Research Associate in Single-Molecule Biology and Physics

Department of Biology and Physics

Closing date: 6 June 2018
Interview date: 29 June 2018
Vacancy reference: 6642
INTRODUCTION

A vacancy exists for a fixed term full time postdoctoral research associate available as soon as June 2018 and funded for 36 months, in the group of Professor Mark Leake (see http://single-molecule-biophysics.org/). This position has been funded by the Leverhulme Trust for the project “Probing the shape of DNA by twisting, pulling and ‘seeing’ single molecules” in collaboration with Prof Tony Maxwell (see https://www.jic.ac.uk/staff/tony-maxwell/) and Prof Bart Hoogenboom (see https://www.london-nano.com/our-people/%5Bfield_people_section-raw%5D/bart-hoogenboom). The Biological Physics and Biophysics Group at the University of York was formed in 2013 with the appointment of Professor Leake as Chair in Biological Physics jointly appointed between the Departments of Physics and Biology as part of our overall strategy of expanding activities in this research area. In addition there have been recent new appointments of two lecturers and three research fellows in the Physics Department in the area of biophysics/biological physics, and there are several research groups in the Physics and Biology Departments whose research involves activities at the interface between the life and physical sciences.

Your position will be administratively homed in the Physics Department, however, your research will be in both Physics and Biology Departments. Your primary role is to work in Professor Leake’s group and you will also be part of a collaborative team also involving Professor Tony Maxwell’s and Professor Hoogenboom’s groups on an exciting interdisciplinary project involving the application of cutting-edge single-molecule biophysics and super-resolution microscopy (see http://www.mdpi.com/2304-6732/2/3/758) to investigate how DNA shape is governed by the interplay between mechanical bending, twist, and the interaction with environmental and chemical factors. You will do this by applying innovative technologies and ambitious interdisciplinary approaches to achieve a step change in our understanding of the basic science behind DNA shape, probing one molecule at a time. DNA shape is critically important in terms of how it interacts with, and responds to, its local environment. This is exemplified by the recent discovery that DNA shape directly influences gene activity (see Bryant, JA et al NAR 42:11383 2014) due to DNA arrangement into ‘topological domains’. You will implement a programme of challenging experimental investigations comprising: (i) application of a new magnetic-optical tweezers instrument with combined super-resolution fluorescence imaging to manipulate and measure DNA shape of single molecules; (ii) Biochemical and bioengineering tools to controllably ‘tune’ the DNA sequence and generate fluorescently labelled proteins that perturb the shape of DNA; (iii) Advanced in-liquid AFM to image secondary structures of DNA to very high spatial precision. There may also be valuable opportunities to engage in a wide range of complementary projects active in Professor Leake’s group in what is a fantastic playground for a modern interdisciplinary postdoc at the interface between the physical and life sciences to explore and grow.

Informal email enquiries to Professor Mark Leake (email: mark.leake@york.ac.uk).
Main purpose of the role

To undertake novel research to support the development of Professor Mark Leake’s single-molecule biophysics research programme in collaboration with Professor Tony Maxwell and Professor Bart Hoogenboom on a project to investigate how DNA shape is governed by the interplay between mechanical bending, twist, and the interaction with environmental and chemical factors. The primary purpose of the role is to investigate these essential biological processes using a combination of bespoke single-molecule biophysics and super-resolution fluorescence microscopy, bespoke microfluidics, DNA and protein purification, mutagenesis and fluorescence labelling, and the application of bespoke software to extract and model single-molecule data as well as controlling hardware components for the instrumentation.

Key responsibilities

- Apply novel single-molecule biophysics technologies, in particular a bespoke magnetic-optical tweezers instrument with combined super-resolution fluorescence imaging to manipulate and measure DNA shape of single molecules.
- Apply bespoke software to control hardware and analyse single-molecule data.
- Design and purify a range of synthetic DNA constructs for use in single-molecule experiments.
- Design and implement methods to apply mutagenesis to a range of proteins which perturb DNA shape, to purify these and their wild type counterparts, and fluorescently label them.
- Take an active part in other projects of relevance in the Leake lab at the University of York, including learning new biological and/or biophysical methods where.
- Take an active part in associated biochemical, cell biology and AFM methods in the collaborating labs of Tony Maxwell (John Innes Centre) and Bart Hoogenboom (University College London) where appropriate.
- Take a proactive lead in practical day-to-day supervision of junior members of the Leake group across both Physics and Biology Departments and to maintain the integrity of the Leake group laboratory spaces.
- Disseminate novel research findings by the writing of publications to excellent peer-reviewed scientific journals and by giving presentations at learned scientific meetings to represent the Leake group.

