## Job description and selection criteria

<table>
<thead>
<tr>
<th>Job title</th>
<th>Postdoctoral Researcher in Computational Modelling for Tendon Tissue Engineering</th>
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<tbody>
<tr>
<td>Division</td>
<td>Medical Sciences Division</td>
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<tr>
<td>Department</td>
<td>Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences</td>
</tr>
<tr>
<td>Location</td>
<td>Botnar Research Centre, Windmill road, Oxford, OX3 7LD and Engineering Science, Parks Road, Oxford, OX1 3PJ</td>
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<tr>
<td>Grade and salary</td>
<td>Grade 7: Salary in the range £32,236 - £39,609 per annum</td>
</tr>
<tr>
<td>Hours</td>
<td>Full time</td>
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<tr>
<td>Contract type</td>
<td>Fixed-term (3 years)</td>
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<tr>
<td>Reporting to</td>
<td>Dr Pierre-Alexis Mouthuy</td>
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<tr>
<td>Vacancy reference</td>
<td>139124</td>
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</tbody>
</table>

### Research topic
- Tissue engineering

### Principal Investigator / supervisors
- Dr Pierre-Alexis Mouthuy, Prof Antoine Jérusalem, Prof Sarah Waters

### Project team
- Humanoid Bioreactor project

### Funding partner
- The funds supporting this research project are provided by the EPSRC
The role

Research context

We are currently developing a research programme that investigates if musculoskeletal humanoid robots can be used as a culture platform for growing tissue grafts. With their ability to mimic the inner structures of the human body such as muscles, tendons and bones, these robots could provide physiological mechanical stimulation to support the growth of functional tissue constructs. This involves the development of scaffolds and bioreactor chambers for supporting the cell growth. Working as a computational tissue engineer within the team, you will be expected to undertake a research project that investigates the performance of various scaffold designs and tissue culture parameters in the novel humanoid bioreactor system. The programme is carried out in collaboration with the Engineering Department and the Mathematical Institute.

What motivates this research project is the need for new repair strategies for rotator cuff tendons. Rotator cuff tears are common injuries and can occur following a trauma (e.g., a sport injury) or a disease (e.g., tendinopathy). As our population is aging, they represent a substantial and growing social and economic burden. These injuries often cause significant pain and loss of function. Unrepaired tears grow in size and very large tears are associated with joint failure and the development of osteoarthritis. In patients with persistent symptoms, surgical repair is commonly performed. However, patient outcomes are not promising as the rate of failure is still high. For rotator cuff tendons, 40% of surgical repairs fail within the first 12 months after surgery due to poor healing, despite advances in surgical techniques. A promising translational approach to the treatment of soft tissue tears is the use of engineered autografts.

The overall aim of this research project is to support the development of the humanoid bioreactor system for tendon tissue engineering through a computational modelling approach. Among others, the project will involve:

- The computational modelling of the various forces (compression, tension, shear stress, torsion) involved in native human tendon, under normal motion.
- The design of various scaffolds through CAD tools and the computational modelling of their properties and associated fluid flow.
- The computational modelling of biological processes such as seeding, attachment and growth of cells in the scaffold materials.
- The computational modelling of the forces induced in the cell-material construct in the humanoid bioreactor system and the effect of these on tissue growth.
- Wet-lab work to validate the studies carried out in above.

This position is supported by the Engineering and Physical Sciences Research Council (EPSRC) and the post-holder will divide their time (at 50:50) between the Botnar Research Centre of NDORMS, and the Computational Mechanics of Materials Group of the Engineering Department. They will also interface with the group of Professor Sarah Waters, Mathematical Institute, which develops and solves mechanistic mathematical models for tissue engineering and regenerative medicine applications.

Role overview

In this role you will conduct original research projects, guided by relevant literature, your own experience and discussion with the supervisors. You will be expected to develop your existing abilities and to learn new research skills. You will work closely with bioengineers, computer modelling engineers, mathematicians, biologists and medical doctors.
Responsibilities

Key responsibilities

- To perform scientific research, developing and acquiring relevant skills.
- To analyse, contextualise and interpret data, publishing your findings in peer-reviewed journals.
- To actively participate in the research team, sharing skills and knowledge with colleagues involved in the Humanoid Bioreactor project, and to take part in wider activities as appropriate.
- To communicate results in regular meetings, by poster and oral presentations at scientific meetings, or via other suitable means.
- To write and maintain programs and protocols for data analysis.
- To identify training needs and to follow an agreed strategy to meet them.
- To train and supervise graduate and undergraduate students as appropriate.
- To stay up-to-date with the relevant literature and methodological developments.

