



2019

**Swire Scholarship
Information Pack**



Regulations For the 2019 Swire Scholarship

The **Swire Group** is a major, well established international group of companies with business interests in property, aviation, agribusiness and food chain, marine services, and trading & industrial. The Group has been operating in Taiwan since 1948 and is now involved in a wide range of activities employing over 3,000 persons.

University College, Oxford, the first of Oxford's Colleges to be endowed, in 1249, is located on a central site on the High Street. It has in excess of 200 graduate students in residence and attaches great importance not only to the academic excellence for which the University of Oxford is renowned but also to the contributions that students make to College life.

The Swire Group of Companies is pleased to announce the availability for the 27th year of the prestigious Swire Scholarship for a DPhil at University College Oxford.

A. Regulations

1. The Swire DPhil Scholarship is tenable at University College Oxford for a three year period of research, beginning in October 2019, leading to the award of a DPhil degree.
2. The Scholarship applies to non-clinicians working in the following areas of study:
Biochemistry, Biomedical Imaging, Chemistry, Computer Science, Earth Sciences, Engineering, Immunology, Mathematics, Neuroscience, Pharmacology, Physics, Physiology and Psychology.
3. The Scholarship is open to all candidates with an excellent undergraduate record of study, who will have completed by 2019 a Masters' degree relevant to one of the areas of study listed in 2 above.
4. Applicants will normally work under the supervision of one of the Fellows of University College, but in exceptional circumstances may be supervised by another member of the University. Scholarship candidates should refer to the attached list of Fellows and their research interests. It is essential that candidates communicate with their potential supervisor, preferably by e-mail, to explore the possibility of working together. It is expected that such communication will have taken place before the application is submitted.

5. Consideration for the Swire Scholarship is restricted to candidates who have been offered a place for postgraduate study at the University of Oxford and who have designated University College as their first-choice college. Graduate students are admitted in the first instance by a University department (the 'University Admitting Body', or 'UAB'). Applicants for the Swire Scholarship must therefore have applied direct to the University of Oxford for a place on the programme of study of their choice, in accordance with the standard application procedure, naming University College as their first-choice college; the full details of the application procedure can be found in the University's Graduate Prospectus and on the University website (www.ox.ac.uk/postgraduate).

Applications for a place on a graduate programme must be submitted to The Graduate Admission Office, University Offices, Wellington Square, Oxford, OX1 2JD by the due date specified for the relevant deadline, which will normally be the second application deadline, which has a **closing date of 11 January 2019 for degrees in the Medical Sciences and for Computer Science, and 25 January 2019 for other subjects**. Please note that the closing dates for a place on a postgraduate course antedate the closing date for the Swire Scholarship.

6. The Scholarship will cover the following expenses:

- Economy class air fares, between Taiwan and London, will be provided to the scholar at the beginning and at the end of the scholarship period.
- Combined course fees for three years.
- Living expenses to the value of £17,442 per annum for a single scholar only, or £21,828 per annum for a married scholar (accompanied by spouse)

7. All applicants must be Taiwan nationals. Applicants should have the intention of returning to Taiwan after the completion of their studies to pursue a career in business, government or in a recognised profession.

8. It is a condition of the award of a Swire Scholarship that the selected candidate submit to the Swire Educational Trust a report, in English about his/her experience of life and study at University College.

B. Application Process and Calendar

1. Your application for the Swire Scholarship should consist of:

- A completed application coversheet (the University College scholarship coversheet)
- Your Curriculum Vitae
- English transcripts
- Graduation certificate
- Evidence of English ability: IELTS
- Research proposal, including details of the proposed supervisor

- Two reference letters

Please submit your application to the **Admissions Manager, University College, Oxford, OX1 4BH by 17 February 2019.**

2. Candidates must have taken the IELTS test. Applicants who would like to register for the test, please refer to the British Council Taipei.

SWIRE GRADUATE STUDENTSHIP

The following list describes the research interests of the Science Fellows of University College. Candidates are encouraged to correspond with individual Fellows, by mail or e-mail, in order to discuss projects that may be undertaken with them.

