

DEPARTMENT OF MATERIALS

Job Description and Selection Criteria

Summary

Job title	Postdoctoral Research Assistant in Quantum Optical Control of Spin Defects
Division	MPLS
Department	Department of Materials
Location	Department of Materials, Parks Road, Oxford
Grade and salary	Grade 7: £36,024- £44,263 per annum with a discretionary range to £48,350 (plus Oxford University Weighting of £1,500 per annum)
Hours	Full time
Contract type	Fixed-term (2.5 years)
Reporting to	Professor Hannah Stern
Vacancy reference	175465

Research topic	Development of two-dimensional spin photon interfaces for quantum technologies
Principal Investigator / supervisor	Prof. Hannah Stern
Project team	Materials for Quantum Group, University of Oxford
Project web site	https://www.sternlab.co.uk/
Funding partner	The funds supporting this research project are provided by EPSRC.
Recent publications	1. A single spin in hexagonal boron nitride for vectorial quantum magnetometry . C. M. Gilardoni, S. Eizagirre Barker, C. L. Curtin, S. A. Fraser, O. F.J. Powell, D. K. Lewis, X. Deng, A. J. Ramsay, C. Li, I. Aharonovich, H. H.

	<p>Tan, M. Atatüre and H. L. Stern. arXiv.:2408.10348 (2024).</p> <p>2. A quantum coherent spin in a two-dimensional material at room temperature. H. L. Stern*, C. M. Gilardoni*, Q. Gu, S. Eizagirre Barker, O. Powell, X. Deng, L. Follet, C. Li, A. Ramsay, H. H. Tan, I. Aharonovich and M. Atatüre, <i>Nature Materials</i> (2024).</p> <p>3. Materials for quantum technologies: a roadmap for spin and topology. N. Banerjee*, C. Bell*, C. Ciccarelli*, T. Hesjedal*, F. Johnson*, H. Kurebayashi*, T. A. Moore*, C. Moutafis*, H. L. Stern*, I. J. Vera-Marun*, J. Wade*, C. Barton, M. R. Connolly, N. J. Curson, K. Fallon, A. J. Fisher, D. A. Gangloff, W. Griggs, E. Linfield, C. H. Marrows, A. Rossi, F. Schindler, J. Smith, T. Thomson, O. Kazakova. arXiv:2406.07720 (2024).</p> <p>4. Room-temperature optically detected magnetic resonance of single defects in hexagonal boron nitride , H.L Stern*, Q. Gu *, J. Jarman*, S. Eizagirre Barker, N. Mendelson, D. Chugh, S. Schott, H. H. Tan, H. Sirringhaus, I. Aharonovich and M. Atatüre. <i>Nature Communications</i>, 13, 681, (2022).</p>
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The Department of Materials has been awarded departmental Bronze Athena SWAN status in recognition of its efforts to introduce organisational and cultural practices that promote gender equality and create a better working environment for both men and women. Job applications are particularly welcome from women and black and ethnic minority candidates, who are under-represented in research posts in the Department.

Work/life balance

The Department of Materials is actively promoting the provision of a family friendly working environment and together with the University of Oxford recognises the demands of work/life balance. Therefore for this project we encourage applications from candidates who wish either to hold these positions on a full time, or part time basis or need flexibility in their working hours and will discuss these opportunities with shortlisted applicants at interview.

The role

Solid-state spin photon interfaces are central to emerging quantum technologies, such as optical quantum networks and quantum sensors. Point defects in wide-bandgap solids are an example, where the deterministic interaction between emitted photons and electronic and nuclear spins enables photon mediated entanglement of spins for distributed quantum networks. Optical readout of electronic and nuclear spins on the single spin level can give rise to nanoscale sensors of magnetic field, temperature and pressure.

We have recently discovered that two dimensional materials, namely hexagonal boron nitride (hBN), can host bright point defects with quantum coherent spins at room temperature. Now, our main objective is to transform the material system to platform for quantum technology, a coherent 2D spin-photon interface for networks and sensing. To achieve this goal, this project will advance the pulsed spin control of defects in hBN via a combination of quantum optical techniques and magnetic resonance. This effort will be combined with ongoing work in the group on the characterisation and optimisation of the hBN material and defect formation, which we perform in collaboration with a wide group of material scientists and electron microscopists.

