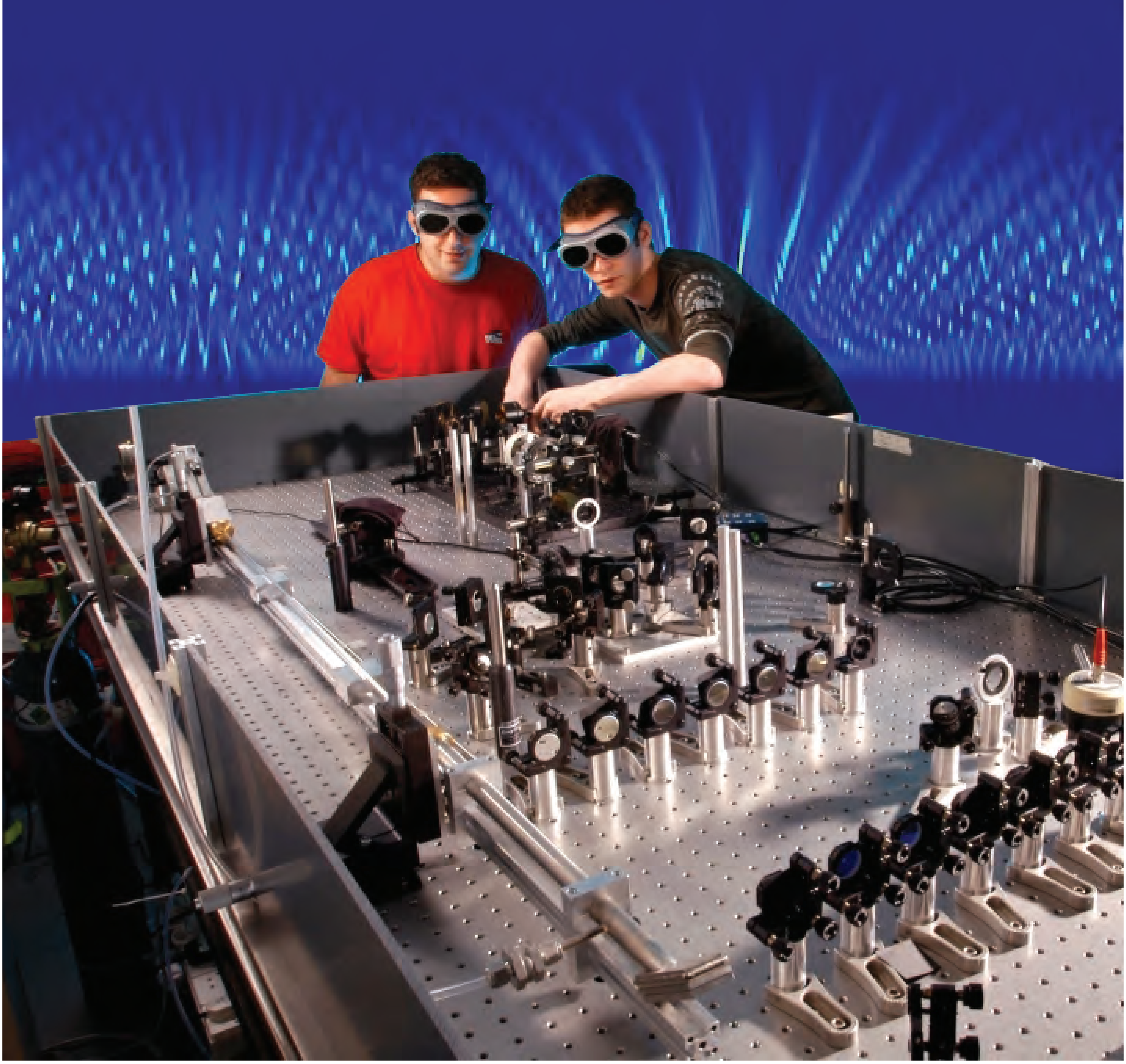
UCL DEPARTMENT OF PHYSICS
AND ASTRONOMY

UCL

Physics and Astronomy
ANNUAL REVIEW 2007



Contents

A copy of this review and further details about the department may be found on the website http://www.phys.ucl.ac.uk

Cover image is a Joseph Wood (University College London) and Jarlath McKenna (Queen's University Belfast) from the Ultrafast Physics UCL/QUB collaboration working on the hollow fibre chirped mirror pulse compressor at the Central Laser Facility (Rutherford Appleton Laboratory).The ten femtosecond laser pulses generated are used to create, image and control nuclear wavepackets in hydrogenic molecular systems. The trace in the background of the page is an illustration of a vibrational revival in deuterium ions, which have been modelled and experimental imaged by the collaboration. This work was recently published in Physical Review A.

Edited by Kate Heyworth, if you have any comments or suggestions for the 2008 issue please contact Kate at k.heyworth@ucl.ac.uk

Introduction

"UCL is booming", so started the White Paper on Modernising UCL published by the Provost in June. The same can certainly be said of the Department of Physics and Astronomy: 2007 saw us welcome our largest ever and best qualified set of undergraduate entrants in terms of A level grades and our biggest ever cohort of graduate students, along with the arrival of a significant number of new members of academic staff.

The one thing, however that has not boomed is the amount of space we have available for both teaching and research activities. While we are actively looking for room to house our increased student and staff capacity, it is clear that we cannot continue to admit undergraduate students in such large numbers and maintain our current teaching standards. As a result there has been a gentle rise in our standard A level offer.

We aim however, in line with UCL policy, to continue to increase our post graduate teaching by continued recruitment of PhD students and by expanding our taught graduate courses. Our MSc Degrees in Physics and in Astrophysics are now firmly established and have been successful in attracting well qualified students from around the world into the Department. Many of these continue their studies to complete research degrees. 2007 saw the graduation of the first cohort of students taking the MSc in Nanotechnology, a degree run from Electrical and Electronic Engineering with the close involvement of Physics and Astronomy. A new MSc in Advanced High Energy Physics is due to start in 2008 and a Planetary Sciences MSc, run by Physics and Astronomy in collaboration with the Departments of Earth Sciences and Space and Climate Physics is on course to start in 2009.