Biochemistry

Prof C J Pears

Signalling pathways that influence cell fate in during differentiation of pluripotent stem cells. Genetic, molecular and cell biological approaches are used to study these processes in a genetically tractable eukaryotic micro-organism, *Dictyostelium discoideum*. Further information is available at

<http://www.bioch.ox.ac.uk/aspsite/index.asp?pageid=595>

Bioinformatics

Prof J Hein

Molecular Evolution, Molecular Population Genetics, Bioinformatics and Comparative Genomics. Major projects in our group at present are: i) Stochastic models of sequence evolution describing insertion/deletions events as a foundation of statistical analysis of alignments; ii) the analysis of sequence data experiencing recombinations and gene conversions; iii) the simultaneous annotation (i.e. protein and RNA gene finding) of several relation genomes; iv) the analysis of viral evolution - measurements of rates and the nature of selection. For more information see <https://heingroupoxford.com/>

Chemistry

Dr J Benesch

Biophysics and novel measurement methods. Our research group is interested primarily in biophysical chemistry, understanding the forms, movements, and interactions of biomolecules and how this relates to their function in health, and malfunction in disease. We perform experiments using advanced mass-measurement approaches, and combine these measurements with nuclear magnetic resonance, crystallographic, and electron microscopic data.. Currently our work is focused on investigating

protein misfolding and deposition, which can lead to maladies ranging from Alzheimer's to cardiomyopathy. In particular we are interested to ascertain the molecular mechanism of how they are kept in check by the natural defences of the cell, and how this house-keeping process deteriorates in an ageing organism. Further information at: <http://benesch.chem.ox.ac.uk>

Prof D E Logan

Research centres on developing quantum many-body theories for a variety of experimentally relevant phenomena relating to electronic and magnetic properties of condensed matter; encompassing both the solid state, as well as topical nanoscale systems such as quantum dots and molecular electronic devices. The work is interdisciplinary, spanning the borders of chemistry and physics; prospective students may have a background in either field. Further information at:

<http://research.chem.ox.ac.uk/david-logan.aspx>

<http://www.chem.ox.ac.uk/tcg/>

<http://www.tnacs.ac.uk>

Dr M D Smith

We are a synthetic organic chemistry group with wide ranging interests in synthesis, structure and asymmetric catalysis. The group is engaged in the development of new transformations and their application in the synthesis of complex materials. We are also focused on the investigation of unusual non-covalent interactions and their implications in chemistry and biology. For more details see: <http://msmith.chem.ox.ac.uk/>, or contact Dr Smith by email.

Prof S C E Tsang

Research on both fundamental and applied aspects in Novel Chemistry Materials and Catalysis; Work involves synthesis, testing and characterisation of novel solid state materials for a wide range of applications particularly in the areas of catalysis, sensor and bio-medicine. Uses of well-defined nanomaterials as building blocks for synthesis of functional materials including development of novel core-shell metal nanoparticles of controllable composition, size and morphology as new nanocatalysts; hollow carbon nanotube as nano-scale test tube for separation, storage, magnetic, electronic applications; immobilized biomolecules on nanoparticles as new sensors, etc. In catalysis area, we work on new catalytic techniques for sustainable energy systems (fuel cells catalysts, photocatalytic solar cells, batteries, biomasses to fuels, hydrogen storage, carbon dioxide activation, capture, storage and subsequent conversion into useful chemicals/materials (reduction in

carbon emissions), etc. Further information at:

<https://scetsang.wordpress.com/> or contact Prof Tsang by email.

Computer Science

Prof M Benedikt

Computational logic -- this includes theoretical aspects of logic-based languages -- expressiveness, complexity, and decision problems on logics - as well as applications in information management and software verification. Web data management, including languages for manipulating and understanding information on the Web.

Dr A D Ker

Theory and practice of information security, particularly information hiding: steganography and steganalysis, digital watermarking, and digital media forensics. Current projects include creation and refinement of new features for machine learning steganalysis, the square root law of capacity, and steganography in multiple covers.

