MATHEMATICAL INSTITUTE
ANDREW WILES BUILDING

Job Description and Selection Criteria

Job title	Postdoctoral Research Associate in Battery Modelling
Division	Mathematical, Physical and Life Sciences
Department	Mathematical Institute
Location	Andrew Wiles Building, Radcliffe Observatory Quarter, Woodstock Road, Oxford, OX2 6GG.
Grade and salary	Grade 7: £40,855- £46,913 per annum
Hours	Full time
Contract type	Fixed-term (15 months)
Reporting to	Professor Jon Chapman
Vacancy reference	178846
Additional information	This is a full-time position that cannot be held concurrently with any other substantive post without the explicit permission of the Head of Department. This post is subject to a 12-month probationary period. This post is funded by the Faraday Institution. This position is due to start on 1st July 2025. **(PLEASE NOTE: Applicants are responsible for contacting their referees and making sure their letters are forwarded to references@maths.ox.ac.uk by the closing date)**
Research topic	Modelling and Simulation of Batteries
Principal Investigator / supervisor	Professor Jon Chapman
Funding Partner	The funds supporting this research project are provided by the Faraday Institute.
Research group	Oxford Centre for Industrial and Applied Mathematics

Project web site	https://www.faraday.ac.uk/research/lithium-ion/electrode-manufacturing/
Recent publications	A Multilayer Doyle-Fuller-Newman Model to Optimise the Rate Performance of Bilayer Cathodes in Li Ion Batteries (doi 10.1149/1945-7111/ad5767) Graded Lithium-Ion Battery Pouch Cells to Homogenise Current Distributions and Reduce Lithium Plating (doi 10.1149/1945-7111/ada751) Python Battery Mathematical Modelling (PyBaMM) (doi 10.5334/jors.309)

The role

We invite applications for a Postdoctoral Research Assistant to undertake research in battery modeling. The post is funded by research grant "Next Generation Electrodes (Nextrode)" that is provided by the Faraday Institution, the UK's independent institute for electrochemical energy storage research and skills development, to an Oxford-led group of collaborating universities. The Faraday Institution's vision is to bring together scientists and industry partners on research projects to reduce battery cost, weight, and volume, and to improve performance and reliability (faraday.ac.uk).

The appointed person will work with Professor Jon Chapman at the Mathematical Institute, University of Oxford. This is a 15-month fixed term position, until 30 September 2026, though it may be extended if additional funding is forthcoming. The successful candidate will be expected to be in post by 1st July 2025, or as soon as possible thereafter.

The overall aim of the Nextrode project is to seize the emergent opportunity in the manufacture of smart electrodes by investigating: (i) the underlying reasons why current Li ion battery electrode performance in practice falls well short of theory, (ii) novel approaches to electrode design that can overcome these restrictions, and (iii) how these designs can be realized at a scale and cost that makes them attractive to industry. The research encompasses both optimisation of current manufacturing practices based on improved scientific insight, and the invention and development of the next generation of novel electrode manufacturing processes. Across the Nextrode consortium, the research involves elements of design, modelling, manufacture, characterisation and data science. (https://nextrode.web.ox.ac.uk/)

The postholder will work on developing and implementing models of structured electrodes, in which the local composition (active material, binder, etc) and overall microstructure is controlled to vary spatially within the electrodes. These models will then be used to find a design that maximises the overall performance balance (energy, power, lifetime, cost, etc) of the electrode and the battery. The open source software PyBaMM, along with the optimisation suite PyBOP, have been developed as part of the companion Faraday Multiscale Modelling Project. The postholder will be expected to familiarise themselves with PyBaMM and PyBOP, in order to implement any models developed into that framework, and to take advantage of these tools to produce optimal designs.

Nextrode is led by Professor Patrick Grant in the Department of Materials at Oxford University, and alongside researchers from the Department of Engineering Science and the Mathematical

Institute at Oxford, involves close collaboration with leading researchers from the universities of Birmingham, Sheffield, Southampton, Warwick, Imperial College London and University College London. The university research is supported by strategic industrial partners.