Like most of the UK University sector, much effort during 2007 was expended on completing our return for the 2008 Research Assessment Exercise (RAE). The Physics and Astronomy return, which also included Space and Climate Physics and most of Medical Physics and Bioengineering, was the second biggest from UCL. Putting it together was a huge task accomplished largely by Professor Nella Laricchia and Kate Heyworth. The results of this exercise are due in December 2008.

Not unrelated to the RAE, is the large number of new academic appointments we have been able to make during the last year. It is a pleasure to welcome them all to the Department and to comment on the uniformly high standard of applicants interviewed. Applications to UCL are truly global and we now have at least one representative from every continent on our academic staff (for Antartica see the article on ANITA!).

Professor Jonathan Tennyson

(Head of Department)

Sunset above the clouds from La Palma Observatory. Photo by Dr Francisco Diego during a trip to observe the perseid meteor shower in August 2007.

Undergraduate and Postgraduate Students in 2007

Prizes and Awards

30th October 2007 saw the Departmental Prize giving ceremony in the Old Refectory. This event is considered a valuable opportunity to acknowledge students who have performed outstandingly during their studies and the ceremony was attended not only by the prize winners and their guests, members of the Department and the Dean, but also Mrs Sally Darius as guest of honour. Sally generously endowed a new “Jon Darius Prize” for the best PhD in Astrophysics in memory of her late husband who was a PhD student and post-doctoral researcher in the Department working with Professor Sir Robert Wilson.

As Professor Marshall Stoneham has also generously funded a new prize for the best PhD in Condensed Matter and Materials Physics, we are now in the position to award a prize for the best PhD in each of the four research areas in the Department. This increase is appropriate given our expanding numbers and of our PhD cohort. At the same time we have taken the opportunity to rename the MSc prize after long-time Head of Department, Sir Harry Massey. Additionally the Department’s inaugural prize for Teaching was awarded to Professor Raman Prinja at the same ceremony. A warm thank you to all the sponsors of our prizes, who also include the publishers Wiley and scientific software company Tessella. Congratulations go to the following prize winners:

Undergraduate Prizes

Setrak Balian
OLIVER LODGE PRIZE (Best performance 1st year Physics)
Holly Alexander
HALLEY PRIZE (Best performance 1st year Astronomy)
Jonathan Heslop
C.A.R. TAYLER PRIZE (Best 2nd Year Essay)
Yuval Ben-Haim
WOOD PRIZE(Best performance 2nd year Physics)
Kalle Karhunen
HUGGINS PRIZE (Best performance 2nd year Astronomy)
Gihan Weerasinghe
DAVID PONTER PRIZE (Most improved performance in Department, 2nd year)
Salim Damani
CORRIGAN PRIZE (Best performance in experimental work, 2nd year)
Sidney Tanoto
ADDITIONAL SESSIONAL PRIZE FOR MERIT
Catherine White
BEST PERFORMANCE 3rd YEAR PHYSICS
Daniel Short
BEST PERFORMANCE 3rd YEAR ASTRONOMY
Simon Robert Heard
ADDITIONAL SESSIONAL PRIZE FOR MERIT
Luke Austen
BURHOP PRIZE (Best performance 4th year Physics)
Daniel John
HERSCHEL PRIZE (Best performance 4th year Astronomy)

The 2007 Prize winners at the award ceremony. The platform party (seated) are Prof Jonathan Tennyson (Head of Department), Prof Mike Barlow (Director of Teaching), Prof David Price (the Dean of Mathematical and Physical Sciences and now Vice-Provost Research) and Mrs Sally Darius. Standing are the prize winners with Prof Raman Prinja in the centre with the tie.

Daniel Ryan Smith
BRIAN DUFF MEMORIAL PRIZE (Best 4th Year project in the department)
Alana Rivera E Ingraham
LONDON GRANVILLE PRIZE (Best graduating student in the University of London in Physics and Astronomy)
WILLIAM BRAGG PRIZE (Best overall undergraduate)
Simon Binnie
TESSELLA PRIZE FOR SOFTWARE (Best use of software in final year Physics/Astronomy projects)

Postgraduate Prizes

Ralf Gommers
CAREY FOSTER PRIZE (Postgraduate Research, Physics AMOPP)
Efstathios Stefanidis
(Postgraduate Research, Physics HEP)
Sascha Khakshouri
MARSHALL STONEHAM PRIZE (Postgraduate Research, Physics CMMP)
Alexandros Attikis
Sarah Skoff
HARRIE MASSEY PRIZE – Joint Winners (Best MSc Student)
Tom Bell
JON DARIUS PRIZE (Postgraduate Research, Astronomy)
Daniel Murtagh
IOP STUDENT TRAVEL PRIZE IN POSITRON PHYSICS
Daniel Burgarth
2006 CAREY FOSTER PRIZE (best PhD thesis in Physics within the Department)

Degrees Awarded

In 2007 Physics and Astronomy welcomed 134 undergraduates to the department, 18 MSc students and 40 Post-graduate Research Students.

Undergraduate Physics and Astronomy students have the option of completing a three year degree leading to a Bachelor of Sciences (BSc) award or a Master in Science (MSci) award which takes four years to complete.

Pass Figures for 2007:
Undergraduate degrees:

Degree Class:	Number of students	
	BSc	MSci
1st	6	22
2:1	11	9
2:2	19	4
3	20	1

MSc:

Award Class	Number of students
Distinction	7
Pass	6

PhD Degrees awarded in 2007

Cristiana Arcidiacono Ionisation studies of positron impact (Supervisor Prof. G Laricchia)
Milena Benedettini The structure and the origin of the molecular gas along chemically rich outflows (Supervisor Dr S Viti)
Daniel Burgarth Quantum communication with spin chains (Supervisor Prof. S Bose)
Natasha Doss Calculated final state probability distributions for T_2 -Decay measurements (Supervisor Prof. J Tennyson)
Apostolos Efstathiou Design considerations for a high swing-arm profilometer to measure large aspheric optics (Supervisor Dr D Walker)
Elizabeth English Interactions between dilute matter and intense laser fields (Supervisor Prof. R Newell)
Oliver Fenwick Scanning near-field optical lithography and microscopy of conjugated polymer structures (Supervisor Prof. F Cacialli)
Elaina Ford Gravity waves and small-scale structure of the high latitude upper atmosphere (Supervisor Dr A Aruliah)
Ralf Gommers Symmetry and transport in the cold atom ratchets (Supervisor Dr F Renzoni)
Antonio Hales Gebrim The circumstellar environments of the dusty main sequence stars (Supervisor Prof. M Barlow)
Sascha Khakshouri Developments in mean field density functional theory of simple fluids and charged colloidal suspensions (Prof. I Ford)
Stephen Malton Laser interactions with high-brightness electron beams (Supervisor Dr N Konstantinidis)
Sukina Natarajan Stability of small molecular clusters modelled with stochastic and deterministic dynamaics (Prof. I Ford)
Ross Springell Growth and characterisation of uranium multilayers (Supervisor Dr S Zochowski)
Efstathios Stefanidis Study of the WW scattering in the absence of light Higgs boson using the ATLAS detector at LHC (Supervisor Dr N Konstantinidis)
Philip Taylor Investigations into a novel processing route for diamond at low pressure (Supervisor Prof. M Stoneham)
Helen Walker Magnetic and quadrupolar ordering in (U, Np) Pd3 (Supervisor Prof. K McEwen)
Thomas Weller C6Ca and C6Yb: New graphite based superconductors (Supervisor Prof. N Skipper)
Mark Westmoquette Super-star clusters, their environment and their role in the formation of galactic winds (Supervisor Dr L Smith)
Wei Wu Exchange calculations between donors in silicon and metal-pythalocyanine dimmer (Supervisor Prof. A Fisher)

Dr Angus Bain's Ultrafast Laser Spectrscopy Group collaborates with Cancer Research UK in UCL's interdisciplinary COMPLEX programme. This photograph, taken through the eyepiece of our confocal microscope by graduate student Thomas Masters, shows the effect of evaporative crystallization of Green Fluorescent Protein in an aqueous buffer salt solution.

International Conference of Physics (ICPS)

Mischa Stocklin, a PhD student in the AMOPP Group reports on the highly successful ICPS meeting, held at UCL in August 2007.

After travelling around Europe for 21 years the International Conference of Physics Students (ICPS) finally came to the UK and UCL for the first time in 2007. The conference took place on the 10th to 16th August. With over 360 undergraduate and postgraduate students participating from 30 different countries, the event proved to be an extremely successful and enjoyable conference.

The ICPS is a multi-disciplinary conference organised yearly in a different city and the organizers had to beat off tough opposition to host the conference.

Participants were invited to give 20 minute lectures on either their research topics or indeed any topic in physics, astronomy or related subjects which interested them. A total of 69 participants gave a wide variety of lectures, ranging from fusion energy to the physics of guitars. There were also five invited guest lecturers, including Sir Arnold Wolfendale (former Astronomer Royal and Honorary Member of IAPS) on "Astronomers Royal through the Ages", Prof. Andrew Fisher (UCL) on "Toolkits for Quantum Computers" and Prof. Peter Barham (Bristol University) on "the Physics of Ice Cream". All were received extremely well, with the free samples handed out in the final talk on ice cream perhaps swinging it ever so slightly in Prof. Barham's favour...

The academic programme was rounded off by a day of academic excursions, a poster session featuring contributions from the participants, and tours of the lab facilities in the department and the adjacent London Centre for Nanotechnology.

This busy academic schedule was balanced out by a number of social events, highlights included a costume party and the traditional national party, during which each delegation sets up a stall with typical dishes and drinks from their country or region. As the evening progressed the proximity of the author's own stall to Serbian, Finnish and Austrian liqueurs proved to be rather enjoyable, although concentration levels were somewhat reduced... Those brave enough were also invited to stage a performance, this year included some Romanian folk dancing and the UK delegation's rendition of the Ministry of Silly Walks sketch by Monty Python.

In retrospect ICPS 2007 was a huge success. At a cost of only £100 per delegate for the entire week, this year's conference was also one of the best in terms of value for money. The organisers have also set up various forums for delegates to keep in touch, thereby fostering international relations between physics students and hopefully some long lasting friendships as well. As the presidents of the International Olympic Committee like to say: "we call upon the (physics) youth of the world to reassemble next year in Krakow, Poland for ICPS 2008".

"The Costume Party, including King Henry VIII and his six wives"

Staff Highlights and News

UCL did exceptionally well in the Institute of Physics 2008 Awards, winning four prizes in total. Two of these prizes were awarded to staff members in the department (detailed below), along with Prof. Helen Fielding (Chemistry) who won the Early Career Award, Moseley Medal for distinguished research in experimental physics by and early career scientist and Prof. David Delpy (Medical Physics and Bioengineering) who was awarded the Franklin Medal for distinguished research in physics applied to the life sciences.

INSTUTE OF PHYSICS 2008 AWARDS

Prof. Gabriel Aeppli
2008 MOTT MEDAL for distinguished research in condensed matter or materials physics.
'For his pioneering and highly influential work on the magnetic properties of novel materials using neutron scattering'.

Prof. Sougato Bose
2008 MAXWELL MEDAL for distinguished research in theoretical, mathematical or computational physics by an early career scientist.
'For his work on the characterisation and exploitation of entanglement in quantum systems, in particular for his work on the propagation of information in spin chains'.
Sougato was also awarded the Royal Society Wolfson Research Merit.

In addition Mrs Doreen Stoneham, Director and Company Secretary of Oxford Authentication Ltd, was awarded the 2008 GABOR MEDAL 'For her successful establishment of a world-leading company that authenticates ceramics for the art world'. Doreen is the wife of Prof. Marshall Stoneham (Physics and Astronomy), they started the company together.

Professor Raman Prinja after receiving the Departmental Teaching Prize

OTHER AWARDS:

Prof. Raman Prinja
DEPARTMENTAL TEACHING PRIZE
`Nominated by the student representative body for outstanding teaching,following extensive student input.'

