AYLW1	**So we really believe in Global Warming, Right?**
Summary:	Project for 1 student *Believe it or not there are still global warming sceptics out there. One of them is David Archibald who argues that far from facing global warming the evidence is we are heading for, at best 30 years of reduced temperatures and at worst the long slow slide into the next Ice Age. His case is well supported with documentation, but if he is wrong there must be some flaws in the evidence he presents. In this project we will look at a Powerpoint presentation he gave to a 2008 New York conference, and study his arguments.(They have, incidentally been boosted by the fact we have, as he then predicted, entered a long period of low solar activity over the last two years.) The project will take the case as presented and examine each of the pieces of evidence in turn to see if they are justified and/or correct. If the evidence presented is true, then we need to see what counter-arguments we can find. We will draw conclusions accordingly!*
Supervisor:	**Prof. Alan Aylward** alan@apl.ucl.ac.uk **Allocated:** David Johnson

AYLW1.5	**Solar Variability and Climate Change: possible mechanisms**
Summary:	Modelling project for 1 student *A number of recent sceptical voices have been raised about the role of anthropogenic Carbon Dioxide in promoting global warming. In fact even the significance of current global warming trends has been questioned. Archibald (2007) for example has suggested that the CO2 warming is only a blip on the trends due to solar variability. Meteorologists have dismissed the claims of solar variability being a significant factor because the variations in total power outut from the sun, over a solar cycle forexample, is small - less than 1/10 of 1% - and these variations mainly occur in the EUV and X-ray end of the solar spectrum which affect only the thermosphere, itself a billionth part or less of the terrestrial atmosphere.* *However over many years significant correlations have been found between solar cycles and climate (or at least weather). A number of explanations have been put forward for this. Could it be due to electric coupling via a Global electric circuit between charged particle effects in the magnetosphere and the troposphere? Could it be due to gravity wave propagation down from the auroral zones to the mid-latitude tropospheric cloud layer? Could esoteric power transmission via microwaves created in Rydberg states in the upper ionosphere create and/or destroy water complexes in the troposphere and thus affect cloud production? There is even the suggestion of amelioraton via cosmic rays.* *This project will examine these suggestions and try to evaluate their probabilities. First as comprehensive a list as possible of possible mechanisms will be produced and then they will be ranked by currently accepted likelihood. Finally one or two of them will be examined in detail*

	to see if a plausible coupling mechanism can be suggested. Where possible we will try to do this quantitatively, as most prevous studies have only been qualitative.
Supervisor:	**Prof. Alan Aylward** alan@apl.ucl.ac.uk **Allocated:** Eoin Davies

AYLW2	**How well do the Milankovitch Cycles explain climate change?**
Summary:	Modelling project for 1 student *The Earth is known to have undergone a regular pattern of ice ages followed by inter-glacials. These have often been ascribed to what are called the Milankovitch Cycles - changes in the Earth's orbit or its inclination. There are three of these "cycles" all with different cycle lengths of the order of tens to hundreds of thousands of years. Though the Earth's climate cycles appear to be of the same order of magnitude the ice-core record is very noisy, and it is not always easy to see what the global climate effect might be of any one cycle. This project will see whether simple modelling of the Earth's atmosphere and surface can be made to match the climate record if the Milankovitch changes are fed in.*
Supervisor:	**Prof. Alan Aylward** alan@apl.ucl.ac.uk **Unallocated:**

AYLW3	**Global Electric Circuit: a simple analogue for the terrestrial case**
Summary:	Experimental modelling - 1 student *The Earth's ionosphere is charged to a potential of 120kV with respect to the ground. The charging mechanism is lightning from thunderstorms, and the "relaxation" from this state is due to a very low but globally distributed discharge current in the fine weather areas. The overall electrical circuit description is complicated by the potential drop also included across the Polar regions due to interactions with the solar wind, and "penetration" fields caused by magnetospheric and terrestrial ring current changes. In order to understand the interactions between these effects it is proposed to build a simple model of the terrestrial Global Electric Circuit, using analogues circuit components (that is resistors, batteries, diodes etc) and run this modifying the values in the components to see what insight this gives us into the way the Earth would be expected to react to the range of inputs. This sort of analogue for the GEC can be used as an input to complex Global Circulation models of the Earth's atmosphere: how feasible this is might also be investigated if there is enough time left at the end of the project.*
Supervisor:	**Prof. Alan Aylward** alan@apl.ucl.ac.uk **Unallocated:**

AYLW4	**Nested Grid Implementation in Global Circulation models**
Summary:	Modelling project for 1 student *The Atmospheric Physics Lab has two models of the Earth's atmosphere and ionosphere. This type of model os known as a GCM - A Global Circulation Model - because is used to simulate the motions (winds) in the*

	atmosphere. They use a lat-long-height grid on which they solve the fluid equations of momentum, energy and continuity. The amount of time such a model takes to run is of course dependent on the number of grid volumes there are in the model - if you go to finer resolution the number of grid boxes goes and so the computation takes longer. A typical grid size for the current models might be 5 degrees by 5 degrees by 3 km height. This is satisfactory to simulate typical global effects like solar heating, but there are some inputs (like auroral heating) which take place on a much finer scale. To try to run the full global model at that resolution would be impossible as the time taken for such simulations would tax even the largest computer systems. One alternative that has been suggested is the use of "nested grids" - that is fine grids with a resolution needed for the fine-grain studies, nested inside the coarser global grid. The problem with this suggestion is that there are numerical difficulties at the boundary between the nested model and the global model. This project will look at the way the current models solve the governing equations numerically, and try to suggest what procedures might be used at the boundary between a fine and coarse grid to maintain stability
Supervisor:	**Prof. Alan Aylward** alan@apl.ucl.ac.uk **Unallocated:**

AYLW5	**An Asymmetry in the Earth's upper atmosphere**
Summary:	Analysis project for 1 student *Recent satellite results from the CHAMP satellite has revealed unexpected structure in the Earth's upper atmosphere - that part known as the thermosphere which is the interface between the lower atmosphere and "space". In particular, unexpected asymmetries have been found which cannot be explained by simple solar heating. The Atmospheric Physics Lab has a model of the earth's thermosphere and ionosphere with which possible effects can be tried out. This model is built with some basic assumptions which tend to give symmetric solutions. The question is, how can the model be changed to make it produce the asymmetries that are seen? Initially this will be done entirely theoretically, by taking the theory of how the model works and suggesting mechanisms that might be included. If progress is made on this it might be possible to progress to the next stage of implementing these ideas in the model itself.*
Supervisor:	**Prof. Alan Aylward** alan@apl.ucl.ac.uk **Unallocated:**

