UNIVERSITY OF OXFORD

DEPARTMENT OF STATISTICS

Job Description

Job title	Postdoctoral Research Assistant
Division	Mathematical, Physical and Life Sciences
Department	Statistics
Location	24-29 St Giles', Oxford, OX1 3LB
Grade and salary	Grade 7: £32,817 - £40,322 per annum
Hours	Full time
Contract type	Fixed term (until 10 September 2023)
Reporting to	Simon Myers, Professor of Mathematical Genomics
Vacancy reference	*151568*
Additional information	We are seeking to recruit a Postdoctoral Research Assistant funded by the Wellcome Trust, within a group of ~4 PDRAs working on complementary statistical and experimental topics. This post holder will work on the development of novel statistical models and machine learning algorithms, and application of these to large-scale single-cell datasets on gene expression and chromatin maps, and to protein binding data. The postholder will work in the group of Simon Myers (University of Oxford).

Research topic	Statistical methods for integrative analysis of single-cell 'omics datasets
Principal Investigator / supervisor	Simon Myers, Professor of Mathematical Genomics
Project team	Myers group
Project web site	www.stats.ox.ac.uk/~myers
Funding partner	The funds supporting this research project are provided by the Wellcome Trust

Recent publications	1. Myers S, Freeman C, Auton A, Donnelly P, McVean G. A common sequence motif associated with recombination hot spots and genome instability in humans. Nat Genet. 2008 Aug 24. [Epub ahead of print] 2. Myers S, Bowden R, Tumian A, Bontrop RE, Freeman C, MacFie TS, McVean G, Donnelly P. Drive against hotspot motifs in primates implicates the PRDM9 gene in meiotic recombination. Science. 2010 Feb 12; 327(5967):876-9. [Epub 2009 Dec 31.] 3. Gupta Hinch A, Tandon A, Patterson N, Song Y, Rohland N, Palmer CD, (72 additional authors not listed in full), Chanock SJ, Haiman CA, Wilson JG, Reich D*, Myers SR*. The landscape of recombination in African Americans. Nature. 2011 Jul 20;476(7359):170-5. 4. Davies B*, Hatton EW*, Altemose N, Hussin JG, Pratto F, Zhang G, Hinch AG, Moralli D, Biggs D, Diaz R, Preece C, Li R, Bitoun E, Brick K, Green C, Camerini-Otero RD, Myers SR*, Donnelly P*. Re-engineering the zinc fingers of PRDM9 reverses hybrid sterility in mice. Nature (2016), Advanced Online Publication 3rd February. 5. Altemose N, Noor N, Bitoun E, Tumian A, Imbeault M, Chapman JR, Aricescu R, Myers S R. A map of human PRDM9 binding provides evidence for novel behaviors of PRDM9 and other zinc-finger proteins in meiosis. eLife 2017 (Oct); 6:e28383 DOI:10.7554/eLife.28383 6. Li R*, Bitoun E*, Altemose N*, Davies R W, Davies B, Myers SR. A high-resolution map of mammalian non-crossover events reveals impacts of genetic diversity on meiotic recombination. Nature Communications, August 2019. 7. Jung M*, Wells D*, Rusch J, Ahmed S, Marchini J, Myers S*, Conrad D*. Unified single-cell analysis of testis gene regulation and pathology in 5 mouse strains. eLife, 2019. bioRxiv 393769, doi: https://doi.org/10.1101/393769. 8. Wells D*, Bitoun E*, Moralli D, Zhang G, Hinch AG, Jankowska J, Donnelly P, Green C, Myers S. ZCWPW1 is recruited to recombination hotspots by PRDM9 and is essential for meiotic double strand break repair. eLife, 2020, 9:e53392 DOI: 10.7554/eLife.53392

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The role

We invite applications for a postdoctoral research assistant to develop predictive models for how DNA sequences impact regulatory networks, and apply these models to single-cell datasets including for both gene expression, and chromatin accessibility (openness) during meiosis. The successful candidate will work jointly at the Department of Statistics and the Wellcome Centre for Human Genetics.

There is strong evidence that most of the mutations identified through genome-wide association studies act by regulating the expression of genes, by promoting or disrupting the binding of transcription factors to target DNA sequences. However the complex nature of how DNA and gene expression interact mean it remains difficult to predict the action of such target “motifs” on gene expression and other phenotypes. For example many apparent motif matches are not bound *in vivo*, or their disruption has weak, tissue-dependent or cryptic impacts on gene expression.