The above list of duties is not exhaustive and is subject to change. The post holder may be required to undertake others duties within the scope and grading of the post.
## PERSON SPECIFICATION

<table>
<thead>
<tr>
<th>Qualifications</th>
<th>Knowledge</th>
<th>Essential / Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Understanding of optical methods in biophysics</td>
<td>Desirable</td>
</tr>
<tr>
<td></td>
<td>Understanding of single-molecule biology methods</td>
<td>Desirable</td>
</tr>
<tr>
<td></td>
<td>Understanding of molecular force transduction techniques</td>
<td>Desirable</td>
</tr>
<tr>
<td></td>
<td>Understanding of light microscopy</td>
<td>Desirable</td>
</tr>
<tr>
<td></td>
<td>Understanding of experimental biophysical methods</td>
<td>Essential</td>
</tr>
<tr>
<td></td>
<td>Understanding of DNA construct synthesis methods</td>
<td>Essential</td>
</tr>
<tr>
<td></td>
<td>Understanding of protein mutagenesis and purification methods</td>
<td>Essential</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Skills, abilities and competencies</th>
<th>Essential / Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ability to apply complex biophysical apparatus</td>
<td>Essential</td>
</tr>
<tr>
<td>Skills in DNA construct design and/or synthesis</td>
<td>Essential</td>
</tr>
<tr>
<td>Skills in protein mutagenesis and/or purification</td>
<td>Essential</td>
</tr>
<tr>
<td>Skills in fluorescent labelling of proteins and/or DNA</td>
<td>Desirable</td>
</tr>
<tr>
<td>Ability to deliver high quality presentations at major scientific conferences</td>
<td>Essential</td>
</tr>
<tr>
<td>The ability to produce high quality journal articles</td>
<td>Essential</td>
</tr>
<tr>
<td>Excellent communication skills</td>
<td>Essential</td>
</tr>
<tr>
<td>Microscopy skills</td>
<td>Desirable</td>
</tr>
<tr>
<td>Practical knowledge of MATLAB or LabView, or equivalent</td>
<td>Desirable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Experience</th>
<th>Essential / Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>Practical experience in biophysics, or a related field</td>
<td>Essential</td>
</tr>
<tr>
<td>Practical experience in biochemistry and/or molecular biology</td>
<td>Essential</td>
</tr>
<tr>
<td>Practical experience of microbiology and/or cell biology</td>
<td>Essential</td>
</tr>
<tr>
<td>Experience in computational/analytical methods applied to biology data</td>
<td>Desirable</td>
</tr>
<tr>
<td>Practical experience of interacting with scientists from different disciplines</td>
<td>Desirable</td>
</tr>
<tr>
<td>Experience of genetics manipulation of bacterial systems</td>
<td>Desirable</td>
</tr>
<tr>
<td>Experience of fluorescent protein fusion cell strains design/manipulation</td>
<td>Desirable</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Personal attributes</th>
<th>Essential / Desirable</th>
</tr>
</thead>
<tbody>
<tr>
<td>An able researcher, capable of interaction with members of the Department of Physics the Department of Biology, in addition to other potential collaborators from other institutions.</td>
<td>Essential</td>
</tr>
<tr>
<td>A desire to establish bridges between physical and life sciences</td>
<td>Essential</td>
</tr>
</tbody>
</table>
THE DEPARTMENT’S

Department of Physics

The Department of Physics at York has 54 academic staff members, more than 40 postdoctoral Research Fellows and visitors, and 40 support staff. The student population comprises around 475 undergraduates and 110 postgraduates (mostly PhD). The department has expanded considerably in the last five years, with both staff and student numbers increasing significantly, accompanied by an on-going rise in research funding.