BAR1	**Optical trapping and cooling nanoscale particles**
Summary:	1 or perhaps 2 students Experimental *There is currently considerable interest in exploring the boundary between the quantum and classical world in nanoscale devices. This projects aims to construct and characterize an optical tweezers system*

	in a vacuum. This device will be used to trap small nanoscale particles and reduce their translation energy in the trap via electronic feedback to the trapping laser.
Supervisor:	**Prof. Peter Barker** p.barker@ucl.ac.uk **Allocated:** Alexander Dunning and Peter Edmunds

BARTL	**Gauss Accelerator Study**
Summary:	1 or 2 students experimental - *It is well understood that it is possible to accelerate ferromagnetic objects utilising pulsed magnetic fields. In this study, students will produce a simple 1 / 2 stage accelerator to demonstrate the principles used in such systems and to give an insight into the design of particle accelerators utilised in such places as CERN.*
Supervisor:	**Dr Paul Bartlett** paul.bartlett@ucl.ac.uk **Allocated:** Michael Davis and Rob Clouth

BLUM1	**Simulation of electron transport in aqueous solutions**
Summary:	1 student theory *Electron transport is a common phenomenon in many energy converting processes, in fuel cells, biomolecular machines and enzymes of the respiratory chain and photosynthetic pathway. We are currently developing a method that allows us to simulate the effective interaction of an excess electron with water and solvated ions. The interaction is described by a molecular pseudopotential parametrized to reproduce experimental or ab-initio data. The corresponding one-electron Schroedinger equation is solved for ground and excited electronic states and the coupled ion-electron dynamics is propagated using molecular dynamics simulation. In this way we hope to be able to compute transport characteristics of the excess electron and to compare with analytic theories and empirical rate expressions.*
Supervisor:	**Dr Jochen Blumberger** ucapjbl@ucl.ac.uk **Unallocated:**

BLUM2	**Proton transport pathways in hydrogen converting enzymes**
Summary:	1 student theory/modelling of experimental data *Proton transport is a second common phenomenon in many energy converting processes. In biological proton pumps, for instance, chemical energy is converted into a proton gradient which in turn is used to drive other cellular processes. It is often unclear how protons are transported into, through and out of biomolecules. Here we aim at developing an algorithm that allows us to identify possible proton transport pathways in biomolecules. Starting from the protein crystal structure we generate an*

	ensemble of different structures and weight them according to their thermal accessibility and likelihood for proton conduction. The method will be applied to proton transport in hydrogenases. These are enzymes that catalyze the oxidation of molecular hydrogen into protons and electrons. They are of great technical relevance as they may serve as future catalysts in fuel cells.
Supervisor:	**Dr Jochen Blumberger** ucapjbl@ucl.ac.uk **Unallocated:**

BLUM3	**Computation of redox properties of solvated transition metal ions**
Summary:	1 student theory *Recent advances in density functional molecular dynamics simulation and photo electron spectroscopy has made it possible to study the redox properties of solvated ions and molecules in unprecedented detail. The central quantity of interest is the vertical ionization energy of the solvated ion computed along an ab-initio molecular dynamics trajectory. This quantity can be related to the lowest energy peak of the photo-electron spectrum (PES) corresponding to the highest occupied molecular orbital. Very recently, energy resolved PESs have been measured for a number of transition metal ions in aqueous solution. Here we plan to carry out ab-initio molecular dynamics calculations to interpret these spectra and to characterize the structure and dynamics of the ionic solutions.*
Supervisor:	**Dr Jochen Blumberger** ucapjbl@ucl.ac.uk **Unallocated:**

BOWL1	**Modelling nanowire growth on semiconductor surfaces (theory)**
Summary:	1 student theory/modelling of experimental data *We will use rate-diffusion equations to model the nucleation and growth of nanowires on semiconductor surfaces. This will allow us to make links between experimental STM measurements of nanowire formation and atomic calculations.*
Supervisor:	**Dr David Bowler** david.bowler@ucl.ac.uk

	Allocated: Steven Kinghorn

BOWL2	**Understanding ammonia decomposition on Si(001)**
Summary:	1 student theory/ modelling of experimental data *We will build a kinetic Monte Carlo model of ammonia decomposition on Si(001) to test for correlations in the formation of patterns on the surface. This will allow us to check STM measurements, and understand how the surface can be passivated.*
Supervisor:	**Dr David Bowler** david.bowler@ucl.ac.uk **Unallocated:**

BRAM1	**Investigation of spin ice and related phenomena**
Summary:	Experimental - theoretical 1 student *Spin ice, discovered in our group, is a remarkable magnetic substance showing zero point entropy and emergent magnetic `monopoles' at low temperature (see the recent New Scientist cover article, 6th May, 2009). This project will combine theory and experiment to investigate spin ice and related materials.*
Supervisor:	**Prof. Steve Bramwell** s.t.bramwell@ucl.ac.uk **Unallocated:**

BRAZ1	**Lab in your PC - adsorption of bismuth on the Si(110) surface**
Summary:	Theoretical 1 student *The Si(110) surface has recently become important in the semiconductor industry. It is used either clean or with adsorbed atoms of another element. In this theoretical project the student will investigate adsorption of Bi atoms using density functional theory and standard modelling software. The project results will form a base for further research on Bi adsorption on Si(110). The student will learn the fundamentals of computer simulations on solid state materials. He or she will be expected to learn the basics of the Linux operating systems during the project, to discuss the progress regularly with the supervisors, and to draw independent conclusions from their results.*
Supervisor:	**Dr Veronika Brazdova** v.brazdova@ucl.ac.uk **Allocated:** Greg Lever

BRAZ2	**Lab in your PC - growth of silicon surfaces**
Summary:	Theoretical 1 student *Recent developments in CMOS transistor technology are either grown on or create Si(110) surfaces. In this theoretical project the student will use the tight binding method to investigate growth of silicon on the Si(001) surface. This type of growth has been experimentally shown to create Si(110) sidewalls and the aim of this project is to elucidate the process. The student will learn the fundamentals of computer simulations on solid state materials. He or she will be expected to learn the basics of the Linux*

	operating systems during the project, to discuss the progress regularly with the supervisors, and to draw independent conclusions from their results.
Supervisor:	**Dr Veronika Brazdova** v.brazdova@ucl.ac.uk **Unallocated:**