Single-cell data can provide information in individual cells on whether genes are active, and single-cell ATAC-seq data identifies loci with open chromatin, a signature of binding by transcription factors. This maximally high resolution offers the possibility to greatly reduce complexity by interrogating binding and gene activation in individual cells, while combining information across regions. However, the sparse nature of the resulting data necessitates the use of statistical approaches for analysis. Current methods do not integrate information on sequence motifs, or on genetic variation. This post will aim to develop and apply such methods, including new techniques for mixture decomposition of sparse matrices, and non-linear prediction, among others.

Our group has a longstanding interest in meiosis, and in particular in developing approaches to identify how DNA sequence controls recombination events during meiosis. Recently, we have worked on identifying sequence motifs predicting meiotic gene expression more generally. We identified the first sequence motif controlling mammalian recombination hotspots [1], and this led on to the identification of PRDM9 as the gene binding this motif and initiating almost all recombination events in mammals, and further work on this protein [e.g. 2-6]. Collaborative work on single-cell RNA-seq data [7] identified ~100 distinct groups of functionally related co-expressed genes, and has led on to several follow-up projects, including identifying a role for ZCWPW1 [8] as an essential fertility gene recruited to PRDM9-bound sites and necessary for proper chromosome pairing.

We are now gathering single-cell RNA-seq and ATAC-seq data across all of meiosis, in hybrid mice with variation levels >5-fold higher than in humans. We aim to identify causality in gene expression networks, and to identify how particular mutations influence gene expression on their own chromosome. Our data will lead to insights into meiotic phenomena even beyond gene expression, for example into ongoing recombination events, and transposon silencing, as well as X-chromosome inactivation. More broadly, we anticipate the resulting methods will be widely applicable to provide a technique for identifying the role of mutations in impacting gene expression.

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The successful candidate will have a PhD or equivalent in a quantitative discipline, for example statistics, or computer science. They also should have experience in developing and applying novel statistical methods, and low-level programming. Experience in analysing high-dimensional datasets, for example in computational statistics, machine learning, is highly desirable. They should have a strong interest in biological problems, genetics and/or genomics, but previous experience is not essential. The postdoctoral research assistant may, from time to time, be involved in providing day-to-day supervision for research students within the PI's group. The post holder will join Oxford's leading genomics research community, and the project may involve international collaboration and potential visits to collaborating groups.

The group also works extensively on complementary, and related, population genetics questions. This provides additional opportunities for the appointee to collaborate, and pursue research related to this area within the group, and more broadly we strongly encourage the successful candidate to pursue their own research interests alongside this project.

Responsibilities

- Manage own academic research and administrative duties;
- Develop research questions within a specific context, conduct individual research, analysing detailed and complex qualitative and/or quantitative data from a variety of sources, and generate original ideas by building on existing concepts;
- Work in collaboration with other groups, including possible occasional off-site visits to collaborators;
- Publish outcomes of research in relevant high-profile international journals. Present research at conferences and workshops, and lead seminars to disseminate research findings;
- Represent the research group at external and internal meetings/seminars together with other members of the group or alone;
- Participate in regular group meetings and other activities of the research group. Provide relevant help to junior research group members including research assistants and DPhil students;
- Where appropriate, help raise additional research funds through writing sections of grant applications.

Selection criteria

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Essential selection criteria

- Holds or close to completion of a PhD/DPhil in a relevant quantitative scientific discipline, for example statistics, machine learning, mathematics, statistical or population genetics, or related disciplines;

- Experience in the development of novel computational statistics and/or machine learning algorithms for large-scale data sets (e.g. hidden Markov models, MCMC, gaussian processes, deep learning);

- Experience in working with low-level computing languages such as C, C++, Fortran, Java;

- A strong motivation to work on problems relating to human genetics; The ability to conduct and complete high-quality research both independently, and in collaboration with the PI and project partners;
- The ability to communicate scientific results effectively, both in writing and verbally, as supported by previous publications and oral presentations;
- Willingness to support DPhil students or junior researchers working within the project and the Myers research group;

Desirable selection criteria

- Familiarity with the existing literature and research in statistical genetics or a closely related field;
- A prior publication record of methods development in the broad area of medical, statistical and population genetics;

For further information about the position or about the project, please contact Professor Simon Myers at myers@stats.ox.ac.uk.

About

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.

