



**MATHEMATICAL INSTITUTE**  
ANDREW WILES BUILDING

## Job Description and Selection Criteria

<b>Job title</b>	Postdoctoral Research Associate in Applied Mathematics
<b>Division</b>	Mathematical, Physical and Life Sciences
<b>Department</b>	Mathematical Institute
<b>Location</b>	Andrew Wiles Building, Radcliffe Observatory Quarter, Woodstock Road, Oxford, OX2 6GG.
<b>Grade and salary</b>	Grade 7: £33,309- £40,927 per annum
<b>Hours</b>	Full time
<b>Contract type</b>	Fixed-term until 31 <sup>st</sup> March 2023
<b>Reporting to</b>	Professor Ian Griffiths and Professor Dominic Vella
<b>Vacancy reference</b>	156527
<b>Additional information</b>	<p>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.</p> <p>This post is subject to a six-month probationary period.</p> <p>This post is funded by the Royal Society and the Engineering and Physical Sciences Research Council (EPSRC).</p> <p><b>(PLEASE NOTE: Applicants are responsible for contacting their referees and making sure that their letters are received by the closing date)</b></p>
<b>Research topic</b>	Mathematical modelling of elastic structures interacting with their environment
<b>Principal Investigator / supervisor</b>	Professors Ian Griffiths and Dominic Vella
<b>Project team</b>	Dr Janine Nunes (Princeton University, Mechanical and Aerospace Engineering)



<b>Project web site</b>	<a href="http://people.maths.ox.ac.uk/griffit4/">http://people.maths.ox.ac.uk/griffit4/</a>
<b>Funding partner</b>	The funds supporting this research project are provided by the Royal Society and the Engineering and Physical Sciences Research Council (EPSRC)
<b>Recent publications</b>	Electrostatic wrapping of a microfiber around a curved particle. J.K. Nunes, J. Li, I.M. Griffiths, B. Rallabandi, J. Man & H.A. Stone 2021 <i>Soft Matter</i> 17, 3609-3618 DOI: <a href="https://doi.org/10.1039/D0SM01857K">10.1039/D0SM01857K</a>  Delayed bifurcation in elastic snap-through instabilities. M. Liu, M. Gomez and D. Vella <i>J. Mech. Phys. Solids</i> 151, 104386 (2021). doi: <a href="https://doi.org/10.1016/j.jmps.2021.104386">10.1016/j.jmps.2021.104386</a>

## The role

We invite applications for a Postdoctoral Research Associate in Applied Mathematics to work with Professors Ian Griffiths and Dominic Vella (University of Oxford, Mathematical Institute) and Dr Janine Nunes (Princeton University, Mechanical and Aerospace Engineering) on slender elastic structures interacting with their environments.

Elastic structures interacting with a rigid boundary are found in many natural scenarios, from the packing of RNA within virus capsids to the jumping of the click beetle. Similar behaviour is at play in manufacturing technologies including soft robotics, flexible electronics devices like bendable smartphones, and in multifunctional soft materials for bioengineering and healthcare applications, such as materials for tissue engineering. The successful manufacture of such soft devices, however, depends on our understanding of how a slender structure interacts with a rigid boundary: how does a slender filament wind around a soft object under electrostatic forces? How does the release of elastic energy stored in a bent object allow an object to jump?

In this project we will study the mathematics of such problems through two concrete examples:

The first case concerns the external wrapping of microscale charged fibres around oppositely charged soft particles through mutual electrostatic attraction. As they attract one another, the fibre may wrap completely around the particle, squeezing it and deforming its shape as it does so. The initial configuration and subsequent rate of wrapping have been observed to dictate the shape of the particle and the configuration when the fibre ceases to wrap. We will investigate the wrapping process and dependence on the deformability of the particle and the fibre, the strength of the electrostatic interaction, and its dependence on the initial configuration.

The second concrete problem that we will consider involves understanding how the energy stored in a deformed elastic object can be harnessed to produce useful work. We will take the particular example of jumping induced by snap-through in which rapid motion of an element against a boundary can lead to jumping.

The mathematical models we derive in both example cases will be used to compare and contrast the dynamics of the contact between the moving elastic object and substrate in these and the forces that are involved.

## Responsibilities

The successful candidate will be expected to:

- Manage their own academic research and administrative activities. This will involve small scale project management and coordination of multiple aspects of work to meet deadlines
- Adapt existing and develop new research methodologies
- Prepare theories and compare with experimental data, reviewing and refining theories where appropriate
- Contribute ideas for new projects
- Develop ideas for generating research income, and present detailed research proposals to senior colleagues
- Collaborate in the preparation of research publications
- Present papers at conferences
- Act as a source of information and advice to other members of the group

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

### Essential selection criteria

The successful applicant will:

- have, or be close to completing, a PhD/DPhil in mathematics or a related discipline.