BROWNE1	**Photon-based quantum computing in the presence of "dark-counts".**
Summary:	Theoretical 1 student *Photons are a good candidate for information carriers in quantum computing. However, detecting single photons efficiently remains a technological challenge. A "dark count" is an error in a photon detector - when a photon detector fires even though no photon was present. This presents a practical problem for proposals for quantum computation which assume that photon-detection is perfect. This project will involve learning how to model the quantum detection of light in the presence of dark counts, discovering the extent to which dark counts affect current experiments and how they reduce the performance of proposed quantum computation schemes. This is a theoretical project, for which a solid background in quantum mechanics and an interest in theory applied to experiment is essential.*
Supervisor:	**Dr Dan Browne** d.browne@ucl.ac.uk **Allocated:** Leah Pirondini

BUTTER1	**Modelling the highest energy collisions in the world** (2 Projects)
Summary:	2 students modelling/programming
Supervisor:	**Prof. Jon Butterworth-Dr Ben Waugh** jmb@hep.ucl.ac.uk **Allocated:** Liam Duguid and Alexander Radovic

CACI1	**Near-infra red emitting materials for organic electronics**
Summary:	Experimental – 1 students *This project will involve characterisation of the optical and electrical properties of a new class of organic semiconductors with extremely low energy gap, and thus absorption and emission in the NIR range.* *The student will learn how to prepare thin films of these materials on a variety of substrates and to incorporate them into LEDs and photovoltaic diodes, as well as to characterise their optical, electroluminescent and photovoltaic properties.*
Supervisor:	**Prof. Franco Cacialli** f.cacialli@ucl.ac.uk **Allocated:** Jonathan Binas

CACI2	**Time-correlated single-photon counting (TCSPC) of radiative decay of organic semiconductors and related nanostructures.**
Summary:	Experimental - Also available for MSc students *This project will provide an opportunity to gain expertise in the area of conjugated, polymeric semiconductors which is attracting a burgeoning interest, world-wide, in both condensed matter physics and, especially, Optoelectronics.*

	Conjugated polymers are carbon-based materials with extended pi-electron orbitals that can support both charged and neutral excitations. They are characterised by a rich photophysics revolving around the formation, diffusion, radiative or non-radiative decay, as well as dissociation and/or endothermic regeneration of excitonic species (bound hole-electron pairs – 04-1 eV binding energy). A precious tool to investigate such phenomena, that also underpin the exploitation of these materials in polymer light-emitting (PLEDs) and photovoltaic diodes, PVDs, field-effect transistors, as well as in FETs and light-emitting transistors (LETs), is time-resolved photoluminescence spectroscopy. *This project will make use of a recently acquired state-of-the-art TCSPC spectrometer to look at the decay dynamics of organic semiconductors solutions, thin films and self-organised or lithographed nanostructure, on the ps and ns timescales. The emphasis will be, in particular, on the control of intermolecular interactions in covalently or supramolecularly engineered organic semiconductors that we access via collaboration with a range of world-leading synthetic chemists.*
Supervisor:	**Prof. Franco Cacialli** f.cacialli@ucl.ac.uk **Allocated:** Andrew Strang

CAMP1	**Modelling the highest energy collisions in the world** (1 Project)
Summary:	1 student modelling/programming
Supervisor:	**Dr Mario Campanelli - Dr James Monk** mario.campanelli@cern.ch **Allocated:** Sean Blumenfeld

CYR1	**Building a magnet one atom at a time**
Summary:	Experimental - 1 Students Theoretical modelling and experimental data analysis (MSci) *Using a scanning tunneling microscope (STM), we have built magnetic nanostructures one atom at a time and understood their magnetic configurations by probing their collective spin excitations using inelastic tunneling. These nanomagnets are model systems for studying quantum spin interactions, and may be useful in future data storage and computation paradigms. Previously, we have understood the effects of magnetic anisotropy, spin-coupling, and Kondo screening in individual magnetic atoms in great detail. This project will focus on modeling results from larger structures, and also on understanding the fundamental tunneling mechanisms involved in creating the excitations. We will also explore what configurations could be particularly interesting to explore in future experimental studies.* *This project will require strong computational skills and a solid background in quantum mechanics.*
Supervisor:	**Dr Cyrus F. Hirjibehedin** c.hirjibehedin@ucl.ac.uk and co-supervisor **Prof. Andrew Fisher** andrew.fisher@ucl.ac.uk **Allocated:** Robert Michaelides

CYR2	**Electrical and magnetic properties of graphene nanostructures**
Summary:	Experimental - 1 Students
Supervisor:	**Dr Cyrus F. Hirjibehedin** c.hirjibehedin@ucl.ac.uk **Allocated:** Stephen Gaw

DUFF1	**Modelling nanoparticles**
Summary:	1 student Theoretical *Computer modelling can make a significant contribution to the understanding of the properties of nanoparticles. However the shapes of nanoparticles vary widely and depend strongly on the method of production. The equilibrium shape of a crystal is related to the energy of the surfaces via the Wulff theorem. The aim of this project is to write a computer program that can be used to calculate the coordinates of the atoms of a nanoparticle for a range of materials, given the crystal structure and surface energies. The coordinates could then be used as input to a molecular dynamics program that could be used to calculate a range of properties. Some programming experience will be necessary for the project.*
Supervisor:	**Dr Dorothy Duffy** d.duffy@ucl.ac.uk **Allocated:** Paul Gorman

DUFF2	**Modeling radiation damage in Zirconolite**
Summary:	1 student Theoretical
Supervisor:	**Dr Dorothy Duffy** d.duffy@ucl.ac.uk **Allocated:** Sean Yardley