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 Department of Statistics

The Department of Statistics at Oxford is a world-leading centre for research with a broad portfolio that covers pure theory, the development of innovative methods to analyse and understand data, and their applications to scientific and societal problems. Research is loosely structured around four interconnected research groups: Statistical Methodology, Computational Statistics and Machine Learning; the Oxford Protein Informatics Group; Probability; and Statistical Genetics and Epidemiology. The Department has recently undergone a period of rapid expansion, growing from 21 submitted researchers in the 2014 Research Excellence Framework exercise to 32 in REF 2021.

The Department relocated to a newly renovated building on St Giles' in the heart of the University of Oxford in 2015. The building provides state-of-the-art teaching facilities and modern space to facilitate collaboration and integration, creating a highly visible centre for Statistics in Oxford. Since moving to St Giles', Faculty have secured over £14m in research funding from a variety of funders including UKRI, the Wellcome Trust, the European Commission, NIH, and industrial partners from sectors ranging from services to pharma.

The Department's research excellence has been recognised both collectively, through success in REF 2014, and individually. Awards include Fellowships of the Royal Society to Christl Donnelly and Alison Etheridge; FMedSci to Christl Donnelly; the Royal Statistical Society Guy Medal in Bronze to Chris Holmes, and the Guy Medal in Silver to Arnaud Doucet; the Weldon Memorial Prize, the Francis Crick Prize Lecture, and the Genetics Society Balfour Prize to Simon Myers. Arnaud Doucet, Alison Etheridge, Christina Goldschmidt, Gesine Reinert and Judith Rousseau are all Fellows of the Institute of Mathematical Statistics, and Alison Etheridge is a former President.

The Department is home to Oxford University Statistical Consulting, which provides comprehensive statistical consultancy services to both internal departments and external businesses. It operates across a wide range of sectors, and offers experience in all aspects of data-based research. The service includes two Research Software Engineers who take new and existing software platforms from the Oxford Protein Informatics Group, and provide support to industry to maximise their impact.

The Department of Statistics offers an undergraduate degree (BA or MMath) in Mathematics and Statistics and an MSc in Mathematical Science (OMMS), both joint with the Mathematical Institute, and an MSc in Statistical Science, as well as a lively and stimulating environment for

postgraduate researchers (DPhil or MSc by Research). The Department is involved in four Centres for Doctoral Training (CDTs): the EPSRC CDT in Modern Statistics and Statistical Machine Learning (led by Imperial), the EPSRC CDT in Sustainable Approaches to Biomedical Science: Responsible and Reproducible Research, the EPSRC CDT in Mathematics of Random Systems (with the Mathematical Institute and Imperial), and the EPSRC CDT in Health Data Science (with the Big Data Institute). The Department is also part of the National Academy for PhD Training in Statistics, which provides training in fundamental areas of Statistics and Applied Probability. Our graduate students go on to varied careers, the most popular being academia (45%) and the technology (nearly 30%) and finance sectors.

The Department maintains close links with interdisciplinary centres such as the Wellcome Centre for Human Genetics and the Big Data Institute. Many Faculty have associations with the Alan Turing Institute (the Turing), the UK's national centre for data science, in which Oxford is a founding partner, and Chris Holmes is Programme Director for Health and Medical Sciences at the Turing.

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

The Department of Statistics holds a bronze 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. Oxford is widely recognised as one of the world's leading science universities. . The disciplines within the MPLS Division regularly appear at the highest levels in world rankings and have been evaluated as conducting world-leading and internationally excellent research in UK research assessments, and Mathematical, physical and life sciences research at Oxford is the best in the country according to the 2014 Research Excellence Framework (REF) assessment exercise carried out by HEFCE.

The MPLS Division is home to the non-medical sciences at Oxford and its 10 academic departments 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.

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 (including Nobel prizes and prestigious titles such as FRS and FREng) and we have a strong tradition of attracting and nurturing the very best early career researchers who regularly secure prestigious fellowships. The Division is also the proud holder of ten Athena Swan Awards (3 Silver and 7 Bronze) illustrating our commitment to ensure good practice and to encourage women in science at all levels in the division.

We have around 6,000 full and part-time students (including approximately 2000 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 major 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.net) 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 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: www.mpls.ox.ac.uk

How to apply

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.

Please provide details of at least two referees. **Applicants should ask their referees to send their letters of reference directly to the Personnel Administrator by email to jobs@stats.ox.ac.uk by the closing date quoting the vacancy reference 151568.**

You will 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)
Please upload all documents **as PDF files** with your name and the document type in the filename

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

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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).

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.
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 e-recruitment system to confirm receipt of your application. **Please check your spam/junk mail** if you do not receive this email.

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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 69th 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.

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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

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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.