



MATHEMATICAL INSTITUTE
ANDREW WILES BUILDING

Job Description and Selection Criteria

Job title	Postdoctoral Research Associate in Mathematical Modelling of Batteries
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: £41,636 - £47,779 per annum
Hours	Full time
Contract type	Fixed-term (41 months)
Reporting to	Prof. Jon Chapman
Vacancy reference	188594
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 funded by the Faraday Institution. (PLEASE NOTE: Applicants are responsible for contacting two of their referees and making sure that their letters are sent to references@maths.ox.ac.uk by the closing date.)

Research topic	Mathematical Modelling of Batteries
Principal Investigator / supervisor	Prof Jon Chapman
Project team	Prof Jon Chapman, Prof Colin Please, Prof David Howey, Prof Charles Monroe



Project web site	https://batterymodel.co.uk/
Funding partner	The funds supporting this research project are provided by the Faraday Institution.

The role

We invite applications for a Postdoctoral Research Assistant to undertake research in battery modeling within the Multi-Scale Mathematical Modeling Project (MSM) of the Faraday Institution to work with Professor Jon Chapman at the Mathematical Institute, University of Oxford. This is a 41 month fixed term position, until 31st March 2030. The successful candidate will be expected to be in post by 1 Nov 2026, or as soon as possible thereafter.

The postholder will work on specific aspects of the MSM project undertaking fundamental research in asymptotics, homogenisation and numerics to develop, analyse and solve models of the coupled electrochemistry, mechanics and heat flow that determines the behaviour of batteries. Preference will be given to candidates with a strong mathematical background in asymptotics, partial differential equations, and experience of modelling physical systems. The postholder will report directly to Professor Jon Chapman and be based in the Mathematical Institute. The postholder will be a member of the combined Oxford team involving mathematics and engineering.

The project is a continuation of the MSM Project involving researchers at Imperial, Bristol, Birmingham, Southampton, Warwick, Portsmouth and Oxford Universities and industrial interaction with a large range of industrial partners. The project spans theoretical approaches to examine behaviour in batteries on lengthscales from the microscopic to the battery module. The main focus of the research undertaken in the Oxford Mathematical Institute relates to modelling thermo-chemo-mechanical degradation, but the postholder may also contribute to the other parts of the project, and we may respond flexibly to new challenges. The long term goal is to provide the underlying methodology and procedures for enabling efficient modelling at the pack scale that accounts for the physics-based interactions at the cell and electrode particle level.

Particular goals of this post are to

- couple detailed particle-level degradation mechanisms to cell-level thermo-mechanics;
- understand how cell design and operation influences degradation;
- develop reduced-order models of the interaction between microscale degradation and macroscale mechanics;

The initial focus will be on electrolyte-movement-induced salt inhomogeneity, by which electrolyte flow, induced by stresses created by cyclic expansion and contraction of active particles that alter the porosity of the electrodes, progressively redistributes electrolyte salt within a cylindrical battery.

The open source software PyBaMM has been developed during the Multiscale Modelling Project and is becoming a standard tool for battery modelling. The postholder will be expected to familiarise themselves with PyBaMM and to implement any models developed into that framework.

Applicants should have skills in modelling, relevant to some aspect of the problem, as well as skills for solving PDE problems either with analytical or numerical methods. The postholder will be based in the Mathematical Institute. There will be a large amount of interaction between the many parts of the MSM project and the successful candidate will be central to driving these interactions. This may require some travelling 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 own academic research and administrative activities, as well as coordinate research activities with other parts of the Multi-scale Modelling Project. This involves small scale project management, to co-ordinate 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 Multi-scale Modelling Project;
- Develop ideas for generating research income, and be involved in the development of detailed research proposals.

