Job description and selection criteria

Job title	Postdoctoral Researcher in Advanced Radio Astronomy Software Development
Division	Mathematical, Physical & Life Sciences Division
Department	Department of Physics and Oxford e-Research Centre
Location	Oxford e-Research Centre
Grade and salary	Grade 7: £ 29,249-£35,938 per annum
Hours	37.5
Contract type	Fixed-Term *(2 years, with the possibility of extending for a further year)*
Reporting to	Dr Stefano Salvini
Vacancy reference	103719
Additional information	

Introduction

The University

The University of Oxford is a complex and stimulating organisation, which enjoys an international reputation as a world-class centre of excellence in research and teaching. It employs over 10,000 staff and has a student population of over 21,000.

Most staff are directly appointed and managed by one of the University's 130 departments or other units within a highly devolved operational structure - this includes 5,900 'academic-related' staff (postgraduate research, computing, senior library, and administrative staff) and 2,820 'support' staff (including clerical, library, technical, and manual staff). There are also over 1,600 academic staff (professors, readers, lecturers), whose appointments are in the main overseen by a combination of broader divisional and local faculty board/departmental structures. Academics are generally all also employed by one of the 38 constituent colleges of the University as well as by the central University itself.

Our annual income in 2010/11 was £919.6m. Oxford is one of Europe's most innovative and entrepreneurial universities: income from external research contracts exceeds £376m p.a., and more than 70 spin-off companies have been created.

For more information please visit www.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. We have over 6,000 students and research staff, and generate over half of our funding from external research grants.

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 interdisciplinary in nature. We collaborate closely with colleagues in Oxford across the medical sciences, social sciences and humanities.
Today's scientific research not only crosses traditional subject boundaries, but also transcends national boundaries: MPLS scientists collaborate with researchers from around the world, and play leading roles in many international projects.

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

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.

For more information please visit: http://www.physics.ox.ac.uk/

Astrophysics Sub-department

The Head of Astrophysics is currently Professor Roger Davies. The Astrophysics sub-department consists of approximately 25 tenured research staff, 40 research fellows and associates, 45 graduate student and 5 support staff. In addition, we have a significant number of visiting academics and students for durations varying from 1 day to 1 year.

The Sub-Department has grown steadily in recent years. It is situated in the Denys Wilkinson Building, close to the centre of Oxford and the extensive University Parks. The site has excellent teaching and workshop facilities and a canteen on-site. Research is conducted into instrumental, observational, computational and theoretical astrophysics, and is supported by grants from a wide range of sources including: the Science and Technology Facilities

Council, The European research Council, the Leverhulme Trust and the Royal Society.

The observational astrophysics programme at Oxford spans a wide range of topics from including cosmology and galaxy formation and evolution, ithe evolution of atomic and molecular gas, stellar dynamics and populations, high-redshift galaxies, the epoch of reionization, dark matter, and the physics of active galaxies and exotic objects. It also covers aspects of jet physics, pulsars, star formation and the interstellar medium and a growing activity in exoplanet research. The research is conducted on frontline telescopes around the world, including Chile and the United States, and on space telescopes.

Theoretical research groups study a range of topics including stellar evolution, cosmology, galaxy formation and evolution, dark matter, dark energy and gravitation. Data from a range of ground-based and satellite observatories are interpreted with simulations and increasingly realistic and complex models, and the development of novel techniques and approaches. The Beecroft Institute for Particle Astrophysics and Cosmology, which is located within the Denys Wilkinson Building, provides a focus for some of this activity.

We have an instrumentation programme to develop and construct innovative instruments for astronomical research. A number of visible, infrared and radio instruments have been deployed on telescopes, and design work is underway for the next generation of instruments, including systems for the proposed European Extremely Large Telescope and the Square Kilometre Array radio telescope. Detector and receiver developments are carried out in collaboration with the Oxford Engineering Science department, the Rutherford Appleton Laboratory and other institutes in the UK and around the world.

The Physics administration systems operate on MS Windows machines. Oxford Astrophysics computers run in support of a wide range of observational and numerical/theoretical research programmes. In addition to a multi-node cluster, researchers will typically each have a powerful desktop (running their choice of Mac OS X, linux or in some cases Windows). We benefit from the expertise of the Central Physics IT Support team.

The OeRC-Oxford Astrophysics SKA Collaboration

Combining their strengths, the OeRC and Oxford Astrophysics are collaborating actively on the software and computational aspects of the international collaboration to develop the Square Kilometre Array (SKA) Radio Telescope. This collaboration has now been ongoing for several years, throughout the various stages of the SKA Project.

The Oxford e-Research Centre

The Oxford e-Research Centre (OeRC) works with research units across the whole of the University to enable the use and development of innovative computational and information technology in multidisciplinary collaborations. The Centre is strongly linked to the UK National e-Science programme, and is involved in national as well as international collaborations to ensure its position at the forefront of research infrastructure development. The OeRC hosts the Oxford Supercomputing Centre (OSC).

The Centre focuses on

- bringing new technological advances to multiple disciplines across the University

- facilitating interdisciplinary research

- developing an appropriate infrastructure for research.