Prof. Jonathan Tennyson
OPTICAL SOCIETY OF AMERICA, ELLIS R LIPPINCOTT AWARD
'For contributions to theory and simulations of rotational-vibrational spectra of small molecules and applications for practical purposes'

SENIOR PROMOTIONS:

Promotion to Professor:
Peter Barker
Sougato Bose
Ian Ford
Raman Prinja

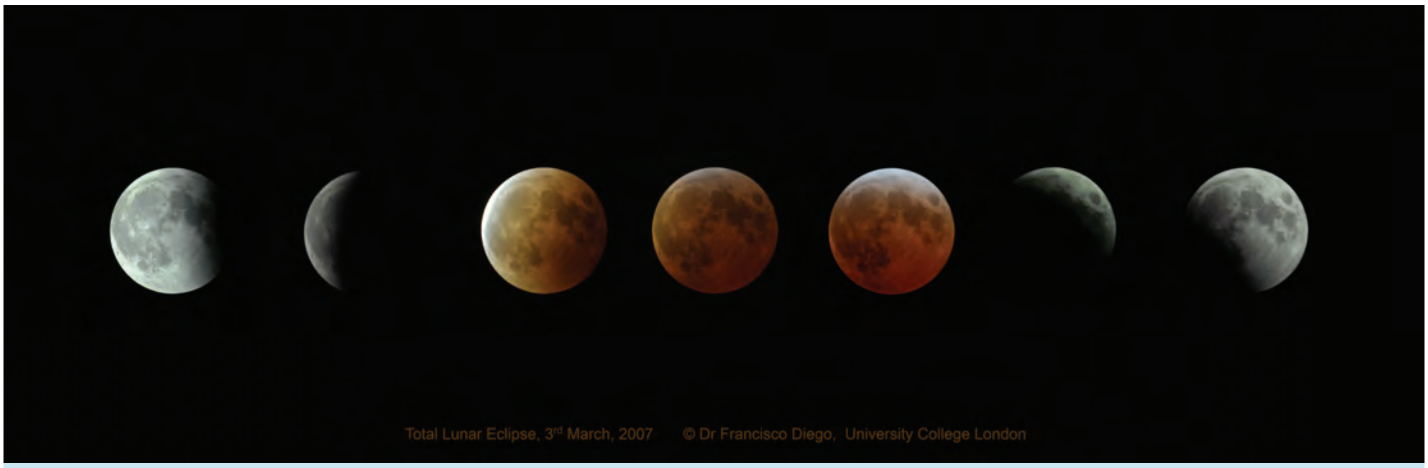
Promotion to Reader:
Ruben Saakyan
Serena Viti
Matthew Wing

Promotion to Senior Lecturer:
Anasuya Aruliah

RETIREMENTS AND RESIGNATIONS:

Prof. Michael Forshaw retired in 2007, he was a member of the Imaging Processing group. This group formed a long standing research area within the Department but is no longer active.

Dr Alan Barr resigned his lectureship to take up an academic post at the University of Oxford.



Total lunar eclipse of March 3rd 2007. Chronological sequence from right to left. Photos and composition by Dr Francisco Diego.

New Staff Appointments

We are pleased to welcome thirteen new members of academic staff who joined the Department during 2007.

Academic staff who joined the department in 2007 left to right (front row) Amy Connolly, Giovanna Tinetti, Bart Hoogenboom, Mario Campanelli, Stephen Lynch (back row) Alessio Serafini, Dan Browne, Nick Achilleos, Thorsten Kohler, Carla Faria, Tom Duke

NEW STAFF APPOINTMENTS:

Dr Nick Achilleos: Lecturer in Astrophysics 01/04/2007, from Imperial College.

Dr Dan Browne: Lecturer in AMOPP 01/08/2007, from the University of Oxford.

Dr Mario Campanelli: Lectureship in HEP 01/10/2007, from the University of Geneva, Senior Research Scientist.

Dr Amy Connolly: Royal Society USA/ Canada Research Fellow in HEP 01/05/07, from University of California.

Prof. Tom Duke: Professor in CMMP, joint appointment with LCN 01/10/2007, from the University of Cambridge.

Dr Carla Figueira De Morisson Faria: EPSRC Advanced Fellow and Lecturer in AMOPP 01/04/2007, from City University.

Cyrus Hirjibehedin: RCUK Fellow/ Lecturer in Nanometrology joint with Chemistry and the LCN 01/09/07 from IBM Research Centre.

Dr Bart Hoogenboom: Lecturer in CMMP, joint appointment with LCN 01/10/2007, from the University of Basel.

Dr Thorsten Kohler: Royal Society University Research Fellow and Lecturer in AMOPP 01/06/2007, from the University of Oxford.

Dr Steven Lynch: EPSRC Advanced Fellowship in the LCN 01/01/07, from the University of Cambridge.

Dr Alessio Serafini: Lecturer in AMOPP 01/10/2007, from Imperial College.

Dr Giovanna Tinetti: STFC Aurora Fellow in Astrophysics, previously transferred ESA fellowship from Paris 01/07/2007.

Dr Jonathan Underwood: Lecturer in AMOPP and joint appointment with Rutherford Appleton Laboratory, Central Laser Facility 01/01/2007, from the Open University.

The University of London Observatory (ULO) by night. After consultation with staff at ULO, Transport for London replaced the old street lighting on Watford Way which runs past ULO with new fully shielded fittings and special shielding that prevents direct light from reaching the Observatory grounds. While the road is now better lit, the night sky is significantly darker. The new fittings are highly effective, so much so that we had to install night lights into the ULO grounds. Photograph taken by Thomas Schlichter (for the purposes of this photo the Observatory lighting was switched on to show the buildings).

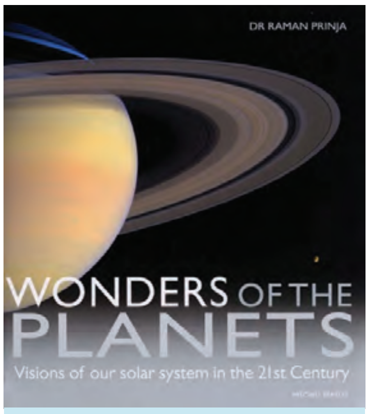
Staff Profile and Alumni Matters

Professor Raman Prinja

2007 proved to be a very successful year for Raman; in September he was given a professorial promotion, and in October was nominated by the student body to receive the inaugural departmental teaching prize. Raman's teaching focused on Astronomy related subjects and he was voted for the award by UCL undergraduates.

Raman first arrived at UCL in 1979 as an undergraduate and after completion of his Bachelor of Science (BSc) in Physics and Astronomy, he completed a PhD in hot star astrophysics. Following from this, Raman was awarded a couple of research fellowships within the department, including a prestigious Royal Society University Research Fellowship Royal Society and was offered a permanent academic position as lecturer in 1998. He has since progressed through UCL ranks to Professor.