The Department has a lively and expanding research programme in several areas of physics, organised within three large research areas: Condensed Matter Physics, Nuclear Physics and Plasma Physics and Fusion. The Department leads several inter-departmental ventures, including the Biological Physical Sciences Institute (BPSI), the York Quantum Technologies Centre (YQTC) and the recently established EPSRC Quantum Communications Hub. There has been significant major investment in laboratories and facilities including the York-JEOL Nanocentre and the York Plasma Institute. There are excellent mechanical, computing and electronic workshop facilities, which support our research and teaching activities.

The Department offers both three year BSc and four year MPhys degree programmes in Physics, Theoretical Physics and Physics with Astrophysics; and joint degree programmes in Maths and Physics and Physics with Philosophy. For postgraduates it offers a taught MSc in Fusion Energy, an MSc by Research and PhD degrees, including leading the EPSRC Centre for Doctoral Training in the Science and Technology of Fusion Energy.

The Department of Physics fully endorses and adheres to the University’s policies on equality of opportunity, and in particular:

- has flexible working arrangements which exceed those stipulated by the University;
- has demonstrated commitment to the University’s policy on job sharing;
- has been awarded both Athena Swan Silver and Champion status within the Institute of Physics’ Juno programme, the intention of which is to recognise and reward departments that can demonstrate they have taken action to address the under-representation of women in university physics and to encourage better practice for both women and men.

Further information about the department is available at: http://www.york.ac.uk/physics
Department of Biology

Research and teaching in the Department of Biology at the University of York is of international excellence and global strategic importance (www.york.ac.uk/biology/). The Department is committed to strengthening our research and teaching expertise in research foci where we have recognised strengths: Ecology & Evolution, Plant Biology, Bioinformatics & Mathematical Biology, Infection & Immunity, Molecular & Cellular Medicine, Cell & Developmental Biology, Microbiology, Biochemistry & Biophysics.

The Department offers undergraduate degree programmes in Biology, as well as joint degree programmes in Biochemistry and in Biomedical Sciences, as well as providing teaching components to the Natural Sciences degree programme. The Department also runs a taught masters programme and provide a stimulating interdisciplinary research and training environment for our research students.

Following the 2014 REF the Department of Biology at York has again been placed in the Top 10 in the UK. It is 1st for impact outside academia - our research has had major influence on environmental policy, industry and health. This demonstrates our strengths across the biological sciences: from ecology to biochemistry, biotechnology and biomedical sciences.

In terms of teaching, Biology at York ranks consistently in the top 5 across the major UK University league tables, with - for example - fourth place in the Complete University Guide in both 2015 and 2016.

The Department of Biology covers the spectrum of contemporary biological sciences with no internal barriers, and collaboration within the Department is strongly encouraged. Our Department comprises approximately 65 academic staff, 85 research associates, 170 support (technical, professional and administrative) staff, 180 graduate students, and approximately 863 undergraduates. Several senior positions are funded by charities or industry.

The Department has successfully continued to establish new laboratory space and refurbish our existing space. A new £6M teaching wing opened in 2014 and a £16M phase two expansion have very recently opened for the academic year in 2016.

Staff working patterns are flexible and a formal flexitime system is in operation in the Department. The Department provides support and advice for staff taking maternity, paternity, adoption and parental leave, and the University has a nursery and a Child Care voucher scheme.

The Department strives to address gender inequalities and ensure that there is a culture that supports equality and encourages better representation throughout the department. Support for women at all stages of their career is recognised as being extremely important.

Further information about the department is available at: http://www.york.ac.uk/biology/
Founded on principles of excellence, equality and opportunity for all, the University of York opened in 1963 with just 230 students. In 2018 it is the home of more than 17,000 students across more than 30 academic departments and research centres. Since opening over fifty years ago, we have become one of the world's leading universities and a member of the prestigious Russell Group.

We are consistently recognised as one of the leading Higher Education Institutes and are ranked 16th in the Times & Sunday Times league table (2017). The University of York has won six Times Higher Education (THE) Awards and five Queen’s Anniversary Prizes.