Relationships

The Postdoctoral Researcher in Computational Modelling for Tendon Tissue Engineering will be a member of the team led by Dr Mouthuy at the Botnar Research Centre and as such will also be included in the activities of the Carr group. The post-holder will also be a member of Prof Jerusalem’s group at the Engineering Department and Prof Waters’ group at the Mathematical Institute.

Hazard-specific / Safety-critical duties

This job includes the following hazards or safety-critical activities which will require successful pre-employment health screening through our Occupational Health Service before the successful candidate will be allowed to start work:

- Lone Working
- Travel outside of Europe or North America on University Business

Selection criteria

Essential

- A PhD/DPhil (or near completion) in a discipline of direct relevance to computational mechanics and/or tissue engineering.
- A passion for problem-solving and research in the areas of biomaterials and tissue engineering that is grounded in expert-level knowledge or experience.
- Strong competences with programming languages such as C/C++ and Matlab.
- Strong competences in numerical simulations, model calibration and validation.
- Knowledge of inner-workings of numerical methods such as finite elements.
- Experience with multiscale computational modelling of fibre networks and soft tissues.
- Experience in implementing mathematical descriptions of physical biological processes.
• Outstanding background in cellular biology and tissue biomechanics, in particular soft tissue biomechanics at the shoulder joint.
• Excellent interpersonal and organisational skills, able to work independently and in a team-oriented environment.
• Highly self-motivated and committed to pursuing interdisciplinary research.
• Excellent communication skills, both oral and written.
• Able to use own initiative to solve problems.
• Able to conduct research in a multidisciplinary, fast paced research environment, occasionally with tight deadlines.
• Proven track record in authorship of peer-reviewed publications in related fields.
• Good project management skills and a track record in meeting deadlines.
• Cross-disciplinary collaborative experience.

Desirable
• Experience with handling clinical imaging data such as CT, MRI or ultrasound scans.
• Experience with scaffold design, manufacturing and characterization.
• Strong competences in the use of CAD software to design materials.
• Knowledge of the basic characterisation techniques such as mechanical testing, scanning electron microscopy and microCT.
• Knowledge in electrospinning and traditional textile manufacturing methods.
• Knowledge in other scaffolding methods.
• Knowledge in tendon bioreactor chambers.
• Ability to conduct experiments with cells and biomaterials.
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, and in providing all of our staff with a welcoming and inclusive workplace that supports everyone to develop and do their best work. Recognising that diversity is a great strength, and 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. Income from external research contracts in 2014/15 exceeded £522.9m and ranked first in the UK for university spin-outs, with more than 130 spin-off companies created to date. 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

Medical Sciences Division

The Medical Sciences Division is an internationally recognised centre of excellence for biomedical and clinical research and teaching. We are the largest academic division in the University of Oxford.

World-leading programmes, housed in state-of-the-art facilities, cover the full range of scientific endeavour from the molecule to the population. With our NHS partners we also foster the highest possible standards in patient care.

For more information please visit: www.medsci.ox.ac.uk

Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences

The Nuffield Department of Orthopaedics, Rheumatology and Musculoskeletal Sciences (NDORMS) is part of the Medical Sciences Division and is the largest European academic department in its field, running a globally competitive programme of research and teaching.

Our mission is to discover the causes of musculoskeletal and inflammatory conditions to deliver excellent and innovative care that improves people’s quality of life. Our highly skilled teams have expertise in a broad range of areas, including orthopaedic surgery, inflammation, immunology, rheumatology, medical statistics, epidemiology, and clinical trials.

We currently have 500 staff and students and over 100 honorary staff, have a grants portfolio worth £100 million, and an annual turnover in excess of £30 million.
The Botnar Research Centre

The Botnar Research Centre enables and encourages research and education into the causes of musculoskeletal disease and their treatment.

The Centre provides world-class facilities for scientists in the field of musculoskeletal research. It takes a multidisciplinary approach, encompassing orthopaedic, rehabilitation and rheumatology clinical scientists, bone oncologists, laboratory scientists, epidemiologists, engineers and statisticians. The Botnar also hosts the Oxford Clinical Trials Research Unit (OCTRU) and the Centre of Statistics in Medicine (CSM), providing excellent statistical support to all aspects of clinical research.