These achievements are indicative of the active role which Raman plays within the department. He is an integral part of the Astrophysics Group, with his research work focusing on massive stars and the physical processes involved in their evolution. Raman describes these as 'stars that live in the fast lane' they are luminous, powerful stars whose lives are much shorter than other stars- such as the sun. He refers to them as 'the bread and butter of Astrophysics', with pivotal influences in galaxies. The chemicals they produce such as carbon, oxygen and iron form our very existence and can only be naturally created in the cores of these massive stars.



Raman Prinja's recently published book, 'Wonders of the Planets'

Raman is also the Natural Sciences Programme Tutor. This is a newly established, prestigious degree, run by the Maths and Physical Sciences (MAPS) Faculty. It has close ties with Physics and Astronomy, bringing a significant number of additional students into the department (30 in 2007). Plans to increase student numbers within the scheme are already well under way. Raman has been the Natural Sciences Tutor since its launch and has worked enthusiastically within a small a team at UCL in ensuring its success.

In addition to his teaching, tutoring and research at UCL, Raman has also successfully published a series of popular-level books as part of his Outreach efforts. These books are written with the aim of heightening public understanding of Astronomy by combining the fantastic imagery which Astrophysics produces, with informative text at an accessible level for members of the public. He plans to publish a new book in 2008, for further details on Raman's publications please visit his website at **http://zuserver2.star.ucl.ac.uk/~rkp/**

Alumni Matters

Prof. Tegid Jones heads all Alumni matters and events in the Department and he provides a lowdown of past and future Alumni events.

The inaugural dinner of the Physics and Astronomy Alumni took place on Friday 27th April 2007. Around forty alumni responded to the invitation sent out with last years annual report and I am pleased to report that it was a thoroughly enjoyable event. Two alumni attended who had been members of the department during the Second World War at its temporary relocation to Bangor, as were students I well remember from my first years in the department in the 1970's. It was also gratifying to see many more recent alumni at the dinner.

Following from the success of this dinner, a second event was arranged around six months later. This was organised by contacting all the participants who attended the inaugural dinner and inviting them to contact other alumni. Around twenty participants came to the second dinner on Friday 16th November and it was again a most enjoyable occasion.

As a result of Alumni suggestions, I will shortly be setting up (with the greatly appreciated help of Greg Coulbourn) an alumni website and, among many other items, this will include 'thumb nail' sketches of the research activities of members of academic staff. The address is **http://www.ucl.ac.uk/silva/phys/outreach/alumni**

The next Alumni dinner will take place on Friday 9th May, please respond on the enclosed form if you wish to attend. Somewhat rashly(?) I propose giving a short after dinner speech on 'Thirty seven years of lecturing and the Six Nations'.

Unfortunately Galina Reeder has now left the department, but if you wish to contact either myself or Galina's successor Kate Heyworth please email us at **alumni.physast@ucl.ac.uk**


Prof. Tegid Jones heads all Alumni matters and is assisted by Kate Heyworth

Public Outreach

Anais Rassat (first Cosmology PhD from the department) explains solar prominences to young audiences at our speaker's corner event in Hyde Park. Photograph taken by F.Diego

Dr Francisco Diego reports on the Departments many public outreach activities during 2007.

In 2007 our public and school outreach activities increased substantially in their number and in the variety of topics covered.

STFC funded school lectures and visits to the Observatory had a record of 50 events attended by around 4000 children, most of them having observed the Sun in white light and in H alpha at either the Department's Observatory in Mill Hill or at their school playground using our portable H alpha telescope. The events detailed below provide a taste of the many varied outreach activities which Physics and Astronomy students and staff undertook in 2007.

In the summer, The World Scout Jamboree came to the UK to celebrate 100 years of the scout movement. It was a massive gathering of 40,000 scouts from all over the world camping near Chelmsford in Essex. Thanks to the initiative of Brian Sheen from the Roseland Observatory in Cornwall, astronomy and space sciences were well represented with activities such as a portable planetarium (by the RAL), lectures, meteorite displays and telescope sessions. Francisco Diego was there several days and nights with a 20cm Schmidt cassegrain telescope, the portable H alpha telescope and binoculars mounted on tripods. Daytime targets included the Sun, Venus and Mercury. During the night there were the obvious orienteering sessions locating the north star, the plough, Cassiopeia, etc. Telescope/binocular observing included the moon, Jupiter, the Andromeda galaxy, several star clusters and double stars.

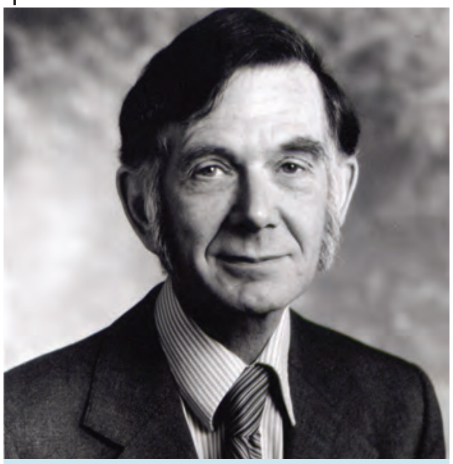
Another unusual venue was the speaker's corner in Hyde Park, London, where Anais Rassat (UCL), Dr Francisco Diego (UCL) and Joe Kuntz (Oxford University) had a very dynamic experience debating about the origin of the universe alongside a variety of religious fundamentalists. Some solar observing was also possible (it was cloudy most of the afternoon) with the portable Halpha telescope. This event was very successful and we plan to establish it as a regular item in our non-winter programme.
Our outreach for 2008 faces great challenges as UCL is now one of the six selected UK beacons for public engagement. In addition there will be intensive work in preparation for the International Year of Astronomy in 2009, which has just received the endorsement of the United Nations.

Francisco Diego has since been awarded a Science in Society fellowship by the STFC to produce The Mind of the Universe, a series of public/school lectures and teacher workshops on particle physics, cosmology, astrophysics, space exploration, extra solar planets and life in the universe. The project has a wide panel of science advisors and links with relevant institutions, like the Royal Astronomical Society and the Institute of Physics. Francisco is the second member of the department to receive the award after Maggie Aderin, who has been very active lecturing to schools and collaborating with the media with many radio interviews and BBC news appearances.

Cosmology at Hyde Park corner. A Universe that comes out of nothing just like that? Impossible! Only God could have done it! Joe Kuntz faces the challenge.

