

## Job Description and Selection Criteria

<b>Job title</b>	Marie Sklodowska Curie Early Stage Researcher (ESR) x 2
<b>Division</b>	Mathematical Physical and Life Sciences
<b>Department</b>	Physics
<b>Location</b>	Clarendon Laboratory
<b>Grade and salary</b>	Salary from £30,680 p.a. See payment and benefits arrangements below.
<b>Hours</b>	Full time
<b>Contract type</b>	Fixed-term for 3 years
<b>Reporting to</b>	Professor Andrew Turberfield
<b>Vacancy reference</b>	132190
<b>Additional information</b>	<p>Closing date – midday (UK time) on 16<sup>th</sup> February 2018.</p> <p>Please note that an earlier deadline of midday (UK time) on 19<sup>th</sup> January 2018 preferably applies for application to study for a doctoral degree.</p> <p>When recruited, ESRs must not have been resident in the UK for more than 12 months in the past 3 years, not have been awarded a doctorate, and be in the first 4 years (FTE) of their research careers.</p>

<b>Research topic</b>	DNA-Based Modular Nanorobotics
<b>Principal Investigator / supervisor</b>	Professor Andrew Turberfield
<b>Project web site</b>	<a href="https://www2.physics.ox.ac.uk/research/self-assembled-structures-and-devices">https://www2.physics.ox.ac.uk/research/self-assembled-structures-and-devices</a> [research project URL]
<b>Funding partner</b>	The funds supporting this research project are provided by the EU Research Framework programme H2020 People – Marie Sklodowska Curie Actions



## The role

The main purpose of these Early Stage Researcher (ESR) positions is to provide training through research into the development of a new science and technology, DNA-Based Modular Nanorobotics, based on the principles of structural DNA nanotechnology. This interdisciplinary project is part of the Marie Skłodowska Curie Innovative Training Network “DNA-Based Modular Nanorobotics” (DNA-Robotics). The successful candidates will develop techniques for the design, construction, actuation and characterization of functional synthetic nanostructures and for their integration to create modular molecular robotic systems.

N.B. These positions are suitable for a student embarking on a first doctoral degree (an Oxford D.Phil.). ***They are also suitable as a first postdoctoral position for a researcher who, at the time of appointment, is close to completing a PhD at another university but has not yet been awarded this degree.*** The starting date is flexible, but for students studying for a D.Phil. is preferably 1<sup>st</sup> October 2018.

## DNA-Robotics ITN ([www.DNA-Robotics.eu](http://www.DNA-Robotics.eu))

### Individual research projects at Oxford

#### **Project 1:** “Powered linear and rotary motion for molecular robotic devices”

Design and test robust mechanisms for rapid actuation of synthetic molecular machinery, constructed using techniques of structural DNA nanotechnology, using both photochemical and chemical energy sources. ii) Develop modular linear and rotary actuators. iii) Implement modules capable of extended linear and rotary motion. Demonstrate precise, repeatable and programmable motion including extended motion between programmable end stops. Integration of modules to produce general-purpose multi-axis robot capable of positioning and orienting molecular components.

#### **Project 2:** “Modular assembly of integrated nanorobotic systems”

Develop techniques and standards for the design and assembly of nanoscale modules, constructed using techniques of structural DNA nanotechnology, that are capable of sensing, computation and/or actuation. The modular architecture will be designed to facilitate the integration of different functionalities to create robotic systems. The project will include the creation of draft standards for modular and reconfigurable assembly of robotic devices and the creation of new techniques for DNA origami assembly.

### The “DNA-Based Modular Nanorobotics” Innovative Training Network

Robotic systems currently transform the way we work and live – they greatly speed up and enhance manufacturing processes, they provide assistance in diverse areas such as health care or environmental remediation, they perform in environments inaccessible, too harsh, or too dangerous for humans. In essence, robotic systems comprise sensors and actuators connected to and coordinated by an information-processing unit. Sensors provide information about the environment, which is evaluated by a computer and then used to decide on necessary actions - typically mechanical motion. Over recent years, researchers have developed the concept of “molecular robotic systems”, motivated by dramatic progress in the chemical sciences that has resulted in the development of a huge variety of molecular sensors, nanoscale machines, and molecular computing devices. Implementation of basic functions such as, e.g., controlled rotation and linear motion by molecular machines has just been recognized with the award of the 2016 Nobel Prize in Chemistry. Much more complex function can be achieved with artificial machinery made from nucleic acids, one of the most promising technologies for the control and organization of matter at the nanoscale to date.

