and Humanities Research Institute (TLRH)
- Centre for Research on Adaptive Nanostructures and Nanodevices (CRANN)

Trinity is the top-ranked European university for producing entrepreneurs for the past five successive years and Europe’s only representative in the world’s top-50 universities (Pitchbook Universities Report).

Trinity is home to the famous Old Library and to the historic Book of Kells as well as other internationally significant holdings in manuscripts, maps and early printed material. The Trinity Library is a legal deposit library, granting the University the right to claim a copy of every book published in Ireland and the UK. At present, the Library’s holdings span approximately 6.5 million printed items, 400,000 e-books and 150,000 e-journals.

With over 120,000 alumni, Trinity’s tradition of independent intellectual inquiry has produced some of the world’s finest, most original minds including the writers Oscar Wilde and Samuel Beckett (Nobel laureates), the mathematician William Rowan Hamilton and the physicist Ernest Walton (Nobel laureate), the political thinker Edmund Burke, and the former President of Ireland Mary Robinson. This tradition finds expression today in a campus culture of scholarship, innovation, creativity, entrepreneurship and dedication to societal reform.

**Rankings**

Trinity is the top ranked university in Ireland and ranked 108th in the world (QS World University Rankings 2020). Trinity ranks in the top 50 in the world on 4 subjects and in the top 100 in 18 subjects (QS World University Rankings by Subject 2020). Full details are available at: [www.tcd.ie/research/about/rankings](http://www.tcd.ie/research/about/rankings).
The Selection Process in Trinity

The Selection Committee (Interview Panel) may include members of the Academic and Administrative community together with External Assessor(s) who are expert in the area. Applications will be acknowledged by email. If you do not receive confirmation of receipt within 1 day of submitting your application online, please contact the named Recruitment Partner on the job specification immediately and prior to the closing date/time.

Given the degree of co-ordination and planning to have a Selection Committee available on the specified date, the University regrets that it may not be in a position to offer alternate selection dates. Where candidates are unavailable, reserves may be drawn from a shortlist. Outcomes of interviews are notified in writing to candidates and are issued no later than 5 working days following the selection day.

In some instances the Selection Committee may avail of telephone or video conferencing. The University’s selection methods may consist of any or all of the following: Interviews, Presentations, Psychometric Testing, References and Situational Exercises.

It is the policy of the University to conduct pre-employment medical screening/full pre-employment medicals. Information supplied by candidates in their application (Cover Letter and CV) will be used to shortlist for interview.

Applications from non-EEA citizens are welcomed. However, eligibility is determined by the Department of Business, Enterprise and Innovation and further information on the Highly Skills Eligible Occupations List is set out in Schedule 3 of the Regulations https://dbei.gov.ie/en/What-We-Do/Workplace-and-Skills/Employment-Permits/Employment-Permit-Eligibility/Highly-Skilled-Eligible-Occupations-List/ and the Ineligible Categories of Employment are set out in Schedule 4 of the Regulations https://dbei.gov.ie/en/What-We-Do/Workplace-and-Skills/Employment-Permits/Employment-Permit-Eligibility/Ineligible-Categories-of-Employment/. Non-EEA candidates should note that the onus is on them to secure a visa to travel to Ireland prior to interview. Non-EEA candidates should also be aware that even if successful at interview, an appointment to the post is contingent on the securing of an employment permit.
Equal Opportunities Policy

Trinity is an equal opportunities employer and is committed to employment policies, procedures and practices which do not discriminate on grounds such as gender, civil status, family status, age, disability, race, religious belief, sexual orientation or membership of the travelling community. On that basis we encourage and welcome talented people from all backgrounds to join our staff community. Trinity’s Diversity Statement can be viewed in full at https://www.tcd.ie/diversity-inclusion/diversity-statement.

Pension Entitlements

This is a pensionable position and the provisions of the Public Service Superannuation (Miscellaneous Provisions) Act 2004 will apply in relation to retirement age for pension purposes. Details of the relevant Pension Scheme will be provided to the successful applicant.

Applicants should note that they will be required to complete a Pre-Employment Declaration to confirm whether or not they have previously availed of an Irish Public Service Scheme of incentivised early retirement or enhanced redundancy payment. Applicants will also be required to declare any entitlements to a Public Service pension benefit (in payment or preserved) from any other Irish Public Service employment.

Applicants formerly employed by the Irish Public Service that may previously have availed of an Irish Public Service Scheme of Incentivised early retirement or enhanced redundancy payment should ensure that they are not precluded from re-engagement in the Irish Public Service under the terms of such Schemes. Such queries should be directed to an applicant’s former Irish Public Service Employer in the first instance.
Application Procedure

Applicants should submit a two page CV, a covering letter outlining their educational background, research track-record, interest in the position and the names and contact details of two referees to

Prof. Stephen Dooley
stephen.dooley@tcd.ie