For more information please visit: http://www.oerc.ox.ac.uk

Job description

Research topic	New software for large scale radio astronomy data processing
Principal Investigator / supervisor	PI: Prof Ghasaan Yassin, Oxford Astrophysics Supervisor: Dr Stefano Salvini (Oxford e-Research Centre)
Project web site	http://www.radionet-eu.org/ , http://www.radionet-eu.org/hilado
Funding partner	EU funded project RadioNet3 (FP7)

Overview of the role

Oxford e-Research Centre and Oxford Astrophysics have been closely and successfully collaborating and part of SKA, the Square Kilometre Array (http://www.skatelescope.org/) Project for several years. Although this position is not directly part of the SKA effort, we expect that activities, results and software produced will play an important role within SKA.

The position is within the EU funded project RadioNet3 (FP7). RadioNet3 is an activity that coordinates all of Europe's leading radio astronomy facilities in an integrated cooperation to achieve transformational improvement in the quality and quantity of the scientific research of European astronomers. RadioNet3 includes 27 partners operating world-class radio telescopes and/or performing cutting-edge R&D in a wide range of technology fields important for radio astronomy.

In particular, the successful candidate will cooperate within an international team in the activities of the Joint Research Activity (JRA) Hilado (HIgh performance processing of Large Astronomical Datasets in an Open-source environment).

The successful candidate will be based at the Oxford e-Research Centre, within a very strong team for Radio Astronomy HPC computation led by Dr S.Salvini. The team is involved with SKA software and computing activities, has produced packages such as OSKAR, for the simulation of SKA Phase 1-sized Aperture Arrays; PELICAN, a framework for quasi-real-time parallel computation, used within ARTEMIS (to which the team contributed) and to be used within AARTFAAC (fast imaging project). Obviously, the team has very strong and close ties with Oxford Astrophysics, with continuous and constant collaboration.

The scientific and technical goal for Hilado is to create optimized prototype software and demonstrator processing pipelines that improve the capabilities of currently planned software packages for existing and emerging radio telescopes. These developments are essential to increase the potential of the RadioNet user community in opening up those facilities for the more demanding scientific applications. This post would concentrate on the development of software for calibration, analysis and imaging of large cross-correlated data sets, in particular in the development and deployment of the large solvers necessary to tackle these problems.

Current applications for image processing and transient processing, particularly for wide-field imaging, cannot cope with the computational requirements of the newest radio telescopes, such as LOFAR or ALMA, and a new generation of analysis software will be required for SKA and its precursors, such as MEERKAT and ASKAP.

Within this JRA, you will cooperate in the development of algorithms and software to carry out the development of computing solution, in particular large scale solvers, to meet these analysis challenges. New solutions must be applicable within existing pipelines (e.g. EVLA, LOFAR, ASKAP, etc.) as well as being interoperable with existing software libraries and tools such as CASA. You will naturally interact with the international teams developing parallel solutions for the various pipelines. You will be encouraged to study the possible deployment of novel hardware architectures, such as GPUs, the forthcoming Intel MIC, etc. Any algorithms and software produced will need to be applicable to within the SKA Project.

Responsibilities/duties

As part of the team, you will cooperate in the development and deployment of solvers for imaging calibration and analysis. These new solvers must be highly parallel and scalable to ensure their applicability to current as well as emerging challenges. In particular, scalability would ensure that software develop within this project will be reusable in the future for SKA-class radio telescopes.

- Identification of appropriate technologies and current pipelines needs
- Design of algorithms
- Prototype code design, test, validation
- Deployment within existing pipelines and libraries
- Advanced code development and deployment
- Possibly, research and development towards deployment on alternative architectures
- Teaching of up to 3hrs per week during term time

Selection criteria

Candidates will be judged on the basis of the following criteria and their application should address **each point** to show how their experience and skills meet the criteria

Essential
- A higher degree, preferably a PhD, in a relevant subject such as Physics, Mathematics, Computing Science, Engineering Science, or equivalent industrial experience.
- Numerical/scientific software development experience and a good understanding of relevant modern technologies;
- Track record of published work appropriate to the age and work experience of the candidate;
- Willingness to work effectively as a team member and to supervise less experienced team members;
- Experience of carrying out independent research/development.

Desirable

- Knowledge of radio astronomy technologies is highly desirable.

- Knowledge of high performance computing, applications and tools;

- Software development experience within a controlled project environment;

- Good personal organization and time-management skills;

Further Enquiries

If you have any further questions about the scientific/technological aspects of this poition, please get in contact with

- Dr Stefano Salvini, Oxford e-Research Centre, University of Oxford
  email: stef.salvini@oerc.ox.ac.uk

- Prof. Ghassan Yassin, Oxford Astrophysics, Uiversity of Oxford
  email: g.yassin1@physics.ox.ac.uk

Working at the University of Oxford

For further information about working at Oxford, please see: (relevant link to be inserted here, please select from one of the three below):

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

How to apply

If you consider that you meet the selection criteria, click on the **Apply Now** button on the 'Job Details' page and follow the on-screen instructions to register as a user. You will then be required to complete a number of screens with your application details, relating to your skills and experience. When prompted, please provide details of three referees whom you have asked to provide letters of reference by the application deadline. You will also be required to upload a CV (including publication record) and a statement of research interests. The supporting statement should describe what you have been doing over at least the last 10 years. The research interest statement should describe your work experience. Your application will be judged solely on the basis of how you demonstrate that that you meet the selection criteria outlined above and we are happy to consider evidence of transferable skills or experience which you may have gained outside the context of paid employment or education.

Please save all uploaded documents to show your name and the document type.

All applications must be received by **12 noon** on the closing date stated in the online advertisement.

Should you experience any difficulties using the online application system, please email recruitment.support@admin.ox.ac.uk

To return to the online application at any stage, please click on the following link www.recruit.ox.ac.uk

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