Professor Mike Seaton Obituary

Emeritus Professor Michael ("Mike") Seaton, Fellow of the Royal Society and a former President of the RAS, died on 29 May 2007, at the age of 84. Trained under Professors Sir Harrie Massey and Sir David Bates at UCL just after the second world war, he quickly saw that the relatively new field of quantum mechanics could be applied to important problems in astronomy and embarked on a series of calculations which paved the way for major advances in both fields. His academic career was almost stillborn. Having been shocked by Chamberlain's speech on his return from Munich and by the civil war in Spain, Mike joined the Young Communist League in 1938 and quickly found himself in trouble with the police because of his political activities. Expulsion from school followed, but he was fortunately allowed to sit matriculation exams. The war then intervened, and he volunteered for Air Crew and served as a navigator in Bomber Command until 1945. After the war, Mike studied Physics at UCL, where he obtained both his BSc and his PhD. By 1951, he had published a research paper which established the density of the gas in interstellar space; this was the third of his nearly three hundred research papers. The conclusions of the first paper were controversial at the time but subsequently proved to be correct. During the 1950s, as a lecturer at UCL and during sabbatical leave at the Institut d'Astrophysique in Paris, he laid the foundations of his later academic work. He began what proved to be a series of seminal papers on Quantum Defect Theory, which enabledreliable values of electron collisional rates, photoionization cross sections and radiative recombination coefficients to be calculated. His first calculations were done on hand-operated mechanical calculators, but Mike began using electronic computers as soon as they became available in the 1960s. In collaboration with observational astronomers, notably Don Osterbrock of Lick Observatory, California, he applied the results of his calculations to interpreting astronomical spectra, providing powerful new tools for measuring temperatures and densities in astronomical objects such as planetary and diffuse nebulae; these techniques remain in use today. The interplay between theoretical atomic physics and astronomy was to remain a central theme of his work. Foreseeing the crucial role that digital computers were to play in the subsequent progress of science, he oversaw the procurement by UCL of what was, at the time, the most powerful computer in Europe. He formulated ambitious plans to implement on the new computer the quantum mechanical methods that



Professor Mike Seaton (1923 - 2007)

he and others had developed. Many of the computer codes that were written by Mike and his many students and collaborators in the 1960s and 70s are still in use today. His former students recall with affection his eccentricities. During scientific discussions, he would often fall silent for long periods, head inclined and in deep reflection. Those who knew him would simply wait until, reflection over, he would return to life and frequently be able to give the solution to the problem in hand. It was very rare for a student to leave Mike's office without a clear idea of how to advance his research project. In the late 1970s, he was drawn further into astronomy by Professor Sir Robert Wilson, when the International Ultraviolet Explorer satellite was launched. The spectra of astronomical objects such as planetary nebulae and P Cygni stars were measured at ultraviolet wavelengths for the first time, and a host of discoveries resulted. In recognition of his contributions to theoretical physics and astronomy, he was elected a Fellow of the Royal Society in 1967, and he became President of the Royal Astronomical Society in 1978. The project that was to occupy much of the final twenty-five years of his life -- long into formal retirement -- began in 1982, during one of his many summer visits to the University of Colorado in Boulder. It had become apparent that there were major flaws in the understanding of the transmission of light through the outer atmospheres of stars. New atomic physics calculations were needed, and Mike succeeded in assembling a team of about twenty-five people, many of whom were former students, working in laboratories around the world. It is a testament to the respect and affection in which he was held that so many were willing to follow his lead in this "Opacity Project". In terms of intellectual power and breadth of scientific knowledge, Mike had few peers. He continued to work on and publish the results from the project right up to his death: his final paper, completed shortly before his death and currently in press in MNRAS, made use of the results from the Opacity Project to determine the radiative acceleration in stellar interiors. The data produced by the Opacity Project will form the basis for interpreting the spectra of stars for years to come. During his Air Force (RAF) training in Cambridge during the War, Mike met and married Olive Singleton, who died in 1958. Mike's second wife, Joy Balchin, lives in the Brecon Beacons, a region that they both loved and where they moved after retirement. His students and collaborators are legion, and scattered across the world.

Careers

The Departmental Careers Officer, Prof. Roy Newell discusses the merits of undertaking a Physics and Astronomy degree at UCL.

An ideal career is one that engages you, which gives you enjoyment as well as financial reward. Your aspirations can be fulfilled, but firstly you must identify the path you wish to make. Your primary degree is the first step and this could be followed by vocational training or a higher degree.

There is no doubt that employers value graduates with a degree in physics or astronomy; this is confirmed by the high rate of job securement by physics and astronomy graduates from UCL. It is well acknowledged that a degree in physics and astronomy with its attendant acquired abilities of problem solving, rational thinking and a lateral approach to diverse situations is an excellent training for many jobs. Graduates from UCL are successful in establishing careers which embrace a wide spectrum of interests including research, communication and information technologies, finance and banking, and management.

Students are encouraged to consider various career paths early in their undergraduate years. The UCL Careers Office provides essentially an open door service to students for help and guidance. All students are advised to use this service for professional advice from dedicated staff. The success of some past students should offer an indication of what is possible.

Careers for Physics and Astronomy Students

Dr Sophie Kain
Internet Entrepreneur
(MSci Physics 1997; 1st, PhD Physics 2001)

Sophie Kain, recently appeared on the BBC reality TV programme 'The Apprentice' as the token "girl geek".

I graduated in Physics at UCL in 1997 and stayed on to complete a PhD in Atomic and Molecular Physics under the supervision of Professor Jonathan Tennyson. Although I loved my time at UCL, I admit to not being a born researcher. However I do fully believe that my time studying Physics at UCL gave me the grounding to pursue a career in almost any field.

After leaving UCL I went on to work for the research and development departments at Thales and then General Dynamics, where I led various large scale research projects in subjects such as Adaptive Learning Systems and Data Information Fusion.

Last year I applied for 'The Apprentice' on a "whim" and before taking a breath found myself on the show. At no point did I believe that a Physicist would win, but I thought it might be fun and was certainly a learning experience.