The Botnar opened in 2002, with a large annex completed in 2013. The Botnar is now home to around 300 staff and postgraduate students enjoying the international and friendly atmosphere of this workplace and benefits from the vast knowledge of leading experts in the field of musculoskeletal research.

To accommodate its rapid growth, the Centre will open another wing in 2018 and building is already underway. This will provide research space for the new Professor of Biomaterials. The new space will include 1000m$^2$ of office and 1000m$^2$ of laboratory space. The laboratory space includes a GMP clean room facility suitable for the manufacturing of biomaterials for human implantation.

Sharing the site of the Nuffield Orthopaedic Centre, the largest specialist academic musculoskeletal hospital in the UK, puts the Botnar in a unique position to foster the collaboration between basic scientists and clinicians, which is essential to success in medical research.

Athena Swan

The Athena SWAN Awards specifically recognise success in developing employment practices to further and support the careers of women in science, technology, engineering, maths and medicine (STEMM) departments in academia. Within NDORMS, we feel that we have an established culture of equality but are using the process to spur on-going improvement that benefits everyone involved in the Department. Our on-going progress was rewarded in May 2014 with an Athena Swan Bronze Award and in October 2015 with a Silver Award. Our development in this area has resulted in a number of commitments to our staff, central to which are:

- establishing an open, supportive and family-friendly research environment
- supporting career progression through teaching programmes, personal development reviews and mentoring
- proactive communication of support policies such as flexible working, provision of leave, promotion and career support schemes

NDORMS aims to actively promote the implementation of the University’s family-friendly policies to help foster a family
friendly working environment, including provision of family leave (such as policies for maternity, paternity, parental, carers and adoption leave), flexible/part-time working and scheduling inclusive meetings.

The University’s childcare services support staff with a Childcare Voucher Scheme to help staff save tax and national insurance on childcare costs, offer information on nursery providers and a nursery fee Salary Sacrifice Scheme, work in partnership with playscheme providers to help support families during school holidays and signpost staff to parenting, local authority and other organisations that help support families and parents.

The Department is also committed to ensuring that staff undertaking part-time or flexible working receive the same access to benefits and entitlements as full-time staff, including the same opportunities for training and promotion, a pro-rata entitlement to leave including bank holidays and careful consideration of requests to work part-time (particularly for those by staff returning from maternity leave).

For more information please visit: http://www.admin.ox.ac.uk/personnel/staffinfo/benefits/family/ and http://www.admin.ox.ac.uk/personnel/during/flexible/

We are also actively working to uphold the University’s aim of providing an inclusive environment and equal career opportunities by promoting equality, valuing diversity and maintaining a working, learning and social environment in which the rights and dignity of all staff are respected. Separate University policies are also in place to ensure race, disability and gender equality.

For more information, please visit: http://www.admin.ox.ac.uk/eop/

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/

Engineering Science Department

Engineering teaching and research takes place at Oxford in a unified Department of Engineering Science whose academic staff are committed to a common engineering foundation as well as to advanced work in their own specialities, which include most branches of the subject. We have especially strong links with computing, materials science and medicine. The Department employs about 120 academic staff (this number includes 13 statutory Professors appointed in the main branches of the discipline, and 25 other professors in the Department); in addition there are 9 Visiting Professors. There is an experienced team of teaching support staff, clerical staff and technicians. The Department has well-equipped laboratories and workshops, which together with offices, lecture theatres, library and other facilities have a net floor area of about 22,000 square metres. The Department is ranked third in the world in the latest Times Higher Education World University Rankings, behind Caltech and Stanford, but ahead of MIT (4th), Cambridge (5th), Princeton (6th) and Imperial (7th).

Teaching
We aim to admit 160-170 undergraduates per year, all of whom take a 4-year Engineering Science course leading to the MEng degree. The course is accredited at MEng level by the major engineering institutions. The syllabus has a common core extending through the first two years. Specialist options are introduced in the third year, and the fourth year includes further specialist material and a major project.

Research
The Department was ranked the top engineering department in the UK, as measured by overall GPA, in the Research Excellence Framework 2014 exercise. We have approximately 350 research students and about 130 Research Fellows and Postdoctoral researchers. Direct funding of research grants and contracts, from a variety of sources, amounts to an annual turnover of approximately £19m in addition to general turnover of about £18m. The research activities of the department fall into seven broad headings, though there is much overlapping in practice: Thermofluids; Materials and Mechanics; Civil and Offshore; Information, Control and Vision; Electrical and Optoelectronic; Chemical and Process; Biomedical Engineering.