Prof A W Roscoe

The theory of concurrency and its applications; related automated tools. Applications of concurrency theory and tools to model driven software development. Computer security: protocol analysis, information flow and security in pervasive/ubiquitous/peer to peer networks. Computer science aspects of blockchain: consensus and decentralised algorithms as topics in applied cryptography.

Earth Sciences

Dr L Hansen

Rock deformation and the dynamics of Earth's upper mantle and lower crust. Research interests focus on relating the mechanisms of deformation at the atomic scale to processes occurring at the scale of lithospheric plates. Applications include the viscosity of the convecting mantle, post-glacial rebound, the formation of tectonic plate boundaries, and the evolution of earthquake generating faults. Primary methods involve high-temperature laboratory experiments, outcrop-scale field work, and high-resolution electron microscopy. More information at lhansen.wordpress.com and www.earth.ox.ac.uk/people/profiles/academic/larsh.

Prof G M Henderson

The development and application of geochemistry to better understand Earth's surface systems. Particular interests are in the climate of the last half million years, ocean circulation on similar timescales, the chemistry of seawater, and the global carbon cycle.

<http://www.earth.ox.ac.uk/people/profiles/academic/gideonh>

Prof T Mather

Understanding volcanoes as natural hazards and their role in the Earth system. Particular interests include: measuring and understanding the implications of volcanic deformation, using volcanic products to understand the inner workings of volcanoes and their impacts, understanding the influence of external forcings on volcanoes and their impacts and understanding the process and consequences of volcanic degassing. Further details at: www.earth.ox.ac.uk/mather; and www.earth.ox.ac.uk/research/groups/volcanology

Engineering

Prof S Collins

Sensitive Light Detectors and Receivers.

Particular interests: Sensitive receivers for visible light communications (LiFi) based upon Single Photon Detectors and novel wide field of view fluorescent optical concentrators. Sensitive light detectors for the detection of a wide range of phenomena including contamination in food processing plants, cancerous cells and bacteria. Anyone who would like further details about these areas or would like to suggest a topic of their own should contact Prof Collins by e-mail. (steve.collins@eng.ox.ac.uk)

Prof C MacMinn

Prof MacMinn studies the mechanics of multiphase systems, with an emphasis on the coupling between flow, transport, and deformation. His group uses a combination of mathematical modelling, numerical simulation, and benchtop experiments to study a variety of problems related to subsurface systems (e.g., water resources, energy resources, natural fluid migration), biological systems (e.g., cell and tissue mechanics, vascular flows, drug delivery), and commercial and industrial uses of gels.

Prof T Povey

The High Speed Turbomachinery group is interested in components within jet-engines and rockets, particularly performance-limiting components with challenging aero-thermal duties. We conduct combined theoretical, computational and experimental work in the following areas: turbine performance; turbine capacity understanding; nozzle guide vane and rotor cooling optimisation; combustor turbine interaction effects; measurement techniques in turbines; transonic facility design. We are also interested in advanced instrumentation for flow measurement. The following areas are of particular interest: measurements of angle in highly swirling flows (such as in modern combustors); measurement of flow (Mach, temperature, angle) in

aggressive environments; high-frequency temperature measurements in highly unsteady (turbine) environments; miniature probes for measurements in moderately ($M < 2$) supersonic flow; advanced IR camera techniques for metal effectiveness measurements.

More information can be found here:

<http://oti.eng.ox.ac.uk/about/people/academic-staff/tom-povey/>

For enquires about DPhil project please email:

thomas.povey@eng.ox.ac.uk

Mathematics

Prof P D Howell

Applied mathematics, in particular mathematical modelling, partial differential equations, perturbation methods and fluid dynamics. Further information at: <http://www.maths.ox.ac.uk/people/profiles/peter.howell>

Dr N Nikolov

Asymptotic behaviour of invariants of finite or infinite groups, for example expansion, word width, growth of rank or Betti numbers. Further information can be found at:

<http://www.maths.ox.ac.uk/people/profiles/nikolay.nikolov>

Medical Imaging

Prof P Jezzard

The group develops novel magnetic resonance imaging (MRI) methodologies for the study of normal and diseased brain. The majority of students in the group are physicists or engineers by background, but the projects are highly interdisciplinary involving collaborations with clinicians and neuroscientists. Research interests include the development of new MRI sequences, improved image acquisition and image processing strategies, and the quantitative measurement of human brain structure, physiology and metabolism. Further details can be found at: <https://www.ndcn.ox.ac.uk/divisions/fmrib/fmrib-physics-group>

Prof N Sibson

The goal of the Experimental Neuroimaging Group is to develop and apply imaging methods to improve our understanding of the biology of secondary cancer to the brain, or brain metastasis. To achieve this goal, we use a broad range of imaging methods, including magnetic resonance imaging and spectroscopy (MRI and MRS), positron emission tomography (PET) and single photon emission computed tomography (SPECT), for interrogating different aspects of the tumour microenvironment. Further details can be found at:

<http://www.oncology.ox.ac.uk/research/nicola-sibson>

Medical Sciences: Immunology, Neuroscience, Pharmacology, Physiology and Psychology

Prof T Dong

The main objective of my group's research is to focus on the functional aspects of the antigen specific T cells and study the factors affecting T cells in controlling virus infection and cancer development. Important human infections, cancer development and the course of disease is influenced mainly by the T cell response - while a robust and appropriate T cell response is beneficial to the host, a weak or inappropriate response can be ineffective or even have a detrimental effect. Numerous factors influence the quality of the T cell response to viral infections, predominant among them being the microenvironment of the infection site, the type of cells infected and the variability of the virus.

By understanding the key factors required for efficient viral control by the T cell response in a number of different viral infections and viral associated cancer, we aim to augment and control the immune response to as a way of improving the outcome of in several important human diseases. Our current research program aims:

- To study the Viral OncoProtein(VOP) and Tumor Specific Protein(TSP) specific T cell responses in virus associated cancer (ie HBV/HCC; EBV/NPC and HPV/CC)
- To identify the factors determining functional avidity and anti-viral/cancer efficacy of antigen specific T cells in cancer micro-environment
- To define the impact of IFTIM3 genetic variation on Influenza, and other virus infection, immune responses and disease outcome

Further information at: <https://www.imm.ox.ac.uk>

Prof T Sharp

Physiology and pharmacology of brain neurotransmitters in relation to the cause and treatment of psychiatric disorder. Current projects include i) physiological and pharmacological properties midbrain serotonin neurons and their targets, ii) role of serotonin in emotional learning, iii) function of transmitter co-release from serotonin neurons, iv) development of novel lithium-like mimetics to treat bipolar depression and impulse control disorders. Methodological approaches include: large scale in vivo recording of neurons, neurochemical and immunohistochemical analysis, rodent models of emotional and cognitive processes, neuron-specific optogenetic and pharmacogenetic manipulations. Further information at <http://www.pharm.ox.ac.uk>

Prof N Yeung

Prof Yeung's lab studies human learning, memory, and decision making using behavioural, brain imaging (EEG, fMRI), and computational methods. Current projects in the lab include: 1) Metacognition in decision making – understanding people's ability to evaluate their own decisions via detecting errors or judging confidence, and how this information is used to shape adaptive behaviour; 2) Reward-guided learning – investigating the cognitive and neural mechanisms by which people learn from experience and instruction; 3) Cognitive enhancement – combining transcranial electrical stimulation (tES) with brain imaging to improve human performance in applied settings.

Further information is available at:

<http://www.psy.ox.ac.uk/research/attention-cognitive-control-lab/>

Physics

Prof M Barnes

Plasma physics and turbulent dynamics. Research topics range from fundamental studies of the properties of turbulence in magnetized plasma

— how it is sustained, how energy is distributed amongst scales, where the energy goes once thermalized, etc. — to how plasma dynamics determine the behaviour of fusion energy experiments and astrophysical objects.