Since appearing on the show, most people ask me just how scary it is to be fired by Sir Alan Sugar and in truth I admit that it is far less scary than being kicked out of Oxford or in fact doing a PhD viva!
Going on the show made me realise that there is a lot more money in the world than there are good ideas so I have since been trying my luck as an internet entrepreneur. My new website www.toastandtrash.com is a review

site where people can review anything from pashminas to their local plumber. I am also
launching a second venture later this year which allows people to find the person they were flirting with on the train, in the car, in the bar etc. and failed to get their phone number **www.secondglances.co.uk.**

If you would like to know more about Sophie log on to her website at **www.sugarkain.co.uk.**

Mr Mark Frary
Freelance Journalist
(BSc Astronomy and Physics 1987)

When I tell people that I'm the ski correspondent at The Times newspaper, there are invariably two questions that people ask. The first is 'Can I come with you on your next trip?' and the second is 'How did you get that job you jammy git?'. The answer to the first is, sadly, no but people are always surprised when I tell them I studied Physics and Astronomy at UCL as the answer to the second.

The link is far from obvious. After finishing my undergraduate degree, I took some time out, doing some temping in London, before being convinced by Prof. David Miller to return to take a PhD in nuclear physics, working out at the CERN particle physics laboratory in Geneva, Switzerland. UCL has been and is heavily involved there and it seemed like a great opportunity to explore the world.

Like some other PhD students, I found the transition from undergraduate to postgraduate study tough and decided to leave after just one year. I think the fact that my office had a view of the snow-covered mountains and I had recently been introduced to skiing might have had something to do with it too.

I then took a job as a technical editor for the International Organization for Standardization (ISO) in the city. These are the people who make sure that screw threads and things like that are all the same size as well as standards such as the now ubiquitous ISO 9000.

This marked my first real entry into writing. I had previously written some articles at UCL for the college science fiction and fantasy society's then magazine Azathoth's Pipings but this was different. This was all about checking style, rewriting and proofreading. It was a useful grounding though, in the nuts and bolts of journalism.

On returning to the UK four years later, I picked up a couple of jobs with magazines, the first with a specialist business travel publication called Business Travel World and then with a skiing magazine, the Good Ski Guide.

These days, I'm a freelance writer, working for several publications. I'm the ski correspondent for The Times newspaper – someone has to do it - and also write extensively about business travel.

So what about all that astronomy and physics? Has it all been for naught? Not exactly.
In my spare time – if there is any – I write books and now have three under my belt. The first was a history of cryptology, called Codebreaker, written with Australian science writer Stephen Pincock. The second – You Call this the Future? – looks at science fiction gadgets and was written with Nick Sagan, son of the famous cosmologist Carl.

The wheel turned full circle last year when I worked with Stephen again to write The Origins of the Universe for Dummies – a simple guide to cosmology. I see it as appealing to those people who bought Stephen Hawking's A Brief History of Time but never made it past the first five pages. We have had some good reviews and it seems to be selling reasonably well – despite the competition from new books by Queen guitarist and astronomer Brian May and Stephen Hawking.

UCL gave me many things – a wife (she studied maths), a great circle of friends who I still see regularly today and a real enthusiasm for physics and astronomy. I'm still as excited about looking up at the sky today as I was when I did when asked by Mike Dworetsky to look up at delta Cephei every night to measure the cycle of variable stars. And as it turns out ski resorts, with their lofty locations in the mountains, are a surprisingly good place to watch the skies.

Arron Rumsey
Business Analyst
(MSc Physics 2006, BSc Theoretical Physics 2005; 2:2 Hons)

Nearing the end of my Masters degree in Physics, I applied for a variety of jobs in the science/physics and IT industries. I applied for a job as a Graduate Business Analyst with an IT software developer company called Cerillion Technologies Ltd. They write and implement billing and customer care software, primarily for telecommunications companies. I was offered the job and started in early October 2006. The graduate training scheme lasted 3 months, with this encompassing training and teaching in the field of telecoms and the products that Cerillion develop. During my time at Cerillion, I have been on a training course in using UML, which is a standardised way of presenting business scenarios by using many different diagrams, in order that a complete and unambiguous description of what is required to be developed can be obtained.

My work involves travel and I have worked at a client site in London, where I was involved in front-line billing operations. I have also worked in Manchester at another one of our clients for several months, where I was involved in a team to gather requirements from the client; this being one of the early stages in our project lifecycle.

I was also involved in a new implementation for a client based in Switzerland and Sweden. I travelled to Sweden with 2 other colleagues in June, again working with requirements gathering.

I had no experience of working in the IT/ software industry prior to this job, but completing a Physics degree has provided me with the analytical skills necessary for the job. As I am interested in technical aspects of work and also my having a background in physics and mathematics, I have been able to settle into my job comfortably and quickly understand and use technical and theoretical applications.

Research Groups

Astrophysics

The Astrophysics group at UCL is one of the largest and most active in the UK. The group's current activities cover an impressive range of research topics, which include atmospheric physics at the Earth and other planets; circumstellar and interstellar environments; galaxies and cosmology; massive stars and clusters; optical instrumentation; star formation; astrochemistry, and recent pioneering studies of the environments of extra-solar planets. Some of the highlights of the group's research in these areas during 2007 are described below by Dr Nick Achilleos, Dr Mark Westmoquette, Dr Serena Viti and Nick Wright.

Water on an extra solar planet

In July 2007, scientists from UCL were involved in the first conclusive detection of water vapour in the atmosphere of a planet outside the Solar System. The discovery emerged from the work of Dr Giovanna Tinetti (UCL) and an international team including UCL scientists Dr Robert Barber and Prof. Jonathan Tennyson. The team used data from NASA's Spitzer Space Telescope to analyse the infrared signal from the transit of the gas giant planet HD 189733b across its parent star (situated 63 light years from the Earth). This passage reduces the star's brightness by about three percent. Dr Tinetti and the team analysed the dimming starlight at infrared wavelengths near 3.6 and 5.8 micrometres, while a team at Harvard acquired measurements at 8 micrometres. For a planet lacking an atmosphere, one would expect similar behaviour in these wave bands.

However, something quite different was observed: the planet's tenuous outer atmosphere absorbed less infrared radiation at 3.6 micrometres than at the other wavelengths. Water is the only molecule with absorption properties that can explain this behaviour – the team used models by Barber and Tennyson their analysis which incorporated sophisticated high-accuracy calculations of the water molecule's spectral lines.