We are looking for an excellent post-doctoral candidate with a PhD degree (or near completion) in quantum optics, solid state quantum physics, magnetic resonance or related areas. The successful candidate will be part of our research team and involved in designing and implementing experiments, disseminating our work via writing research articles and giving oral presentations at conferences and participating in the training and management of PhD students.

Responsibilities

- Manage own academic research and administrative activities. This involves small scale project management, to co-ordinate multiple aspects of work to meet deadlines
- Adapt existing and develop new scientific techniques and experimental protocols
- Test hypotheses and analyse scientific data from a variety of sources, reviewing and refining working hypotheses as appropriate
- Contribute ideas for new research projects
- Collaborate in the preparation of scientific reports and journal articles and occasionally present papers and posters
- Use specialist scientific equipment in a laboratory environment
- Act as a source of information and advice to other members of the group on scientific protocols and experimental techniques
- Represent the research group at external meetings/seminars, either with other members of the group or alone
- Carry out collaborative projects with colleagues in partner institutions, and research groups

Selection criteria

Essential selection criteria

- Hold a PhD/DPhil in Physics, Chemistry, Materials Science or a related discipline (or close to completion) together with relevant experience
- Possess sufficient specialist knowledge in the discipline to work within established research programmes
- Ability to manage own academic research and associated activities

- Previous experience of contributing to publications/presentations
- Ability to contribute ideas for new research projects and research income generation
- Excellent communication skills, including the ability to write for publication, present research proposals and results, and represent the research group at meetings

Desirable selection criteria

- Experience of independently managing a discrete area of a research project
- Experience of actively collaborating in the development of research articles for publication

Pre-employment screening

Standard checks

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

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

Hazard-specific / Safety-critical duties

This job includes hazards or safety-critical activities. If you are offered the post, you will be asked to complete a health questionnaire which will be assessed by our Occupational Health Service, and the offer of employment will be subject a successful outcome of this assessment.

The hazards or safety-critical duties involved are as follows:

- Night working (11pm-6am)
- Lone Working
- Working with category 3b or 4 lasers (laser safety class)
- Travel outside of Europe or North America on University Business

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.

Mathematical, Physical and Life Sciences Division

The Mathematical, Physical, and Life Sciences (MPLS) Division is one of the four academic divisions of the University. Its nine academic departments span the full spectrum of the mathematical, computational, physical, and engineering and life sciences, and undertake both fundamental research and cutting-edge applied work. Research in MPLS 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 the most recent award of a Nobel Prize for Physics 2020 to Sir Roger Penrose. Within MPLS we are as focused on the generation as we are on those who have gone before, having a strong tradition of attracting and nurturing the very best early career researchers who regularly secure prestigious fellowships and faculty positions.

MPLS continues in its work to support diversity in its staffing, seeing that it will bring benefits to everyone. All academic departments in the Division hold Athena Swan Awards. (The Athena Swan Charter encourages and recognises commitment to advancing the careers of women in science, technology, engineering, maths and medicine employment in higher education and research.)

We have around 7,400 full and part-time students (including approximately 3,500 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 (<http://www.oxfordsparks.net/>) and the Science Together programme (<https://www.mpls.ox.ac.uk/public-engagement/science-together-oxford-researchers-and-communities>). These are complemented by a large variety of outreach activities; these are crucial activities given so many societal and technological issues demand an understanding of the

science that underpins them. We also bring the potential of our scientific efforts forward for practical and beneficial application to the real world and our desire, aided by the work of Oxford University Innovation and Oxford Science Enterprises, 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/>

Department of Materials

The Department is one of nine within the Mathematical, Physical and Life Sciences Division of the University of Oxford, and one of world's leading materials teaching and research institutions. According to the UK's Research Excellence Framework 2021 assessment (in a Unit of Assessment joint with Engineering Science), 97% of the Overall Research was awarded the 3* (26% - internationally excellent) and the highest 4* (71% - world-leading) rating. For Research Impact and Research Environment our submission was ranked first equal within the Unit of Assessment with 90% and 100% respectively of Oxford's submission receiving the 4* rating, and overall we obtained the second highest percentage of 4* contributions within our Unit of Assessment. National league tables (Guardian, Times Good University Guide) regularly place us as the UK's top materials department.