For more information please visit:

http://www.eng.ox.ac.uk/

The Department of Engineering Science holds a bronze Athena Swan award to recognise advancement of gender equality: representation, progression and success for all.

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) 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

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.

Teaching is central to the life of the Mathematical Institute and we have an annual intake of
approximately 300 undergraduates, some on courses jointly with other departments. We
admit 100 students each year across five taught master’s degree courses and have over 230
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. Our provision expanded in 2014 following the award of two EPSRC-funded
Centres for Doctoral Training.

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 Good Practice Committee contributes to many aspects of our work, see
www.maths.ox.ac.uk/members/good-practice.

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.
How to apply

Before submitting an application, you may find it helpful to read the ‘Tips on applying for a job at the University of Oxford’ document, at

http://www.ox.ac.uk/about_the_university/jobs/research/

If you would like to apply, click on the Apply Now button on the ‘Job Details’ page and follow the on-screen instructions to register as a new user or log-in if you have applied previously. Please provide details of two referees and indicate whether we can contact them now.

You will also be asked to upload a CV 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).

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. (Customise this statement to confirm the document(s) you would like the applicant to attach, but make sure that you keep the reference to PDF. See section 1.4 of QRG REC01 Creating a Vacancy (Recruitment and Personnel) for guidance on selecting the appropriate application form).

All applications must be received by midday on the closing date stated in the online advertisement.

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 departments.

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).

Should you experience any difficulties using the online application system, please email recruitment.support@admin.ox.ac.uk. Further help and support is available from www.ox.ac.uk/about_the_university/jobs/support/. To return to the online application at any stage, please go to: www.recruit.ox.ac.uk.

Please note that you will be notified of the progress of your application by automatic emails from our e-recruitment system. Please check your spam/junk mail regularly to ensure that you receive all emails.

Important information for candidates

Pre-employment screening

Please note that the appointment of the successful candidate will be subject to standard pre-employment screening, as applicable to the post. This will include right-to-work, proof of
identity and references. We advise all applicants to read the candidate notes on the University’s pre-employment screening procedures, found at: www.ox.ac.uk/about/jobs/preemploymentscreening/.

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: www.admin.ox.ac.uk/councilsec/compliance/gdpr/privacynotices/job/. The University’s Policy on Data Protection is available at: www.admin.ox.ac.uk/councilsec/compliance/gdpr/universitypolicyondataprotection/.

The University’s policy on retirement

The University operates an Employer Justified Retirement Age (EJRA) for all academic posts and some academic-related posts. From 1 October 2017, the University has adopted an EJRA of 30 September before the 69th birthday for all academic and academic-related staff in posts at grade 8 and above. The justification for this is explained at: www.admin.ox.ac.uk/personnel/end/retirement/acrelretire8+/. For existing employees, any employment beyond the retirement age is subject to approval through the procedures: www.admin.ox.ac.uk/personnel/end/retirement/acrelretire8+/

From 1 October 2017, 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

University Club and sports facilities

The University Club provides social, sporting and hospitality facilities. It incorporates a bar, café and sporting facilities, including a gym. 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 www.sport.ox.ac.uk/oxford-university-sports-facilities.

Information for international staff (or those relocating from another part of the UK)

If you are relocating to Oxfordshire from overseas, or elsewhere in the UK, the University's International Staff website includes practical information related to moving to and settling in Oxford such as advice on immigration, relocation, accommodation, or registering with a doctor. See: www.internationalstaffwelcome.admin.ox.ac.uk/

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 to settle into Oxford and to provide them with an opportunity to meet people in the area. See www.newcomers.ox.ac.uk/

Childcare

The University has excellent childcare services with 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 www.admin.ox.ac.uk/childcare.

Family-friendly benefits

The University subscribes to My Family Care (www.admin.ox.ac.uk/personnel/staffinfo/benefits/family/mfc/) and staff are eligible to register for emergency back-up childcare and adultcare services, a 'speak to an expert' phone line and a wide range of guides and webinars through a website called the Work + Family space.

Disabled staff

We are committed to supporting members of staff with disabilities or long-term health conditions. Please visit www.admin.ox.ac.uk/eop/disab/staff for further details including information about how to make contact, in confidence, with the University’s Staff Disability Advisor.

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 www.admin.ox.ac.uk/eop/inpractice/networks/

Other benefits

Staff can enjoy a range of other benefits such as free visitor access to the University’s colleges and the Botanic Gardens as well as a range of discounts. See www.admin.ox.ac.uk/personnel/staffinfo/benefits