DNA nanotechnology is based on the specificity and programmability of interactions between oligonucleotides that can be controlled through design of base sequences. DNA molecules can be designed to assemble into well-defined molecular structures, which can be combined and integrated into complex functional systems. Around 100 research groups worldwide are dedicated to DNA nanotechnology and the field is closely followed in industry and in other research fields. The partners of the ITN DNA-Robotics have come together to develop a framework for integrated biomolecular robotics. The DNA-Robotics proposal will be firmly based on groundbreaking recent achievements in DNA nanotechnology, including computation, sensing, actuation and the ability to integrate other materials. Our proposal is based on the engineering principle of modularity, for which DNA-based construction is a natural platform. We will develop DNA modules with a range of novel functions for sensing, actuation, intra-system communication and computing, implementing all of the typical components required for a robotic system at the molecular level. We will develop and design standards for assembling these modules to form an integrated modular robotic system, making it possible to reconfigure a given set of basic modules to create systems capable of tackling different high-level tasks. Our overall vision is the creation of a modular “plug-and-play” platform - similar to macroscopic modular robotics – based on well-defined design rules and standardized molecular interfaces that will enable the composition of molecular robotic systems from a repository of parts. All team members and Early Stage Researchers (ESRs) subscribe to specific design standards that will facilitate the seamless exchange and combination of parts and. DNA-Robotics will thus initiate the development of the first “industry standards” for modular robotics at the molecular level.

DNA-Robotics combines training through research with a carefully designed and strongly interlinked programme of research projects at seven leading European universities and commercial partners:

- Aarhus University, Aarhus, Denmark
- Ludwig-Maximilians-University, Munich, Germany
- The Technical University of Munich, Munich, Germany
- Karolinska Institutet, Stockholm, Sweden
- University of Oxford, Oxford, United Kingdom
- University of Rome Tor Vergata, Rome, Italy
- ATDBio Ltd., Oxford and Southampton, United Kingdom

in association with Partner Organizations baseclick GmbH, Microsoft Research, LGC Biosearch Technologies, Autodesk and Affibody AB.

A coordinated network-wide training programme will be provided by experts within the field; this will be closely interlinked with research programmes. ESRs will visit partner institutions on secondment as an integral part of their individual training project.

## **Responsibilities**

- Participate in DNA-Robotics training programme, including secondment to network partners
- Develop a Personal Career Development Plan which will address generic, transferable and task-specific skills training needs
- 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
- Use specialist scientific equipment in a laboratory environment

- Test hypotheses and analyse scientific data from a variety of sources, reviewing and refining working hypotheses as appropriate
- Contribute ideas for new research projects
- Work collaboratively with colleagues on all aspects of research, including in the preparation of scientific reports and journal articles and presentation of papers and posters
- 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.
- Share in communal tasks associated with the smooth running of the research group.
- Provide help and advice to colleagues where appropriate.
- Participate in journal club meetings

## Selection criteria

Applications are invited from both:

- ***final year undergraduates or recent graduates who satisfy the eligibility criteria for an Oxford D.Phil.*** and will study for a D.Phil. as part of the DNA-Robotics training programme ***and***
- ***those already studying for a PhD in a relevant subject*** who expect to finish their doctoral research before joining the DNA-Robotics programme and to graduate shortly afterwards.

### All applicants –

#### *Essential*

- Applicants must satisfy the eligibility requirements listed below for an Early Stage Researcher under the European Commission H2020 Training Scheme:  
At the time of recruitment by the host organisation, Early Stage Researchers:
  - a) **must not** (yet) have been awarded a doctorate degree;
  - b) **must** be in the first 4 years (full-time equivalent) of their research careers (this period is measured from the date when they obtained the degree which would entitle them to embark on a doctorate, irrespective of whether or not a doctorate is envisaged);
  - c) **must not** have spent more than 12 months in the past 36 months in the UK.
- Applicants should hold or expect to gain a first or upper second class Masters degree or equivalent in a relevant discipline, e.g. physics, chemistry, biochemistry, molecular or cellular biology, engineering, computer science
- The potential to contribute to and benefit from the Molecular Robotics programme of training, including both taught and research components
- Demonstrable interpersonal and communications skills and the ability to work as part of a team
- Ability to manage own academic research and associated activities
- Ability to contribute ideas for new research projects

## Applicants who will study for a doctoral degree (D.Phil.)

### *Essential*

- Fulfil the requirements for admission as a graduate research student in the Condensed Matter Physics sub-department at Oxford University:  
<https://www.ox.ac.uk/admissions/graduate/applying-to-oxford/application-guide> (Note that the requirement for a 'standard' level language test or test waiver will apply).