FARI 1	**High-order harmonic generation in diatomic molecules: control of quantum-interference patterns**
Summary:	1 student theory *High-order harmonic spectra in molecules subjected to intense laser fields (10^{14}W/cm^2 or higher) are a powerful tool for extracting information about its structure with precision of hundreds of attoseconds (10^{-18}s) [1]. This is due to the fact that high-order harmonic emission is theconsequence of the recombination of an electron with a bound state of its parent ion [2]. In a molecule, there is a specific configuration of centers with which the electron may recombine, and this structure manifests itself as interference patterns. Recently, we have different recombination scenarios, involving one or two centers, in the context of high-order harmonic generation in diatomic molecules. We have employed semi-analytic methods, and have been able to identify particular sets of electron orbits, which contribute the most to the interference patterns in the spectra [3]. In this project, the work developed in [3] will be taken a step further, and we intend to control such patterns by employing driving laser pulses of specific shapes or polarization. In particular, we intend to find driving-field configurations in order to localize the electron in specific spatial regions in the molecule,*

	and thus suppress or enhance the interference patterns in the high-order harmonic spectra. This project will involve analytical computations within an S-matrix framework to a great extent, and also extending existing codes for monochromatic fields to more complex pulse shapes and polarization. See the website http://www.homepages.ucl.ac.uk/~ucapcfi/ [1] See, e.g., H. Niikura,et al, Nature **417**, 917 (2002); Nature 421, 826 (2003); S. Baker, et al, Science **312**, 424 (2006). [2]P. B. Corkum, Phys. Rev. Lett. **71**, 1994 (1993). [3]C. Figueira de Morisson Faria, Phys. Rev. A 76, 043407 (2007).
Supervisor:	Dr Carla Faria c.faria@ucl.ac.uk **Unallocated:**

FISH1	**Density functional theory of magnetic atoms in the STM**
Summary:	1 student Theoretical *Theoretical modelling of the interactions of magnetic species on imaged using scanning tunneling microscopy*
Supervisor:	**Prof. Andrew Fisher** andrew.fisher@ucl.ac.uk **Allocated:** Anders Schuller

FORD1	**Theory of nanoelectronic kinetics**
Summary:	Theoretical project for 1 student
Supervisor:	**Prof. Ian Ford** i.ford@ucl.ac.uk **Allocated:** Danial Khan

HARK1	**Waves in model polycrystalline materials**
Summary:	Theoretical *Ultrasonic waves are often used to inspect materials for flaws, but engineering materials are polycrystalline and the boundaries between crystallites scatter the elastic waves to produce 'noisy' signals. There are many theories which account for this scattering, but most assume that the scattering takes place far from the transmitter and detector. Also, the theories make predictions which are averaged over different realisations of the medium, whereas in reality each experiment is done on one realisation of the medium. This project will use numerical modelling of a simplified problem (two dimensions, acoustic waves instead of three dimensions, elastic waves) to explore these phenomena. The student will write the code for the model from scratch, as well as applying it and*

	analysing the results.
Supervisor:	**Dr Tony Harker** a.harker@ucl.ac.uk **Allocated:** Daniel Deacon-Smith

HARK2	**Electrons in image states**
Summary:	Theoretical *The method of images (familiar from the second year E&M course) tells us that a charged particle will be attracted to a metal surface. Less familiar is the fact that this is more general -- a charged particle in one medium will be attracted (repelled) by a medium with a higher (lower) relative permittivity. It has been suggested that this effect, combined with a negative electron affinity barrier, might provide a mechanism by which electrons could be held in vacuo above the surface of a solid, and channeled from place to place, perhaps forming 'flying qbits' in quantum information processing devices. This project will study the wavefunctions, in two dimensions, of electrons in such situations. The project is heavily computational, and will use a combination of an existing FORTRAN program, data analysis and fitting routines to be written by the student, and a finite element package for the computation of the wavefunctions.*
Supervisor:	**Dr Tony Harker** a.harker@ucl.ac.uk **Unallocated:**

HOOG1	**Scanning Kelvin Probe Microscopy in Aqueous Solution**
Summary:	1 experimental – *The atomic force microscope (AFM) is the only instrument that allows (sub-)nanometre-resolution imaging of biological molecules under physiological conditions. This makes it a powerful tool to investigate their dynamic behaviour and structure. A disadvantage of the AFM, however, is its lack of chemical specificity. Different molecules may appear differently in an AFM image, but – without detailed theoretical understanding – in a way that is not quantitatively understood.* *The surface potential (or work function for metals) is a physical property that allows to distinguish different molecules or even different domains on the same molecule. It can be accessed using Kelvin probe methods, which effectively measure the potential energy stored in the capacitor formed by*

	the sample and the probe. In scanning Kelvin probe microscopy, the AFM tip acts as such a probe and enables us to do a local measurement of the surface potential. This method has been applied successfully in vacuum and air. In aqueous solution, its application is hampered by electrochemical processes and by the reduced signal-to-noise ratio due to viscous damping of the cantilever in water. In a collaboration with King's College London, we have shown that electrochemical processes can be avoided by using oxidised silicon tips and by properly contacting them. *The aim of this Masters project is to optimise the Kelvin probe method for high-resolution imaging of the local surface potential in aqueous solution. To this end, the student will:* *(a) Acquire AFM images in aqueous solution using the frequency shift of the cantilever as a measure of the tip-sample interaction. This method has recently yielded atomic-resolution images of the mica-water interface.* *(b) Develop a method for detecting the Kelvin probe signal simultaneously with the topography, both acquired with the tip at minimum distance above the surface. This method is commonly used in vacuum environment. During this project, it will first be applied in air, to measure the surface potential and topography on well-understood samples.* *(c) Once the technique is properly understood and optimised, it will be applied in aqueous solution, to measure the local surface potential and to control electrostatic interactions on hard surface and on biomolecules.* *The project is suited for a student with flair for delicate experiments and a strong interest in searching and stretching the limits of nanometre-scale technology. We envisage high-resolution AFM imaging of physically, chemically and biologically relevant surfaces in liquid environment.* **References:** Zerweck *et al*., Phys. Rev. B 71, 125424 (2005), Hoogenboom *et al*., Appl. Phys. Lett. 88, 193109 (2006), Sinensky and Belcher, Nature Nanotechnol. 2, 653 (2007).
Supervisor:	**Dr Bart Hoogenboom** b.hoogenboom@ucl.ac.uk **Unallocated:**

HOOG2	**Optical actuation of nanomechanical resonators**
Summary:	1 student theoretical/modelling *The aim of this project is to provide a quantitative description for laser-driven actuation of nanomechanical resonators/cantilevers. To this end, the student will work on a theoretical/numerical model for the laser-controlled temperature in a cantilever and its effect on the cantilever bending, and experimentally test it in our interferometric cantilever detector.* *This project covers a wide range of disciplines and applications, ranging from theoretical physics to experimental nano-optics and from atomic force microscopy to (potentially) quantum mechanical oscillators, and will therefore be a highly valuable experience in nanoscientific research. We are looking for a student with a strong interest in both theoretical and experimental methods in nanotechnology.*

Supervisor:	**Dr Bart Hoogenboom** b.hoogenboom@ucl.ac.uk **Allocated:** Jake Stinson