Applicants will be also expected to demonstrate:

- Independence and ability to undertake high-quality research;
- Expertise in mathematical modelling using partial differential equations;
- Expertise in continuum mechanics;
- Excellent interpersonal skills, including written and verbal communication skills;
- Previous experience of contributing to publications/presentations;
- An ability to work using own initiative and as part of a team;
- Self-motivation, with the ability to manage time effectively.

### Desirable selection criteria

- Experience in mathematical modelling of fluid–elastic interactions.
- Experience of computational software such as ABAQUS, FreeFEM

## Pre-employment screening

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>

## 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](http://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 were all ranked first in the UK in the 2014 Research Excellence Framework exercise, 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](http://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](http://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](http://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/awards-and-prizes](http://www.maths.ox.ac.uk/news/awards-and-prizes).

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 facility for carrying out table-top experiments. For more information, see [www.maths.ox.ac.uk/about-us](http://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 and provide flexible arrangements for staff with parental responsibilities. Further information about family support can be found in the Standard Terms and Conditions. Our [Equality, Diversity and Inclusion Committee](#)<sup>1</sup> 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.

For more information on the Mathematical Institute, please visit: [www.maths.ox.ac.uk](http://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.

## **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. In the results of the six-yearly UK-wide assessment of university research, REF2014, the MPLS division received the highest overall grade point average (GPA) and the highest GPA for outputs. We received the highest proportion of 4\* outputs, and the highest proportion of 4\* activity overall. More than 50 per cent of MPLS activity was assessed as world leading.

The MPLS Division's 10 departments and 3 interdisciplinary units 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 addresses major societal and technological challenges and is increasingly focused on key interdisciplinary issues. MPLS is proud to be the home of some of the most creative and innovative scientific thinkers and leaders working in academe. We have a strong tradition of attracting and nurturing the very best early career researchers who regularly secure prestigious fellowships.

We have around 6,000 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 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 (<http://www.oxfordsparks.net/>) and a large variety of outreach activities. We also endeavour to bring the potential of our scientific efforts forward for practical and beneficial application to the real world and our desire is to link our best scientific minds with industry and public policy makers.

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

## **How to Apply**

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<sup>1</sup> The Mathematical Institute was a founding supporter of the London Mathematical Society's Good Practice Scheme ([www.lms.ac.uk/women/good-practice-scheme](http://www.lms.ac.uk/women/good-practice-scheme)). We have held an Athena SWAN Bronze Award since 2013, upgraded to Silver in 2017.

Applications are made through our e-recruitment system and you will find all the information you need about how to apply 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 and indicate whether we can contact them now.

You will also be required to upload a curriculum vitae, list of publications, a statement of research interests and a supporting statement. 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 **156527**.

### **Applicants should ask their referees to send their letters of reference DIRECTLY to**

The Recruitment Coordinator (Vacancies)  
Mathematical Institute, Andrew Wiles Building, Radcliffe Observatory Quarter, Woodstock Road, Oxford, OX2 6GG. Tel: 01865 273525: Email: [vacancies@maths.ox.ac.uk](mailto:vacancies@maths.ox.ac.uk)

**by the closing date** (a letter by email is sufficient) **quoting the vacancy reference 156527**. 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 UK time on Monday 28<sup>th</sup> March 2022**.

Interviews are anticipated to take place in the week commencing **Monday 11<sup>th</sup> April 2022**.

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## **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).

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**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**

Help and support is available from: <https://hrsystems.admin.ox.ac.uk/recruitment-support>

If you require any further assistance please email [recruitment.support@admin.ox.ac.uk](mailto:recruitment.support@admin.ox.ac.uk).

To return to the online application at any stage, please go to: [www.recruit.ox.ac.uk](http://www.recruit.ox.ac.uk).

Please note that you will receive an automated email from our e-recruitment system 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 all academic posts and some academic-related posts. The University has adopted an EJRA of 30 September before the 69<sup>th</sup> birthday for all academic and academic-related staff in posts at **grade 8 and above**. The justification for this is explained at: <https://hr.admin.ox.ac.uk/the-ejra>

For **existing** employees, 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 **grades 1–7** 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](http://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 My Family Care, 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](http://www.newcomers.ox.ac.uk).