

Job Description and Selection Criteria

Job title	Postdoctoral Research Assistant in Computational Quantum Physics
Division	Mathematical Physical and Life Sciences
Department	Physics
Location	Clarendon Laboratory, Parks Road, Oxford
Grade and salary	Grade 7: £38,674 - £46,913 per annum
Hours	Full time
Contract type	Fixed-term until 31/08/24
Reporting to	Dr Sam Vinko
Vacancy reference	176554
Additional information	Closing date – midday on 9 December 2024

Research topic	Towards a New Quantum Frontier in High Energy Density Science
Principal Investigator / supervisor	Dr Sam Vinko
Project team	
Project web site	
Funding partner	The funds supporting this research project are provided by EPSRC.
Recent publications	https://journals.aps.org/prl/abstract/10.1103/PhysRevLett.125.195001



The role

We invite applications for a postdoctoral research position in computational physics to join our research group in the Physics Department, University of Oxford. The project will be led by Dr. Sam Vinko in collaboration with Professor Justin Wark.

This position is part of an EPSRC project aimed at exploiting the most recent developments in optical and x-ray free-electron laser science, to advance our understanding of matter in extreme conditions. Developments in high-energy lasers, and their co-location at large-scale free-electron laser facilities, such as the European XFEL in Hamburg, will soon allow us routinely to drive matter to pressures exceeding 10 Mbar, and probe it with the brightest x-ray source on the planet. In the US, the construction of the LCLS-II facility will enable independent x-ray-pump/x-ray-probe experiments to take place for the very first time. These capabilities will support new laboratory-based studies of matter in stellar interior and exoplanetary core conditions, at the nanoscopic scale, and on ultrashort timescales, and will provide access to exotic new plasma regimes where quantum behaviour is transferred to the macroscale.

A cornerstone of this project is the development of novel resonant inelastic x-ray scattering (RIXS) and related spectroscopic techniques, which will allow us directly to interrogate the electronic structure of extreme states of matter, and how it evolves under material compression and phase transformation. The role of this post will be to support this effort from the theoretical and computational side, including running and developing predictive simulations (atomic kinetics, density functional theory, molecular dynamics, and similar) and deploying modern data analysis approaches leveraging various aspects of machine learning and differentiable programming. Additionally, the post holder will provide guidance to junior members of the research group including research assistants, PhD students, and undergraduate students.

Responsibilities

- Manage own academic research and administrative activities. This involves small scale project management to coordinate multiple aspects of work to meet deadlines;
- Adapt existing and develop new theoretical and computational models related to the research project and to implement them in simulation codes;
- Prepare working theories and analyse quantitative data from a variety of sources, reviewing and refining theories as appropriate;
- Contribute ideas for new research projects;
- Collaborate in the preparation of research publications;
- Present papers at conferences or public meetings;
- Act as a source of information and advice to other members of the group on methodologies and procedures;
- 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.
- The post-holder will have the opportunity to teach. This may include lecturing, small group teaching, and tutoring of undergraduates and graduate students.

Pre-employment screening

All offers of employment are made subject to standard pre-employment screening, as applicable to the post.

If you are offered the post, you will be asked to provide proof of your right-to-work, your identity, and 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 so that we can discuss appropriate adjustments with you), and a declaration of any unspent criminal convictions.

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/.

Selection criteria

- Hold (or about to obtain) a PhD/DPhil in Physics or related discipline;
- Demonstrated research experience in plasma physics, high energy density physics, x-ray science, or a closely related field;
- Good knowledge of running computer simulations of matter in extreme conditions, including, but not limited to, atomic kinetics modelling and first-principles quantum electronic structure methods (density functional theory, quantum Monte Carlo, etc.);
- Demonstrated ability to manage own academic research and associated activities;
- Previous experience of contributing to publications/presentations;
- Excellent communication skills, including the ability to write for publication, present research proposals and results, and represent the research group at meetings;
- Ability to work with international teams on research projects;

Desirable selection criteria

- Research experience in theoretical calculations of resonant inelastic scattering cross sections;
- Research experience using x-ray free-electron laser light sources;
- Excellent coding ability in python/C++ or similar.

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. Income from external research contracts in 2016/17 exceeded £564m and we rank first in the UK for university spin-outs, with more than 130 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

Department of Physics

Oxford Physics is one of the largest and most eminent departments in Europe – pursuing forefront research alongside training the next generation of leaders in Physics.

With an academic staff of almost one hundred our activities range from fundamental particles to the furthest reaches of the universe to manipulating matter on an atomic scale. Oxford physicists are probing new ways to harness solar energy, modelling the Earth's atmosphere to predict the future climate, exploring computation on the quantum scale and executing calculations that reveal the fundamental structure of space and time.

Sub-department

The post-holder will be based in the Atomic and Laser Physics sub-department, which is one of the six sub-departments that together make up the Department of Physics; these are Astrophysics, Atomic and Laser Physics, Atmospheric, Oceanic and Planetary Physics, Condensed Matter Physics, Particle Physics and Theoretical Physics, with a seventh function (Central Physics) providing administrative and technical support to these sub-departments. Members of all sub-departments take part in research, teaching and matters such as examinations, discussion of syllabi, lectures and liaison with undergraduates and postgraduate students.

For more information please visit: <http://www2.physics.ox.ac.uk/>

Mathematical, Physical & Life Sciences Division

The Mathematical, Physical and Life Sciences (MPLS) Division is one of the four academic divisions of the University of Oxford.

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. 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.

For more information please visit: <http://www.mpls.ox.ac.uk/>

Athena Swan Charter

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

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 www.ox.ac.uk/about/jobs/supportandtechnical/

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 full academic CV and a 1-page A4 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.

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)

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 recruitment@physics.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

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/.

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 dependants. 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.