HOOG3	**AFM-imaging of biomolecules with picoNewton forces**
Summary:	1 student experimental *Most atomic force microscopes (AFMs) routinely give access to surface properties at the scale of some nanometres. It is less trivial, however, to improve the resolution to the sub-nanometre range. Especially for imaging delicate biological molecules on surfaces, a "gentle touch" is required.* *In this project, the student will reduce the load forces and acquire AFM images of biomolecules using magnetically actuated cantilevers. The aim is to quantitatively assess and optimise the influence of the applied force on the AFM images. To this end, the student will:* *(d) Apply and optimise a magnetic method for controlling the cantilever oscillation in liquid.* *(e) Measure how elastic and dissipative forces (in the picoNewton range) translate to changes in the cantilever oscillation.* *(f) Demonstrate how these forces affect high-resolution imaging in liquid environment, preferably based on atomic-resolution images of hard surfaces and (sub-)molecular resolution of biological samples.* *The project is suited for a student with flair for delicate experiments and a strong interest in searching and stretching the limits of nanometre-scale technology with applications in the life sciences.*
Supervisor:	**Dr Bart Hoogenboom** b.hoogenboom@ucl.ac.uk **Unallocated:**

HOOG4	**The study of DNA wrapping/condensation using imaging of surface charges**
Summary:	1 student experimental
Supervisor:	**Dr Bart Hoogenboom** b.hoogenboom@ucl.ac.uk **Allocated:** Elliott J Menter

JONE1	**Design a microscope objective lens**
Summary:	1 student theory *Ray-tracing is a powerful technique in the design of optical systems. By applying simple rules to trace the path of a ray of light the imaging properties of complex optical systems can be determined and optimised. Curiously, the defects or aberrations of a real optical system can be quantified by the tracing of ideal rays.* *The aim of this project is to model a complex multi-element optical system such as a microscope objective with paraxial ray-tracing, and optimise the design by compensating the third-order aberrations initially for imaging with monochromatic light. Such a lens may be used for the high-resolution imaging of optically trapped cold atoms. The student can then investigate the effects of chromatic aberrations and their correction in the*

	design of an objective for a light microscope. Suggested reading: W T Welford, Optics (OUP, 1988) F A Jenkins & H E White, Fundamentals of Optics (McGraw-Hill, 1976)
Supervisor:	**Dr Phil Jones** philip.jones@ucl.ac.uk **Allocated:** Caroline J Harfield

JONE2	**Optical nanofibres**
Summary:	1 student experiment *Optical fibres form the backbone of modern telecommunication systems. A typical telecoms fibre consists of a glass core and cladding layer several microns in diameter. An optical nanofibre is made from astandard fibre by pulling to create a tapered region that has a diameter less than the wavelength of the light that is propagating in it. This gives rise to a large evanescent field in the tapered region that can interact strongly with surrounding particles and optically bind them to the nanofibre. Such a device could have many potentially useful applications for optical trapping, guiding and sorting of particles. The aim of this project will be to produce optical nanofibres and integrate them into an experiment to optically trap particles in the evanescent field, and measure the trapping forces.* Suggested reading: V I Balykin, K Hakuta, Fam Le Kien, J Q Liang & M Morinaga, Atom trapping and guiding with a subwavelength-diameter optical fiber, Phys. Rev. A 70 011401(R) (2004) G Brambilla, G Senthil Murugan, J S Wilkinson & D J Richardson, Optical manipulation of microspheres along a subwavelength optical wire, Opt. Lett. 32 3041 (2007)
Supervisor:	**Dr Phil Jones** philip.jones@ucl.ac.uk **Unallocated:**

JONE3	**Optical vortices**
Summary:	1 student theory/experimental *An optical vortex is a phase singularity in the wavefront of a laser beam; a point around which the phase increases with angle, i.e. $\Phi = 2\pi m$, where m is an integer, the topological charge of the vortex. The wavefront is helical around the vortex, where all phases are present, producing a zero of electric field of the laser, and a dark spot in the intensity. The aim of this project is to model the propagation of a laser beam containing a number of vortices. This situation is interesting because the presence of several vortices in the same beam alters the local phase environment for each, leading to the vortices moving across the beam profile as the beam propagates, and has relevance to problems in superfluid hydrodynamics, cold atom physics and catastrophe theory. Results from the theoretical investigation may be compared to experimental results from the laboratory.* Suggested reading:

	D Rozas, C T Law, and G A Swartzlander, Jr., *Propagation dynamics of optical vortices*, J. Opt. Soc. Am. B **14** 3054-3065 (1997). F Flossman, U T Schwarz, and M Maier, *Optical vortices in a Laguerre-Gaussian LG_0^1 beam*, J. Mod. Opt. **52** 1009-1017 (2005)
Supervisor:	**Dr Phil Jones** philip.jones@ucl.ac.uk **Allocated:** Soliman Edris

KOHL1	**Interatomic interactions in ultracold Fermi gases**
Summary:	Theoretical: 1 student *The observation of Fermi degeneracy in dilute gases of trapped Fermi atoms in 1999 has been a milestone in the physics of ultracold matter at temperatures well below 1 mK. This project involves studies of the interactions in gases composed of 40K or 6Li atoms prepared in identical internal states.*
Supervisor:	**Dr Thorsten Kohler** t.kohler@ucl.ac.uk **Allocated:** Chris Kirkham

LANC1	**Particle Physics Beyond the Standard Model - a search for muon to electron conversion**
Summary:	1 Student – Simulation project *In the next two years or so the LHC will hopefully reveal new physics beyond the Standard Model of Particle Physics. Such new physics is likely to point the way towards the Grand Unified Theories (GUTs) unifying Quantum Mechanics and Gravity. In such GUTs it is generally predicted that the conservation of lepton number is not sacrosanct, such that processes where muons convert to electrons (without associated neutrinos) are predicted to occur. In this project you will develop simulation programmes (in C++ on Linux) to model a proposed experiment(COMET) that is seeking to measure (or place a limit) on the rate at which muons convert into electrons. The results will be used to optimise the design of the experiment to maximise the sensitivity to new physics beyond the Standard Model*
Supervisor:	**Prof. Mark Lancaster** markl@hep.ucl.ac.uk **Allocated:** Andrew Verra

LEE1	**Bose-Einstein Condensate in a Toroidal trap**
Summary:	Theoretical: 1 student *Superfluidity can now be studied in the laboratory in Bose condensed ultra-cold atomic gases. This project will use numerical techniques to examine superfluidity and quantum effects in an atom trap with toroidal geometry.*
Supervisor:	**Dr Mark Lee** mark.lee@ucl.ac.uk **Allocated:** Richard J Stones