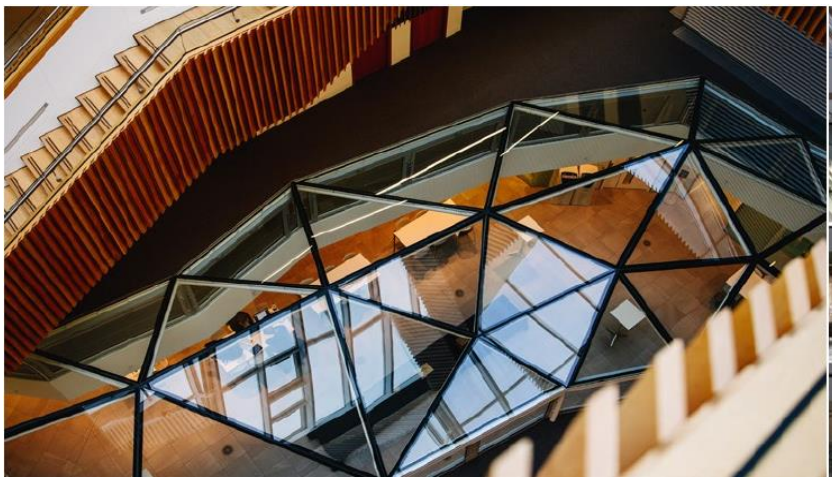
The appointed person will collaborate with other researchers in the group, elsewhere within the Department and the University, and across the Nextrode consortium including industrial partners.

Applicants should have skills in modelling, familiarity with partial differential equations, and be familiar with python. The postholder will be based in the Mathematical Institute. There will be a large amount of interaction between the many parts of the Nextrode project and the successful candidate will be central to driving these interactions. This may require some traveling to other institutions for discussions. There will also be regular meetings with industrial collaborators and the Faraday Institution where results will be discussed and presented. The postholder will also provide guidance to junior members of the research group including doctoral students and masters students.

Responsibilities

The successful candidate will be expected to:

- Manage their own academic research and administrative activities as well as coordinate research activities with other parts of the Nextrode project. This involves small scale project management and coordinating multiple aspects of work to meet deadlines;
- Adapt existing and develop new research methodologies;
- Prepare working theories and analyse qualitative and/or quantitative data from a variety of sources, reviewing and refining theories as appropriate;
- Contribute ideas for new research projects;
- Collaborate in the preparation of research publications;
- Present papers at conferences or public meetings;
- Act as a source of information and advice to other members of the group on methodologies or procedures;
- Represent the research group at external meetings/seminars, particularly those related to Faraday Institute activities either with other members of the group or alone;
- Carry out collaborative projects with colleagues in partner institutions, and research groups, particularly those within the Nextrode project.




It is the policy of the Mathematical Institute to give all PDRAs the opportunity to teach, where the conditions of the grant allow this, and to require teaching if there is a departmental need. Such teaching, if undertaken, will not exceed 3 hours per week for 24 weeks of the year and additional remuneration will be paid. It will normally be delivered as classes, but it might also involve giving lectures or college tutorials.

Selection criteria

Your application will be judged only against the criteria which are set out below. You should ensure that your application shows clearly how your skills and experience meet these criteria.

The Selection Committee for this process is expected to comprise;

- Prof Jon Chapman (Chair, Mathematical Institute)
- Prof Colin Please (Mathematical Institute)
- Dr Nicola Courtier (Department of Engineering Science)

The University is committed to fairness, consistency and transparency in selection decisions. Members of the selection committee are aware of the principles of equality of opportunity, fair selection and the risks of bias.

If, for any reason, you have taken a career break, parental leave or have had an atypical career and wish to disclose this in your application, the selection committee will take this into account, recognising that the quantity of your experience may be reduced as a result.

Essential selection criteria

The successful candidate will be expected to meet the following criteria:

- A PhD in mathematics or a related discipline;
- Experience with programming in python;

- Expertise in modelling practical problems using analytical or numerical approaches for solving PDEs:
- Sufficient specialist knowledge in the discipline to work within established research programmes;
- The ability to manage their own academic research and associated activities;
- A good track record (for the stage of their career) of publications in leading journals;
- The ability to contribute ideas for new research projects;
- Excellent communication skills, including the ability to write for publication, present research proposals and results, and represent the research group at meetings;
- Previous experience of contributing to presentations.

Desirable selection criteria

- Experience of modelling problems related to electrochemistry
- Experience of optimisation
- Familiarity with PyBaMM
- Experience of independently managing a discrete area of a research project

Pre-employment screening

Standard checks

If you are offered the post, the offer will be subject to standard pre-employment checks. You will be asked to provide: proof of your right-to-work in the UK; proof of your identity; and (if we haven't done so already) we will contact the referees you have nominated. You will also be asked to complete a health declaration so that you can tell us about any health conditions or disabilities for which you may need us to make appropriate adjustments.