It is the policy of the Mathematical Institute to give all PDRA's 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 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 have:

- a completed doctorate in Mathematics or a related discipline by the start date of this position. (Candidates who have not yet been awarded their doctorate should provide the date they expect to submit their thesis in their supporting statement);
- 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;
- previous experience of contributing to presentations;
- 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;
- an ability to foster a collaborative and inclusive environment for people from different backgrounds and a commitment to demonstrating respect, courtesy and consideration in interactions with members of the University community;

Desirable selection criteria

- Experience of modelling problems related to electrochemistry or mechanics
- 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.ox.ac.uk/about/jobs/explore-our-careers/applications-process/pre-employment-screening>

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. In particular where there is a need to apply for a valid work visa ahead of the appointment, you will need to provide proof of submission at least three months in advance of your proposed start date.

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

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

We proudly hold a departmental Athena SWAN Silver Award and an institutional Race Equality Charter Bronze Award.

The Mathematical, Physical and Life Sciences Division

Oxford is widely regarded as one of the world's leading science universities, and the University's Mathematical, Physical and Life Sciences (MPLS) Division sits at the heart of this reputation. It offers an outstanding environment for research, teaching, and innovation across the mathematical, computational,

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.

physical, engineering, and life sciences. As one of the four academic divisions of the University of Oxford, encompassing nine academic departments, a Doctoral Training Centre and Begbroke Science Park, it provides a collaborative, interdisciplinary community with a vibrant network of leading researchers and educators.

The division's research outputs, environment, and impact are consistently recognised at the highest levels, both nationally and internationally. MPLS departments regularly appear at the top of global league tables, including the Times Higher Education and QS World Rankings. Our strong performances in the UK Research Excellence Framework in both 2014 and 2021 also highlight the quality and impact of our work. These achievements reflect not only our academic excellence but also the strong networks we foster - with industrial partners, policymakers, and global research institutions.

Our vibrant research environment continues to evolve with major new investments in infrastructure. The Life and Mind Building, the University's largest-ever building project, is now close to completion/opened in 2025. It provides purpose-built facilities for the Departments of Experimental Psychology and Biology in inspiring spaces designed to foster collaboration and brings together researchers working on some of the most pressing questions in life sciences and human behaviour. The striking new Andrew Wiles Building houses our Mathematical Institute next to the Schwarzman Humanities Building, and the Beecroft on the edge of University Parks has provided a transformative home for our physicists. Current plans include significant investment to expand our interdisciplinary research and innovation support facilities at Begbroke Science Park and to transform Osney Mead, to the west of the city centre, into a dynamic innovation district, further strengthening Oxford's position as a world leader in science, technology, and enterprise.

MPLS provides a supportive and inclusive environment for academics at every career stage, from all over the world. The Division has a strong tradition of securing prestigious fellowships and supporting researchers as they progress to leadership roles. We are proud of our diverse community and every department holds an Athena Swan Award.

For educators, Oxford's tutorial system offers an unparalleled opportunity to engage with talented students and contribute to one of the world's most respected teaching systems. The division plays a central role in shaping the future of science through its graduate programmes, with over 3,500 postgraduate students receiving rigorous training and mentorship across MPLS departments.

For more information about the MPLS Division and the dedicated professional support it provides to academics across the sciences, please visit: <http://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.ox.ac.uk/about/jobs/explore-our-careers/applications-process/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.

You will also be required to upload the following:

- A supporting letter of no more than **2 pages** describing how you meet the selection criteria;
- A curriculum vitae of no more than **3 pages**;
- A full list of publications with your top **3 papers** starred;
- A statement of research interests no more than **1 page**.

The supporting statement must explain how you meet each of the selection criteria for the post using examples of your skills and experience. This may include experience gained in employment, education, or during career breaks (such as time out to care for dependants).

Please upload all documents **as PDF files** with your name and the document type in the filename, quoting vacancy reference **188594**.

Applicants are responsible for asking two of their referees to send their reference letters DIRECTLY to the HR Administrator email: references@maths.ox.ac.uk by the advertised closing date. Referees are asked to clearly state the applicant's name and vacancy ID: 188594 in the subject line of the email. Please note that only two references will be considered. Referees should preferably not all be from the same institution. Whenever possible one referee should be the applicant's current, or most recent, supervisor.