LYNCH1	**Optical manipulation and control of energy states in novel materials for quantum computing applications.**
Summary:	1 student Experimental

Supervisors:	**Dr Stephen Lynch** stephen.lynch@ucl.ac.uk **Allocated:** Rabiah Ahmad

LYNCH2	**Autocorrelation: A technique for the measurement of ultra-short optical pulses.**
Summary:	1 student Experimental
Supervisors:	**Dr Stephen Lynch** stephen.lynch@ucl.ac.uk **Unallocated:**

MUR1	**Josephson effect in cold gases**
Summary:	1 student Theory *The Josephson effect is one of the most striking phenomena associated with superfluidity, and has been recently observed in experiments with cold atomic gases. This project will study this effect for the case of mixtures of such gases.*
Supervisors:	**Dr Jordi Mur-Petit** j.mur@ucl.ac.uk **Unallocated:**

NICHOL1	**Preventing terrorism using cosmic ray muons**
Summary:	Programming – simulation : 1 Student *Cosmic ray muon tomography is an imaging technique that utilises cosmic rays to create images of matter density. The CREAM TEA project proposes to use this technique to monitor large enclosed public spaces, such as train stations, for unusual dense objects, such as bombs. This project will research the feasibility of the method using standard particle physics simulation tools.*
Supervisor:	**Dr Ryan Nichol** rjn@hep.ucl.ac.uk **Allocated: Will Brigg**

NICHOL2	**Neutrino fishing in Antarctica**
Summary:	Programming – simulation : 1 Student *There are several current and currently proposed experiments to utilise the Antarctic ice as a target medium for a gigantic ultra-high energy neutrino telescope. This project will simulate the sensitivity of the proposed ARIANNA experiment, which plans to deploy large numbers of semi-autonomous radio detectors across the Ross Ice Shelf to search for the elusive particles.*
Supervisor:	**Dr Ryan Nichol** rjn@hep.ucl.ac.uk **Unallocated:**

NUGYEN1	**Synthesis and Charactersisation Magnetic Nanoparticles**
Summary:	Experimental : 2 Student

	The project will involve the synthesis of magnetic nanoparticles using chemical methods. The student will also learn a variety of techniques to characterise the synthesised nanomaterials. Transmission electron microscopy (TEM) will be routinely used to characterise size, shape and monodispersity of nanonmterials, thereby enabling the determination of the successful synthesis. X-Ray diffraction (XRD) will also be used at later stage to characterise further the structure of materials. Superconducting QUantum Interference Devices (SQUID magnetometer) will be used to characterise the magnetic properties of the materials. The students will also experience some other techniques such as dynamic light scattering technique, elemental analysis by ICP-AES, hyperthermia measurement and MRI.
Supervisor:	**Dr Nguyen TK Thanh** ntk.thanh@ucl.ac.uk **Unallocated:**

NURSE1	**Investigating new techniques to find Higgs events at the LHC**
Summary:	Experimental : 1 Student *The discovery (or exclusion) of the elusive Higgs boson is an essential next step in experimental particle physics, and is indeed one of the main aims of CERN's Large Hadron Collider (LHC) in Geneva, Switzerland. The aim of this project is to investigate new techniques to distinguish collisons that produce a Higgs boson from those that produce less interesting particles. You will study a Higgs production process known as Vector Boson Fusion, which has the distinguishing feature that the Higgs is produced in association with very few additional particles close by. You will try out techniques that utilise this feature to identify Higgs events. This project will start just as the LHC begins operation, giving you the oppurtunity to really contribute to the forefront of fundamental research!* *You will be using and developing C++ programmes on linux.*
Supervisor:	**Dr Emily Nurse** nurse@fnal.gov **Allocated:** Hannah Jones

PEAC1	**Evolution of electron wave packets in highly excited atomic and molecular states**
Summary:	1 student Theory *Only shortly after the excitation of an electron to a highly excited atomic state, the electron wave packet obeys classical dynamics; later many quantum mechanical features become apparent in the evolution of the wave packet. Eventually the wave packet of the bound electron has spread sufficiently around the orbit that it interferes with itself -- a sort of quantum interference.*
Supervisor:	**Dr. G Peach** g.peach@ucl.ac.uk **Unallocated:**

PEAC2	**Collisions between ultracold atoms and loss mechanisms from condensates**

Summary:	1 student Theory *Bose-Einstein condensation in an atomic gas was first observed in 1995 in Boulder, Colorado. About 2000 atoms were trapped in a condensate and since then rapid progress has been made so that millions of atoms can now be trapped at nanokelvin temperatures. Whether or not the atoms can be magneto-optically trapped depends on many factors, including the atomic interactions and how effective collisions may or may not be in removing atoms from the condensate. This is a rapidly developing field and new data on loss rates are becoming available all the time.*
Supervisor:	**Dr. G Peach** g.peach@ucl.ac.uk **Unallocated:**

RENZ1	**Laser spectroscopy of the atomic caesium**
Summary:	1 student experimental
Supervisor:	**Prof. Ferruccio Renzoni** f.renzoni@ucl.ac.uk **Allocated:** Maximilian Genske

ROB1	**Structure of nanowires**
Summary:	1 student experimental/data analysis *CXD methods will be used to study individual Silicon Nanowires (SiNWs) to look for evidence of strain fields. The diameters of these, in the range 20-80nm, are considerably smaller than the 500-1000nm crystals of Au and Pb previously studied. The scattering cross section of Si is also considerably smaller. It is therefore essential to focus the beam. This is possible using Kirkpatrick-Baez (KB) mirror optics, which are available at the APS 34-ID-C beamline, but this must be achieved without spoiling the coherence. The diffraction from a small object being more spread out means that the additional divergence, a consequence of Liouville's theorem, can still be tolerated. Rich patterns of strain are expected inside the wires as a consequence of the growth conditions. We will analyse these data and simulations to look for evidence of strain.*
Supervisor:	**Prof Ian Robinson** i.robinson@ucl.ac.uk **Unallocated:**

ROB2	**X-ray Ptychography**
Summary:	1 Student Experimental *The project will develop the methodology of X-ray Ptychography, which is the simultaneous inversion of diffraction patterns measured from overlapping regions of a sample. This will be used to investigate domain-wall structures in alloys and oxides, but the scope will expand to include other nanoscale materials and biological samples*
Supervisor:	**Prof. Ian Robinson** i.robinson@ucl.ac.uk **Unallocated:**