Please read the candidate notes on the University's pre-employment screening procedures at: https://www.jobs.ox.ac.uk/pre-employment-checks

Proof of qualifications

This post specifies that a PhD qualification is essential. If you are offered the post, you should therefore be in a position to provide proof of this qualification at least three months in advance of your proposed start date, and will be asked to provide the original PhD certificate or transcript as part of the pre-employment checks. If you do not yet have either of these documents, you should provide an academic reference confirming submission of the thesis or that the qualification has been awarded. Failure to present either of these documents in a timely fashion

could result in a delayed start, particularly where there is a need to apply for a valid work visa ahead of the appointment.

About the University of Oxford

Welcome to the University of Oxford. We aim to lead the world in research and education for the benefit of society both in the UK and globally. Oxford's researchers engage with academic, commercial and cultural partners across the world to stimulate high-quality research and enable innovation through a broad range of social, policy and economic impacts.

We believe our strengths lie both in empowering individuals and teams to address fundamental questions of global significance, while providing all our staff with a welcoming and inclusive workplace that enables everyone to develop and do their best work. Recognising that diversity is our strength, vital for innovation and creativity, we aspire to build a truly diverse community which values and respects every individual's unique contribution.

While we have long traditions of scholarship, we are also forward-looking, creative and cutting-edge. Oxford is one of Europe's most entrepreneurial universities and we rank first in the UK for university spin-outs, and in recent years we have spun out 15-20 new companies every year. We are also recognised as leaders in support for social enterprise.

Join us and you will find a unique, democratic and international community, a great range of staff benefits and access to a vibrant array of cultural activities in the beautiful city of Oxford.

For more information, please visit www.ox.ac.uk/about/organisation.

The Mathematical Institute

The Mathematical Institute, as Oxford's Department of Mathematics is known, is one of the leading mathematics departments in the world. Our mathematical research, impact and environment have twice been ranked first in the UK, in the 2021 and 2014 Research Excellence Framework exercises, a government review of research in all UK universities. The Mathematical Institute is the focus of research into both fundamental mathematics and its applications, and our inclusive nature and overall size are key factors in the provision of an outstanding research environment for our members. The large number of faculty, postdocs and students in the Mathematical Institute, all supported by excellent facilities, allows us to maintain a critical mass in research groups encompassing a wide spectrum of mathematics, while our integrated nature fosters collaboration between fields. We also host a large number of academic visitors. Our web pages (www.maths.ox.ac.uk) provide comprehensive information about all of our activities.

The research activities of the Institute as a whole can be gauged from the web pages of the research groups and centres within the Institute (www.maths.ox.ac.uk/research). The range of our research interests is well reflected by the profile of our faculty as listed at www.maths.ox.ac.uk/people. Many members of the Institute have received prestigious prizes and other special recognition for their work; some recent examples can be found at www.maths.ox.ac.uk/news.

The Mathematical Institute moved into the purpose-built Andrew Wiles Building in the University's Radcliffe Observatory Quarter in September 2013. As well as providing offices for all staff and graduate students, it houses a range of other facilities available to members of the department, including the Whitehead Library, a large range of meeting rooms, teaching spaces,

lecture rooms, and social spaces, and a small laboratory for carrying out table-top experiments. For more information, see www.maths.ox.ac.uk/about-us .

Teaching is central to the life of the Mathematical Institute and we have around 900 undergraduates on course, some on joint courses with other departments. We teach around 250 students each year across five taught master's degree courses, and have over 250 doctoral students in residence at any one time. Our doctoral programme always attracts the best research students from across the world, and we have a broad mentoring and training programme.

The Mathematical Institute strives to ensure that all staff and students are given the opportunities and support they need to achieve their potential. We are committed to equality of opportunities and to advancing women's careers. We support staff returning from long-term absence with teaching relief, offer flexible working arrangements, and the department sponsors University nursery places to support the priority allocation of childcare to our staff. Further information about family support can be found below under University Benefits, Terms and Conditions. Our Equality, Diversity & Inclusion Committee[1] contributes to many aspects of our work.

As part of the department's commitment to openness, inclusivity and transparency, we strongly encourage applications from all who consider they meet the requirements of the post, and particularly from women and ethnic minorities.

We have a number of family-friendly policies, such as the right to apply for flexible working, hybrid working, and support for staff returning from periods of extended absence. We are committed to ensuring an inclusive interview process and will reimburse up to £250 towards any additional care costs (for a dependent child or adult) incurred as a result of attending an interview for this position, which may not be applicable if the interviews are held remotely.

For more information on the Mathematical Institute, please visit: www.maths.ox.ac.uk
The Mathematical Institute holds a silver Athena Swan award to recognise advancement of gender equality: representation, progression and success for all.