### *Desirable*

- Previous research experience, e.g. in the form of an experimental masters programme in an associated field
- Evidence of the ability to write for publication, present research proposals and results, and represent the research group at meetings

## Applicants who will not study for a doctoral degree

### *Essential*

- Relevant research experience at the level of PhD studies, e.g. in biophysics, biochemistry, molecular or cellular biology, biological chemistry or computer science. Particularly relevant experience includes:

*Project 1* nanofabrication by biomolecular self-assembly, characterization of cellular and biomolecular systems, cellular transport processes and control mechanisms, synthetic biology, chemistry, chemical functionalization of nucleic acids;

*Project 2* automated techniques for design and verification, nanofabrication by self-assembly, synthetic biology, chemistry, biophysical characterization of cellular and biomolecular systems.

- Previous experience of contributing to the presentation of research results through publication and presentations at scientific meetings.

### *Desirable*

- Experience of independently managing a discrete area of a research project

## Payment arrangements and Benefits - Early Stage Researcher / DPhil Studentships

Fellows are first and foremost registered students of the University. They are also employed by the University as workers. However, the student status takes precedence.

The total amount allocated for this *Fellowship* (based on 36 months) under the *EC Grant Agreement* is € 156,287.88 (€174,287.88 if eligible for the Family allowance). The financial award is composed of a number of fixed allowances. Allowance eligibility depends on the personal circumstances of the fellow:

*Living Allowance*: total amount € 44,895.96 per year. This figure is inclusive of the UK country coefficient of 120.3%.

*Mobility Allowance*: total amount € 7,200 per year.

*Family allowance*: total amount € 6,000 per year (eligibility depends on supporting evidence that at the time the fellowship starts the fellow is married, in a partnership equivalent to marriage in the country it was formalised or have dependent children ).

Eligibility for and amounts of these allowances are fixed under the terms of the *EC Grant Agreement* for the duration of the Fellowship.

The fellow's gross remuneration is derived from the sum of the Living and Mobility allowances (and the Family allowance, if applicable). However, please note that these gross amounts are subject to compulsory employer **and** employee deductions, currently:

- statutory employer **and** employee National Insurance contributions;
- statutory employee income tax deductions: and
- employer and employee superannuation (pension) contributions.

All payments are made monthly in arrears in Pounds Sterling, including during any secondment periods outside of Oxford. The exchange rate used will be the University of Oxford's rate applicable to the ITN project; the exchange rate may be subject to variation throughout the period of the award.

Due to the EC's requirements fellows are paid at a rate of unit cost allowances as set by the EC rather than according to the University's normal employment terms, and the fellowships therefore carry only statutory employment entitlements, i.e. 28 days paid holiday (including bank holidays), statutory sick pay and statutory family (i.e. maternity, paternity, shared parental) leave and pay entitlements.

The fellows are not eligible for the University's own contractual sickness or family leave schemes.

Fellows will be automatically enrolled into the University Superannuation Scheme (USS) – and both employer and employee deductions will be made from the total amount awarded. For further information see <http://www.admin.ox.ac.uk/finance/pensions/uss/>.

### **Payment arrangements and Benefits - Early Stage Researcher / Non-studentship**

Fellows are employees of the University and eligible for standard University terms and conditions and benefits, except that due to the funding rates applied by the EC they are not paid against standard University grades, and instead payment terms are defined by the *EC Grant Agreement* as set out below. .

The total amount allocated for this *Fellowship* under the *EC Grant Agreement* is € 156,287.88 (€174,287.88 if eligible for the Family allowance). The financial award is composed of a number of fixed allowances. Allowance eligibility depends on the personal circumstances of the fellow:

*Living Allowance*: total amount € 44,895.96 per year. This figure is inclusive of the UK country coefficient of 120.3%.

*Mobility Allowance*: total amount € 7,200 per year.

*Family allowance*: total amount € 6,000 per year (eligibility depends on supporting evidence that at the time the fellowship starts the fellow is married, in a partnership equivalent to marriage in the country it was formalised or have dependent children).

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- statutory employer **and** employee National Insurance contributions;
- statutory employee income tax deductions: and
- employer and employee superannuation (pension) contributions.

All payments are made monthly in arrears in Pounds Sterling, including during any secondment periods outside of Oxford. The exchange rate used will be the University of Oxford's rate

applicable to the ITN project; the exchange rate may be subject to variation throughout the period of the award.

Fellows will be automatically enrolled into the University Superannuation Scheme (USS) – and both employer and employee deductions will be made from the total amount awarded. For further information see <http://www.admin.ox.ac.uk/finance/pensions/uss/>.

## **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 2014/15 exceeded £522.9m 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](http://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.

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

## **Condensed Matter Physics Sub-department**

The post-holder will be based in the Condensed Matter 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.