ROB3	**Single molecule imaging**
Summary:	1 Student Simulation/programming *Hard X-ray free-electron laser X-ray sources have not yet been built, but will exist one day at Stanford and Hamburg. Such a source will be able to capture the diffraction pattern of a single molecule in a single flash of duration 10-20 femtoseconds. It is predicted that the diffraction pattern will emerge before the molecule is destroyed by the radiation dose. Before the sources are available, we are developing the methods that will be used one day for this purpose:* *i) massively parallel X-ray detectors* *ii) inversion algorithms for phasing the diffraction* *iii) x-ray optics for focusing the beam while preserving its coherence*
Supervisor:	**Prof. Ian Robinson** i.robinson@ucl.ac.uk **Unallocated:**

ROB4	**Au-Si Eutectic Structures**
Summary:	1 Student Simulation/programming *In our coherent diffraction (CXD) work to date, we have observed that drops of Au can be created by thermal dewetting of an evaporated film of the appropriate thickness, at least on an inert SiO_2 substrate, and that these can crystallise into randomly-oriented crystals. Dewetting upon heating of Au deposits on UHV-clean Si will produce similar particles, and subsequent intermixing with the substrate should cause a eutectic phase to separate. Because it is liquid, a eutectic phase is very hard to identify, but, with the new information that it has a unique ordered surface structure over a certain temperature range, this can now be achieved by surface diffraction methods. This will be studied by tracking the texture changes as a function of time and the breakup of the powder ring into discrete Bragg spots from the individual crystals. Evidence of Au-Si intermixing will be sought by the formation of the eutectic-related surface-crystallised phase recently seen by Shpyrko et al (PRL). Interesting structures are expected to arise associated with the characteristic melting behaviour of the eutectic at 380C.*
Supervisor:	**Prof. Ian Robinson** i.robinson@ucl.ac.uk **Unallocated:**

SAAK1	**Detector development for SuperNEMO neutrino experiment.**
Summary:	1 Student Experimental http://www.hep.ucl.ac.uk/undergrad-projects/
Supervisor:	**Dr Ruben Saakyan** saakyan@hep.ucl.ac.uk **Allocated:** Rammah Shami

SAV1	**DNA images with an Atomic Force Microscope**
Summary:	1 Student Data analysis *The student will be required to perform a preliminary literature study of an Atomic Force Micorscope and its characteristics. Subsequent Images of DNA filaments present slight differences due to the interaction of the AFM point with the DNA sample. Data analysis techniques adopted in*

	astronomy will be applied to improve the quality of these images. *Finally to improve the signal-to-noise ratio, a local correlation technique will be devised to combine non-identical images and produce a final improved image.* *The project will involve study of basic DNA structure and physical characteristics, AFM microscopy and will also require learning to program in IDL (Interactive Data Language).* *As the amount of programming is substantial, previous knowledge of fortran or C/C++ is recommended although not necessary.*
Supervisor:	**Dr Giorgio Savini** gs@star.ucl.ac.uk **Unallocated:**

SAV2	**Optics of a flat dielectric slab**
Summary:	1 Student theoretical / design / modelling *A simple dielectric slab is the fundamental brick in optics, which a number of applications in both instruments and technological applications make use of. It's simple workings constitute the fundamental principle of the Fabry-Perot interferometer. Thin flim interference filters also use the same physics.* *The student performing this project will acquire the necessary tools to design and predict the performance of state-of-the-art anti-reflection coatings. Objectives of this project are the modelling of second order effects when non-parallel light-sources are adopted and non-ideal materials with irregularities are employed. New innovative applications in the infrared are considered such as band-rejection interference filters and polarisation selective filters.* *The project can involve some programming in IDL (Interactive Data Language). Previous knowledge of programming in fortran or C/C++ useful but not necessary.*
Supervisor:	**Dr Giorgio Savini** gs@star.ucl.ac.uk **Unallocated:**

SCHO1	**Photoelectron Spectroscopy of Ketones on Silicon: Toward Single Molecule Conductance Measurements**
Summary:	Theoretical / analysis/experimental *It is well known that there are fundamental physical limits on present methods of electronic device fabrication, and that within the next decade new methods need to be developed if the current trend of miniaturisation and increased performance is to continue. This has resulted in a huge scientific push to develop alternative device concepts that exploit the quantum effects that dominate at the atomic- and molecule-scale, rather than suffer from them. One area of basic science research that holds much promise for the development of such alternative device concepts is called molecular electronics: This field strives to develop the ultimate level of device miniaturisation where individual molecules are used as electronic device components. The particular route toward this goal that is explored here is to adsorb individual organic molecules to the surface of a silicon substrate, and probe their conductance using a scanning*

	tunnelling microscope (STM). This route presents considerable potential for near-term technological applications where the functionality and tunability of organic molecules (size, shape, flexibility, chemical affinity and conductivity) can be incorporated into existing silicon-based technologies. In this project, the student will analyse X-ray photoelectron spectroscopy (XPS) data that was acquired during three separate week-long visits to the National Synchrotron Radiation Research Centre (NSRRC) in Taiwan. This data is expected to produce additional understanding of how to tether organic molecules to semiconductor surfaces and control properties that are important for molecular electronics, such as the degree of electronic coupling between the molecule and surface, and overall stability. The analysis will include comparison to atomic-resolution STM data and theoretical density functional theory (DFT) calculations. It is expected that this data will be published once the analysis is complete. This project will be conducted within the low-temperature scanning probe microscopy group within the London Centre for Nanotechnology. Given sufficient interest from the student, there may also be the possibility of performing some experimental STM measurements of the conductance of single molecules in the laboratory as part of this project.
Supervisor:	**Steven Schofield** scho76@gmail.com **Unallocated:**

SHLU1	**Going amorphous**
Summary:	Theoretical *Finding the parts of amorphous structures that are most vulnerable to defect formation*
Supervisor:	**Prof. Alex Shluger** a.shluger@ucl.ac.uk **Allocated:** Hyun Chul Park

SHLU2	**Imaging atoms**
Summary:	Theoretical *Theoretical modelling of atomic force microscopy imaging*
Supervisor:	**Prof. Alex Shluger** a.shluger@ucl.ac.uk **Unallocated:**