[1] The Mathematical Institute was a founding supporter of the London Mathematical Society's Good Practice Scheme (www.lms.ac.uk/women/good-practice-scheme). We have held an Athena SWAN Silver Award since 2016.

The Mathematical, Physical and Life Sciences Division

The Mathematical, Physical, and Life Sciences (MPLS) Division is one of the four academic divisions of the University. Oxford is widely recognised as one of the world's leading science universities and the MPLS Division is home to our non-medical sciences, with 10 academic departments that span the full spectrum of the mathematical, computational, physical, engineering and life sciences, and undertake both fundamental research and cutting-edge applied work. Our research tackles major societal and technological challenges – whether developing new energy solutions or improved cancer treatments, understanding climate change processes, or helping to preserve biodiversity, and is increasingly focused on key interdisciplinary issues. We collaborate closely with colleagues in Oxford across the medical sciences, social sciences and humanities, and with other universities, research organisations and industrial partners across the globe in pursuit of innovative research geared to address critical and fundamental scientific questions.

The disciplines within the MPLS Division regularly appear at the highest levels in rankings, including the Times Higher Education and QS world rankings. Nationally, the quality of the Division's research outputs and environment, and the resulting impact, was recognised through strong performances in the UK Research Excellence Framework in both 2014 and 2021.

MPLS is proud to be the home of some of the most creative and innovative scientific thinkers and leaders working in academe. Our senior researchers have been awarded some of the most significant scientific honours and we have a strong tradition of attracting and nurturing the very best early career researchers who regularly secure prestigious fellowships and faculty positions. MPLS continues in its work to support diversity in its staffing, seeing that it will bring benefits to all, and we are pleased to note that all academic departments in the Division hold Athena Swan Awards.

We have around 7,300 full and part-time students (including approximately 3,400 graduate students) and play a major role in training the next generation of leading scientists. Oxford's international reputation for excellence in teaching is reflected in its position at the top of the major league tables and subject assessments. MPLS academics educate students of high academic merit and potential from all over the world. Through a mixture of lectures, practical work and the distinctive college tutorial system, students develop their ability to solve diverse mathematical, scientific and engineering problems.

MPLS is dedicated to bringing the wonder and potential of science to the attention of audiences far beyond the world of academia. We have a strong commitment to supporting public engagement in science through initiatives including the Oxford Sparks portal (www.oxfordsparks.ox.ac.uk) and a large variety of outreach activities; these are crucial activities given so many societal and technological issues demand an understanding of the science that underpins them. We also bring the potential of our scientific efforts forward for practical and beneficial application to the real world and our desire, aided by the work of Oxford University Innovation and Oxford Sciences Innovation, is to link our best scientific minds with industry and public policy makers.

For more information about the MPLS division, please visit: www.mpls.ox.ac.uk

How to Apply

Applications are made through our online recruitment portal. Information about how to apply is available on our Jobs website https://www.jobs.ox.ac.uk/how-to-apply.

Your application will be judged solely on the basis of how you demonstrate that you meet the selection criteria stated in the job description.

As part of your application you will be asked to provide details of **two referees**.

You will also be required to upload your application materials: a supporting statement describing how you meet the selection criteria; a curriculum vitae; a full list of publications with your top three papers starred; and a statement of research interests. Your application will be judged solely on the basis of how you demonstrate that you meet the selection criteria stated in the job description.

Please upload all documents **as PDF files** with your name and the document type in the filename, quoting vacancy reference **178846.**

Applicants should ask two of their referees to send their letters of reference DIRECTLY to the Recruitment Coordinator**,** email: references@maths.ox.ac.uk **by the closing date** (a letter by email is sufficient) **quoting the vacancy reference 178846.**

Referees should preferably not, all be from the same institution and whenever possible one should be the applicant's current, or most recent, supervisor. **NOTE: reference letters must be received from your referees by the closing date for your application to be complete.**

All applications must be received by **12.00 noon UK time** on **Wednesday, 30th April 2025.**

Interviews are anticipated to take place on **Thursday, 8th May 2025**.

Information for priority candidates

A priority candidate is a University employee who is seeking redeployment because they have been advised that they are at risk of redundancy, or on grounds of ill-health/disability. Priority candidates are issued with a redeployment letter by their employing department(s).

If you are a priority candidate, please ensure that you attach your redeployment letter to your application (or email it to the contact address on the advert if the application form used for the vacancy does not allow attachments).