All applications must be received by **12.00 noon** UK time on **the advertised closing date for this post**. Interviews are anticipated to take place in the week commencing 19th Oct 2026.

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://www.ox.ac.uk/about/jobs/explore-our-careers/applications-process/support-with-online-applications>

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

To return to the online application at any stage, please go to: <https://www.ox.ac.uk/about/jobs/explore-our-careers/applications-process/how-to-apply>

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** of 30 September before the 70th birthday.

For **existing** employees on these grades, any employment beyond the retirement age is subject to approval through the procedures: <https://unioxfordnexus.sharepoint.com/sites/OXINTRANET-working-here/SitePages/the-ejra.aspx>

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.

Equal Opportunity

The University of Oxford is committed to equal opportunity, and to being a place where everyone belongs and is supported to succeed. We recognise how the diversity of our community enriches our ability to deliver on our academic mission.

We welcome applications from individuals from all backgrounds, including those under-represented within higher education. No applicant or members of staff shall be unlawfully discriminated against on the basis of age, disability, gender reassignment, marriage or civil partnership, pregnancy or maternity, race, religion or belief, sex, or sexual orientation.

Employment with the University and progression within employment will be determined according to personal merit and the application of criteria related to the duties and conditions of the post. In all cases, the primary consideration will be the ability to perform the job.

As stated in the University's Equality Policy and Equality, Diversity and Inclusion Strategic Plan, our commitment to equality and diversity goes hand in hand with our commitment to academic freedom and free speech.

Benefits of working at the University

Employee benefits

University employees enjoy 38 days' paid holiday, generous pension schemes, flexible working options, support for sustainable travel and other discounts. Staff can also access a huge range of personal and professional development opportunities. See <https://www.ox.ac.uk/about/jobs/working-here>.

Employee Assistance Programme

As part of our wellbeing offering staff get free access to a confidential employee assistance programme, available 24/7 for 365 days a year. Find out more at <https://www.ox.ac.uk/about/jobs/life-in-oxford/healthcare-and-wellbeing>

University Club and sports facilities

Membership of the University Club is free for University staff. It 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

Please see our Life in Oxford webpage for information on relocating to and settling into the Oxford area. The website offers valuable guidance, including information on where to find more details about housing, transportation, finances, healthcare, and other key aspects of living in Oxford and the surrounding region. See <https://www.ox.ac.uk/about/jobs/life-in-oxford>

There is also a visa loan scheme to cover the costs of UK visa applications for staff and their dependants. See <https://www.ox.ac.uk/about/jobs/explore-our-careers/applications-process/visas-and-immigration>

Family-friendly benefits

We are a family-friendly employer with one of the most generous family leave schemes in the Higher Education sector (see <https://www.ox.ac.uk/about/jobs/explore-our-careers/applications-process/terms-and-conditions-of-employment>). Our Childcare Services team provides guidance and support on childcare provision, and offers a range of high-quality childcare options at affordable prices for staff. In addition to 5 University nurseries, we partner with a number of local providers to offer in excess of 450 full time nursery places to our staff. Eligible parents are able to pay for childcare through salary sacrifice, further reducing costs. See <https://www.ox.ac.uk/about/jobs/life-in-oxford/childcare-and-schooling/childcare>

Supporting disability and health-related issues

We are committed to supporting members of staff with disabilities or long-term health conditions, including those experiencing negative effects of menopause. Information about the University's Staff Disability Advisor, is at <https://edu.admin.ox.ac.uk/support-for-disabled-staff>. The Staff Disability Advisor can be contacted at staffdisability@admin.ox.ac.uk

The University of Oxford Newcomers' Club

The University of Oxford Newcomers' Club is 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

Research staff

The Researcher Hub supports all researchers on fixed-term contracts. They aim to help you settle in comfortably, make connections, grow as a person, extend your research expertise and approach your next career step with confidence. Find out more <https://www.ox.ac.uk/research/support/researcher-hub/about>