Members of the Department, from graduate students to professors, win national and international awards for their contributions to materials science, including recognition from the Royal Society, the Royal Academy of Engineering and the American National Academy of Engineering. The Department is also active in commercialisation of its intellectual property through licensing to industry and setting up of spin-off companies.

Materials science is a diverse and exciting discipline, and new directions in the Department's research include energy storage materials and devices, and materials for quantum computing, while recently we have also significantly reinforced our leading strengths in materials characterisation, modelling and physical metallurgy.

The Department has extensive laboratory space and supporting facilities spread over two main sites. The central main site, within the Oxford Science Area, Parks Road, has seven buildings. The second site is the Oxford University Begbroke Science Park, located five miles north of Oxford. A minibus provides transport between the two sites.

The Department of Materials 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 and underrepresented groups' careers. We support staff returning from long-term absence and provide flexible arrangements for staff with caring responsibilities. Further information about family support can be found in the Standard Terms and Conditions. Our Equality, Diversity and Inclusion Committee contributes to many aspects of our work, see <https://www.materials.ox.ac.uk/edi#/>

The Department of Materials holds a Bronze Athena Swan award to recognise advancement of gender equality, representation, progression and success for all. The Department is also member of WISE (<https://www.wisecampaign.org.uk/>) and AFBE-UK Association for Black and Minority Ethnic Engineers (<https://www.afbe.org.uk/>)

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.

TEACHING

The teaching in the Department is regularly rated as high quality. We teach two four-year undergraduate degree programmes (M.Eng level). The joint intake for this course is about 42 a year. Around 52 graduates are accepted each year to study for research degrees.

RESEARCH

The Department has an outstanding record for world class research, as underlined by the UK Government's most recent assessment of research excellence in UK universities, the 2021 REF <<https://results2021.ref.ac.uk/>>, where Oxford Materials was one of the top-rated materials departments in the country. Annual external research funding in the Department is approximately £20 million, from industry, research councils, the EU and charities.

For more information on the Department of Materials, please visit: <https://www.materials.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. We understand that careers can be non-linear and affected by all manner of external circumstance, and would be happy for candidates to include a brief contextual statement if they wish to do so.

As part of your application you will be asked to provide details of three referees and indicate whether we can contact them now.

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.

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

Application FAQs, including technical troubleshooting advice is available at:

<https://staff.web.ox.ac.uk/recruitment-support-faqs>

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

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

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

Important information for candidates

Data Privacy

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

The University's policy on retirement

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

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

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

Equality of opportunity

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

Benefits of working at the University

Employee benefits

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

University Club and sports facilities

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

Information for staff new to Oxford

If you are relocating to Oxfordshire from overseas or elsewhere in the UK, the University's Welcome Service website includes practical information about settling in the area, including advice on relocation, accommodation, and local schools. See <https://welcome.ox.ac.uk/>

There is also a visa loan scheme to cover the costs of UK visa applications for staff and their dependents. See <https://staffimmigration.admin.ox.ac.uk/visa-loan-scheme>

Family-friendly benefits

With one of the most generous family leave schemes in the Higher Education sector, and a range of flexible working options, Oxford aims to be a family-friendly employer. We also subscribe to the Work+Family Space, a service that provides practical advice and support for employees who have caring responsibilities. The service offers a free telephone advice line, and the ability to book emergency back-up care for children, adult dependents and elderly relatives. See <https://hr.admin.ox.ac.uk/my-family-care>

The University has excellent childcare services, including five University nurseries as well as University-supported places at many other private nurseries.

For full details, including how to apply and the costs, see <https://childcare.admin.ox.ac.uk/>

Disabled staff

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

Staff networks

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

The University of Oxford Newcomers' Club

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