Some of the questions we are interested in answering are: What causes plasmas to spontaneously rotate? Can turbulent plasma heating be used to explain the observed structure of astrophysical accretion discs and/or the temperature of ions in the solar wind? Is it possible to control turbulence properties in laboratory plasmas? Each of these projects requires a combination of analytic theory and cutting-edge numerics carried out on the world's largest supercomputers.

Prof R J Nicholas

New semiconductor heterostructures and carbon nanotubes and studies for both fundamental physical properties and possible device applications.

Experimental techniques include electrical and optical measurements at very low temperatures in a laboratory which produces the highest magnetic fields available in Europe (70T).

Prof P A Norreys	This involves studies of the inertial fusion concept using state-of-the-art intense lasers, as well as other topical areas of high energy density science. Current projects make use of large computational data-sets, generated using state-of-art supercomputers, and machine learning techniques to extract new physics from them. These inform experiment design and interpretation. The topics being investigated include novel methods for the ignition of the compressed fusion fuel, new ways of generating ultra-bright and ultra-short X-ray pulses by combining intense lasers and particle beams from synchrotrons (for applications in other areas of the natural sciences), plasma amplifiers to generate laser pulses of extraordinary peak power and beam-driven plasma wakefield accelerators for a future collider at CERN. The team are keen to explore physics at the intensity frontier in future projects.
Prof C Terquem	Dynamics of extrasolar planetary systems and protoplanetary discs, using astrophysical fluid dynamics and classical mechanics. The aims of the research is to develop models or study some particular aspects of the systems to understand their properties and characteristics, by means of analytical theory and numerical simulations. Current projects include planet/disc interactions.
Prof J F Wheeler	My research is mostly concerned with discretized models of quantum gravity, for example euclidean and causal dynamical triangulations, which can be expressed rigorously in terms of random graph ensembles. Current work includes the relationship of boundary states in matrix models to those in Liouville/conformal field theory and questions concerning recurrence and the spectral dimension in random graph ensembles.

Contact e-mail addresses for Science Fellows of University College:

Prof M Barnes	michael.barnes@physics.ox.ac.uk
Prof M Benedikt	michael.benedikt@cs.ox.ac.uk
Dr J Benesch	justin.benesch@chem.ox.ac.uk
Prof S Collins	steve.collins@eng.ox.ac.uk
Prof T Dong	tao.dong@imm.ox.ac.uk
Dr L Hansen	lars.hansen@earth.ox.ac.uk
Prof J Hein	hein@stats.ox.ac.uk
Prof G M Henderson	gideon.henderson@earth.ox.ac.uk
Prof P D Howell	peter.howell@maths.ox.ac.uk
Prof P Jezzard	peter.jezzard@univ.ox.ac.uk
Dr A D Ker	andrew.ker@cs.ox.ac.uk
Prof D Logan	david.logan@chem.ox.ac.uk
Prof C MacMinn	christopher.macminn@eng.ox.ac.uk
Prof T Mather	tamsin.mather@earth.ox.ac.uk
Prof R J Nicholas	r.nicholas1@physics.ox.ac.uk
Dr N Nikolov	nikolay.nikolov@univ.ox.ac.uk
Prof P A Norreys	peter.norreys@physics.ox.ac.uk
Prof C J Pears	catherine.pears@bioch.ox.ac.uk
Prof T Povey	thomas.povey@univ.ox.ac.uk
Prof A W Roscoe	bill.roscoe@cs.ox.ac.uk
Dr T Sharp	trevor.sharp@pharm.ox.ac.uk
Prof N Sibson	nicola.sibson@oncology.ox.ac.uk
Dr M D Smith	martin.smith@univ.ox.ac.uk
Prof S C E Tsang	edman.tsang@chem.ox.ac.uk
Prof C Terquem	caroline.terquem@physics.ox.ac.uk
Prof J F Wheeler	john.wheater@physics.ox.ac.uk
Prof N Yeung	nicholas.yeung@psy.ox.ac.uk