DATA PROTECTION: All data supplied by applicants will be used only for the purposes of determining their suitability for the post, and will be held in accordance with the principles of the Data Protection Act 1998 and the department's data protection policy.
https://www.maths.ox.ac.uk/members/policies/data-protection/statement

Due to the large volume of recruitment that the department administers we are unable to provide feedback to non-shortlisted applicants.

If you need help

Application FAQs, including technical troubleshooting advice is available at: https://staff.web.ox.ac.uk/recruitment-support-faqs

Non-technical questions about this job should be addressed to the recruiting department directly at recruitment@maths.ox.ac.uk.

To return to the online application at any stage, please go to: www.recruit.ox.ac.uk.

Please note that you will receive an automated email from our online recruitment portal to confirm receipt of your application. **Please check your spam/junk mail** if you do not receive this email.

Important information for candidates

Data Privacy

Please note that any personal data submitted to the University as part of the job application process will be processed in accordance with the GDPR and related UK data protection legislation. For further information, please see the University's Privacy Notice for Job Applicants at: https://compliance.admin.ox.ac.uk/job-applicant-privacy-policy. The University's Policy on Data Protection is available at: https://compliance.admin.ox.ac.uk/data-protection-policy.

The University's policy on retirement

The University operates an Employer Justified Retirement Age (EJRA) for very senior research posts at **grade RSIV/D35 and clinical equivalents E62 and E82**, which with effect from 1 October 2023 will be 30 September before the 70th birthday. The justification for this is explained at: https://hr.admin.ox.ac.uk/the-ejra.

For **existing** employees on these grades, any employment beyond the retirement age is subject to approval through the procedures: https://hr.admin.ox.ac.uk/the-ejra.

There is no normal or fixed age at which staff in posts at other grades have to retire. Staff at these grades may elect to retire in accordance with the rules of the applicable pension scheme, as may be amended from time to time.

Equality of opportunity

Entry into employment with the University and progression within employment will be determined only by personal merit and the application of criteria which are related to the duties of each particular post and the relevant salary structure. In all cases, ability to perform the job will be the primary consideration. No applicant or member of staff shall be discriminated against because of age, disability, gender reassignment, marriage or civil partnership, pregnancy or maternity, race, religion or belief, sex, or sexual orientation.

Benefits of working at the University

Employee benefits

University employees enjoy 38 days' paid holiday, generous pension schemes, travel discounts, and a variety of professional development opportunities. Our range of other employee benefits and discounts also includes free entry to the Botanic Gardens and University colleges, and discounts at University museums. See https://hr.admin.ox.ac.uk/staff-benefits

University Club and sports facilities

Membership of the University Club is free for all University staff. The University Club offers social, sporting, and hospitality facilities. Staff can also use the University Sports Centre on Iffley Road at discounted rates, including a fitness centre, powerlifting room, and swimming pool. See www.club.ox.ac.uk and https://www.sport.ox.ac.uk/.

Information for staff new to Oxford

If you are relocating to Oxfordshire from overseas or elsewhere in the UK, the University's Welcome Service website includes practical information about settling in the area, including advice on relocation, accommodation, and local schools. See https://welcome.ox.ac.uk/
There is also a visa loan scheme to cover the costs of UK visa applications for staff and their dependents. See https://staffimmigration.admin.ox.ac.uk/visa-loan-scheme

Family-friendly benefits

With one of the most generous family leave schemes in the Higher Education sector, and a range of flexible working options, Oxford aims to be a family-friendly employer. We also subscribe to the Work+Family Space, a service that provides practical advice and support for employees who have caring responsibilities. The service offers a free telephone advice line, and the ability to book emergency back-up care for children, adult dependents and elderly relatives. See https://hr.admin.ox.ac.uk/my-family-care
The University has excellent childcare services, including five University nurseries as well as University-supported places at many other private nurseries.
For full details, including how to apply and the costs, see https://childcare.admin.ox.ac.uk/

Disabled staff

We are committed to supporting members of staff with disabilities or long-term health conditions. For further details, including information about how to make contact, in confidence, with the University's Staff Disability Advisor, see https://edu.admin.ox.ac.uk/disability-support

Staff networks

The University has a number of staff networks including the Oxford Research Staff Society, BME staff network, LGBT+ staff network and a disabled staff network. You can find more information at https://edu.admin.ox.ac.uk/networks

The University of Oxford Newcomers' Club

The University of Oxford Newcomers' Club is an organisation run by volunteers that aims to assist the partners of new staff settle into Oxford, and provides them with an opportunity to meet people and make connections in the local area. See www.newcomers.ox.ac.uk.