The University is proud of its association with Athena SWAN, holding 12 awards in support of gender equality, representation and success for all, with gold awards for Chemistry and Biology and a University-wide bronze award.

Of 154 universities that took part in the Research Excellence Framework (REF) in 2014, The University of York ranked 14th overall and 10th for the impact of our research. The University is consistently in the top ten UK research universities and attracts over £60m a year of funding from research alone.

Our vision is to make the University of York a world leader in the creation of knowledge through fundamental and applied research, the sharing of knowledge by teaching students from varied backgrounds and the application of knowledge for the health, prosperity and well-being of people and society.
Attractive workplace

Centred around the picturesque village of Heslington on the edge of the city of York, our colleges are set in an attractive landscaped campus. York enjoys a safe, friendly atmosphere with facilities including bars, shops, theatres and concert halls all within easy walking distance.

The University has undergone an unprecedented period of expansion and renewal since 2000. We have invested in twenty new buildings on the original campus and have completed the first and second phases of a £750m campus expansion. Our investment in new colleges, teaching and learning spaces, laboratories, research facilities and a new sports village mean there has never been a better time to join us.

During this period of change we’ve worked hard to retain our friendly, informal and collegiate atmosphere, which is important to our core values of inclusivity and interdisciplinarity.

We have a thriving international community and are committed to providing staff moving to York with as much support as possible through our Relocation Package and Welcome Officers.

The University is committed to promoting a diverse and inclusive community - a place where we can all be ourselves and succeed on merit. We offer a range of family friendly, inclusive employment policies, flexible working arrangements, staff engagement forums, campus facilities and services to support staff from different backgrounds.

For further information please visit our employee benefit pages.
The City of York

Internationally acclaimed for its rich heritage and historic architecture, York's bustling streets are filled with visitors from all over the world. Within its medieval walls you will find the iconic gothic Minster, Clifford's Tower and the Shambles - just a few of the many attractions.

But York isn’t just a great place to visit - it’s also a great place to live and work. While nourishing a vibrant cosmopolitan atmosphere, York still maintains the friendly sense of community unique to a small city.

Visit www.visityork.org for more information on the city of York

Shopping, culture and entertainment

York boasts specialist and unique boutiques but also all the high street stores on its busy shopping streets. Alongside them you will find cinemas, theatres, an opera house, art galleries, a vast range of restaurants, live music venues and clubs. York is particularly renowned for its multitude of pubs and bars, from the modern to the medieval.

Housing and schools

Whether you choose to live close to the city, in one of the surrounding villages or further afield, you will find a wide range of housing within comfortable distance of York and the University. For families, the area has a range of excellent schools both in the state and independent sector.

Great location

York is one of Britain’s best-connected cities. Halfway between London and Edinburgh on the East Coast mainline, on intercity trains you can reach London King’s Cross in less than two hours and Edinburgh in two and a half hours. York is also well served by road links, and it is easily accessible from the A1, M1 and the M62.

For those travelling from overseas, Manchester Airport is two hours away and Heathrow Airport just three and a half. Flights from nearby Leeds Bradford Airport provide easy access to mainland Europe. By Eurostar from London St Pancras, Paris is just over six hours away.

Yorkshire

The Lonely Planet guide recently declared Yorkshire the third best region in the world to visit. There is something to cater to every taste, whether it be the rugged landscapes of the Moors or the Dales, the picturesque seaside towns of Scarborough and Robin Hoods Bay, the gothic architecture of Whitby or the vibrancy of cosmopolitan Leeds.
Apply online

- Go to https://jobs.york.ac.uk
- Find this job using reference 6642
- Complete the online application form

You will need to submit your completed application by midnight (local UK time) on 6 June 2018.

What will I need?

You will need to upload:

- your CV
- a letter describing how you meet the requirements of the job

You will also need details of 2 referees.

Help and assistance

Direct any informal queries to mark.leake@york.ac.uk

If you have any questions about your application, contact the HR Services team:

recruitment@york.ac.uk
+44 (0)1904 324835