## 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.

## 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/>

## How to apply

**Final year undergraduates or recent graduates** who wish to study for a D.Phil. as part of the DNA-Robotics training programme must apply separately **both** for admission to the D.Phil. (PhD) course in Condensed Matter Physics (which includes a substantial Biological Physics section), following the procedure on <http://www2.physics.ox.ac.uk/study-here/postgraduates/condensed-matter-physics> (also <https://www.ox.ac.uk/admissions/graduate/courses/dphil-condensed-matter-physics>), **and** for the 'job' of ESR following the procedure below. The documents and information required for the two processes are very similar. **Please apply for graduate admission before the earlier deadline of 19<sup>th</sup> January 2018 (midday UK time)** stating clearly in your 'research project proposal' that you wish to be considered for a DNA-Robotics ESR position with Prof. Turberfield as supervisor (you may, of course, also wish to be considered for other projects and supervisors within Condensed Matter Physics). (If you miss the 19<sup>th</sup> January graduate study deadline but meet the later deadline for the ESR position it will be possible to submit a later application for graduate study.)

**Those already studying for a PhD in a relevant subject** who expect to finish their doctoral research before joining the DNA-Robotics programme and to graduate shortly afterwards should apply by the procedure below.

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 CV (including your nationality and information on your country of residence for the last 3 years), academic transcript and supporting statement. The supporting statement should outline your motivation for participating in this training programme and must explain how you meet 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)*

Should you experience any difficulties using the online application system, please email [recruitment.support@admin.ox.ac.uk](mailto:recruitment.support@admin.ox.ac.uk). Further help and support is available from [www.ox.ac.uk/about\\_the\\_university/jobs/support/](http://www.ox.ac.uk/about_the_university/jobs/support/). To return to the online application at any stage, please go to: [www.recruit.ox.ac.uk](http://www.recruit.ox.ac.uk).

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

### **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/](http://www.ox.ac.uk/about/jobs/preemploymentscreening/).

#### **The University's policy on retirement**

The University operates an Employer Justified Retirement Age (EJRA) for all academic posts and some academic-related posts. From 1 October 2017, the University has adopted an EJRA of 30 September before the 69<sup>th</sup> birthday for all academic and academic-related staff in posts at grade 8 and above. The justification for this is explained at:

[www.admin.ox.ac.uk/personnel/end/retirement/revisedejra/revaim/](http://www.admin.ox.ac.uk/personnel/end/retirement/revisedejra/revaim/).

For **existing** employees, any employment beyond the retirement age is subject to approval through the procedures: [www.admin.ox.ac.uk/personnel/end/retirement/revisedejra/revproc/](http://www.admin.ox.ac.uk/personnel/end/retirement/revisedejra/revproc/)

From 1 October 2017, 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.

## Benefits of working at the University

### University Club and sports facilities

The University Club provides social, sporting and hospitality facilities. It incorporates a bar, café and sporting facilities, including a gym. 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](http://www.club.ox.ac.uk) and [www.sport.ox.ac.uk/oxford-university-sports-facilities](http://www.sport.ox.ac.uk/oxford-university-sports-facilities).

### Information for international staff (or those relocating from another part of the UK)

If you are relocating to Oxfordshire from overseas, or elsewhere in the UK, the University's International Staff website includes practical information related to moving to and settling in Oxford such as advice on immigration, relocation, accommodation, or registering with a doctor. See: [www.internationalstaffwelcome.admin.ox.ac.uk/](http://www.internationalstaffwelcome.admin.ox.ac.uk/)

### 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 to settle into Oxford and to provide them with an opportunity to meet people in the area. See [www.newcomers.ox.ac.uk/](http://www.newcomers.ox.ac.uk/)

### Childcare

The University has excellent childcare services with 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 [www.admin.ox.ac.uk/childcare](http://www.admin.ox.ac.uk/childcare).

### Family-friendly benefits

The University subscribes to My Family Care ([www.admin.ox.ac.uk/personnel/staffinfo/benefits/family/mfc/](http://www.admin.ox.ac.uk/personnel/staffinfo/benefits/family/mfc/)) and staff are eligible to register for emergency back-up childcare and adultcare services, a 'speak to an expert' phone line and a wide range of guides and webinars through a website called the Work + Family space.

### Disabled staff

We are committed to supporting members of staff with disabilities or long-term health conditions. Please visit [www.admin.ox.ac.uk/eop/disab/staff](http://www.admin.ox.ac.uk/eop/disab/staff) for further details including information about how to make contact, in confidence, with the University's Staff Disability Advisor.

### 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 [www.admin.ox.ac.uk/eop/inpractice/networks/](http://www.admin.ox.ac.uk/eop/inpractice/networks/)

### Other benefits

Staff can enjoy a range of other benefits such as free visitor access to the University's colleges and the Botanic Gardens as well as a range of discounts. See [www.admin.ox.ac.uk/personnel/staffinfo/benefits](http://www.admin.ox.ac.uk/personnel/staffinfo/benefits)