SKIP1	**Graphene Sheets from Solution**
Summary:	2 students Experimental *Isolated sheets of graphite are know as "graphene", and are predicted to possess many useful physical and electronic properties. Unfortunately, current the current methods for producing graphene involve a block a graphite, some selotape and a huge amount of patience! In this project we will attempt to dissolve small graphene platelets, and deposit them on a flat substrate.*
Supervisor:	**Prof. Neal Skipper** n.skipper@ucl.ac.uk **Allocated:** David Buckley and Kian Rahnejat

SUSHP1	**Breaking crystals: what it costs?**
Summary:	Theoretical/computational 1 student *Surfaces of cleaved insulating oxides are never ideal. Instead, they contain point defects, pits, and extended topographic features. These can be used as the binding sites for nano-scale objects or serve as "antennae" for the electronic excitations. Unfortunately, the atomistic structure of these features is still difficult to resolve experimentally. This project will focus on constructing realistic surface structures via computational atomic-scale modelling of topographic irregularities at the surfaces of the cleaved crystals.*
Supervisor:	**Dr. Peter Sushko** p.sushko@ucl.ac.uk **Unallocated:**

TENN1	**Partition function for isotopically substituted water**
Summary:	Theoretical: 1 Student *Water is one the most important molecules on earth, yet the properties of water as it gets hot (above 1000K) are not that well understood. Previous project students have produced, and published in the refereed academic literature, very accurate partition functions for the main isotopologue of water (H2(16)O). As part of an international project I have assembled very accurate datasets for isotopically substituted water molecules. The project involves using these energy levels from the above assembly augmented with calculated levels to obtain values for the partition function of water as a function of temperature, estimating the accuracy of this partition function, and using the partition function to compute other thermodynamic properties of the molecule such as the specific heat. Comparison with previous work in this are will form an important part of the project.* *The energy levels in question are available electronically and the calculations, which will involve writing some small programs in Fortran, C++ or Excel, can be performed on a computer of the student's choice.* Student(s) doing this project will find MSci/MSc course 4431 Molecular Physics helpful.
Supervisor:	**Prof Jonathan Tennyson** j.tennyson@ucl.ac.uk **Unallocated:**

TENN2	**Investigation of the possible contribution of electron-molecule collisions to the production of weak water lines in cometary spectra.**
Summary:	Theoretical 1 *During our investigation of cometary spectra, we have identifies a number of weak water emission lines of a type not previously recorded in*

	comets. Current models of the excitation processes that give rise to cometary emission spectra do not explain the existance of these features. The transitions are from upper states whith energies too high to be populated by the 'solar pumping' mechanism that is responsible for the stronger water lines. *The generally accepted models assume that cometary coma consist of two discrete regions, one collisionally-, and the other radiatively-dominated. We wish to examine the possibility that these highly-excited states arise in an intermediate region of the coma, where electron-neutral collisions may be an important source of ro-vibrational excitation of the water molecules.* *This is an excellent opportunity to contribute to an original piece of research. The successful applicant will be required to extract relevant data from published material and suggest methods of testing whether or not these data are consistent with our electron-molecule collision hypothesis.*
Supervisor:	**Prof Jonathan Tennyson** j.tennyson@ucl.ac.uk **and Dr. Bob Barber** bob@theory.phys.ucl.ac.uk **Unallocated:**

THORNE1	**Determining quarks in the proton**
Summary:	Theoretical: 1 student *The quark and gluon composition of the proton is a fundamental input for the calculation of scattering processes at the LHC. The quark and gluon distributions are obtained by comparing QCD calculations with data to determine free parameters. This simplifies in the case of neutrino scattering off nuclei where one probes directly the valence quarks so detailed studies can be made in a theoretically clean environment. The project involves writing a code to solve for the evolution of the quarks with scale and to perform a best fit to data, examining the effect of statistical and systematic data uncertainties and of theoretical uncertainties in modelling the quark distributions.*
Supervisor:	**Dr Robert Thorne** thorne@hep.ucl.ac.uk **Allocated:** Johnathan Lau

TREV1	**Controlling the motion of large molecules on insulating surfaces**
Summary:	Theoretical: 1 student *The precise positioning of large organic molecules on a surface is essential for the development of single molecule electronic devices. This project will use theoretical modelling to develop methods to manipulate the structure of these systems in a controlled way with an atomic force microscope tip.*
Supervisor:	**Dr Tom Trevethan** t.trevethan@ucl.ac.uk **Unallocated:**

UNDER1	**Methods of inversion of charged particle imaging experiments**
Summary:	Theoretical/computational: 1 (possibly 2) student *Velocity map imaging is a technique used in molecular physics to tomographically measure recoil velocity distributions of ions and electrons. In order to recover the 3D velocity distribution from its 2D projection, a mathematical inversion is required. This project will involve implementing a number of algorithms for doing this inversion, allowing for a direct comparison of the properties of each approach in order to establish the ideal algorithm.*
Supervisor:	**Jonathan G. Underwood** j.underwood@ucl.ac.uk **Unallocated:**

WAT1	**Simulation Studies for the Proposed SuperNEMO Neutrinoless Double-Beta Decay Experiment**
Summary:	1 student data modelling/programming(computer-based data analysis. Prior knowledge of computing and object-oriented programming desirable but not essential.)
Supervisor:	**Dr David Waters** dwaters@hep.ucl.ac.uk **Allocated:** Cristovao Vilela

WING1	**Particle Physics Beyond the Standard Model - a search for muon to electron conversion**
Summary:	1 Student – Simulation project *In the next two years or so the LHC will hopefully reveal new physics beyond the Standard Model of Particle Physics. Such new physics is likely to point the way towards the Grand Unified Theories (GUTs) unifying Quantum Mechanics and Gravity. In such GUTs it is generally predicted that the conservation of lepton number is not sacrosanct, such that processes where muons convert to electrons (without associated neutrinos) are predicted to occur. In this project you will develop simulation programmes (in C++ on Linux) to model a proposed experiment(COMET) that is seeking to measure (or place a limit) on the rate at which muons convert into electrons. The results will be used to optimise the design of the experiment to maximise the sensitivity to new physics beyond the Standard Model*
Supervisor:	**Matthew Wing** mw@hep.ucl.ac.uk **Allocated:** Terry Duboyski

ZOCH1	**Computer simulation of magnetic phases and models**

Summary:	Theoretical
Supervisor:	**Dr Stan Zochowski** s.zochowski@ucl.ac.uk **Unallocated:**

ZOCH2	**Simulating and fitting magnetic powder diffraction patterns**
Summary:	Theoretical/Experimental
Supervisor:	**Dr Stan Zochowski** s.zochowski@ucl.ac.uk **Allocated:** Aiden Dunne