Water is widely considered to be the first perquisite for finding life. However it does take more than water vapour alone to make a planet a good candidate for extraterrestrial life. The extrasolar planet being discussed, HD189733b. Is a large planet, about 15% more massive than Jupiter, and is located just 4.5 million km from its parent star, which it orbits every 2.2 days. In comparison, the Earth is 150 million km from the Sun; and even Mercury, our Solar System's innermost planet, is 70 million km away. This is why planets such as HD189733b are referred to as 'hot Jupiters'. They tend to have greatly expanded atmospheres due to the heat from the nearby star. The diameter of HD 189733b is 1.25 times that of Jupiter, and its atmospheric temperature is 1000 K (a little more than 700°C) or higher. This implies that the water vapour in the atmosphere cannot condense to fall as rain or form clouds.

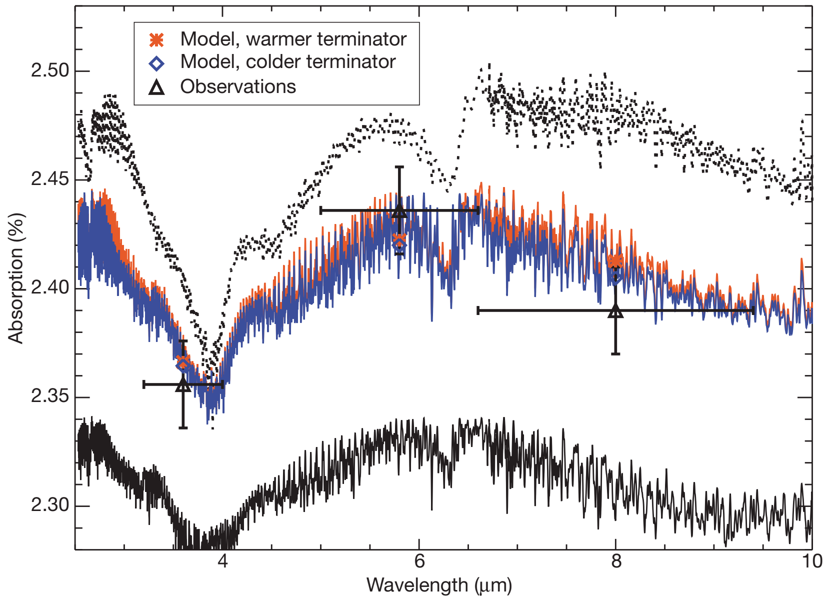


Figure 1: Comparing observations and models of the absorbing effects of water in the atmosphere of the extrasolar planet HD189733b, from Tinetti et al (Nature, 2007). Measurements of the absorbed fraction of starlight at each wavelength are shown as black triangles: Horizontal bars indicate the Spitzer telescope's infra-red wavebands; vertical bars show the uncertainty of the measurement. The model absorption spectra shown were produced by simulating how light is absorbed as it travels through warm (orange trace) and cold (blue trace) atmospheric layers near the boundary between the planet's day- and nightside. Simplified models using constant-temperature atmospheres are also shown, for 500 K (black trace, solid) and 2000 K (black, dotted).

If the planet were in a synchronous orbit, with one hemisphere constantly facing the star, the heating of the atmosphere would produce a system of fierce winds sweeping from the day-side to the night-side. Simulated winds flowing at up to 4 km/s have been generated in computer models of global exoplanet atmospheres, calculated at UCL by graduate student Tommi Koskinen in collaboration with Prof. Alan Aylward and Prof. Steve Miller (Koskinen et al, Nature 2007). These exciting new results by Tinetti and colleagues have encouraged hope for the future detection of water on other, rocky planets, which would be more likely candidates for harbouring life.

Spectacular Survey of the Milky Way

Prof. Mike Barlow and graduate student Nick Wright are part of a consortium of over 50 astronomers who are conducting the first comprehensive digital survey of the Milky Way at optical wavelengths. The project is known as IPHAS (INT (Isaac Newton Telescope) Photometric H-alpha Survey), and involves astronomers from the UK, Europe, the US and Australia. Data from the survey, containing stunning images of nebulae and stars, were released in December 2007, and described in a paper submitted to Monthly Notices of the Royal Astronomical Society.

The IPHAS database includes observations made using a filter which is sensitive to the red spectral line emitted by hydrogen, known as H-alpha. Using this distinctive tracer of excited hydrogen gas makes it possible to explore the poorly-understood stars which are at the very early and very late stages of their lives. The IPHAS data will therefore greatly improve our knowledge of stellar evolution by allowing us to study, in unprecedented detail, the 'birth' and 'death' of individual stars.

This initial data release is of observations of the Northern Plane of the Milky Way Galaxy (the star-filled section) that cover 1600 square degrees. The distribution of the bright H-alpha emission line stars traces 'hot spots' of recent star formation in our Galaxy much more convincingly than has previously been possible. The image resolution is high enough to allow detection of individual stars with H-alpha emission, as well as the beautiful glowing nebulae in which these stars are often embedded. To date, the IPHAS survey includes some 200 million objects in the newly released catalogue. This database is a vast and important scientific resource for supporting studies of our Galaxy's three-dimensional structure and its various stellar populations.

Galactic and Extragalactic Star

Formation Understanding the birth of stars is fundamental to astrophysics. Questions such as 'How do planetary systems form and evolve?' and 'Does life exist elsewhere in the Universe?' cannot be tackled without an understanding of the star formation process.

Star formation begins when the cold, dense parts of interstellar clouds of gas and dust collapse under their own gravity. These dense cores typically have masses around ten thousand times that of the Sun. Being denser than the surrounding cloud, the core regions are first to collapse in this way. As they do so, they fragment into clumps, with masses of 10 to 50 solar masses. The clumps then form into newly-born 'protostars', the entire process requires about 10 million years. In order to 'probe' the collapse phase which may be obscured by cloud material, astronomers from the UCL group perform imaging and spectroscopic studies at infrared and sub-millimetre wavelengths. These activities involve state-of-the-art UK and international telescopes such as the James Clark Maxwell Telescope in Hawaii and the IRAM interferometric array in France. The group also undertake theoretical calculations of the interaction between the regions of gas and dust which contribute to star formation in various environments. This work is done in collaboration with chemists around the UK and in particular at UCL (through the Centre of Cosmic Chemistry and Physics).

Some of the important results to have emerged from the work of the

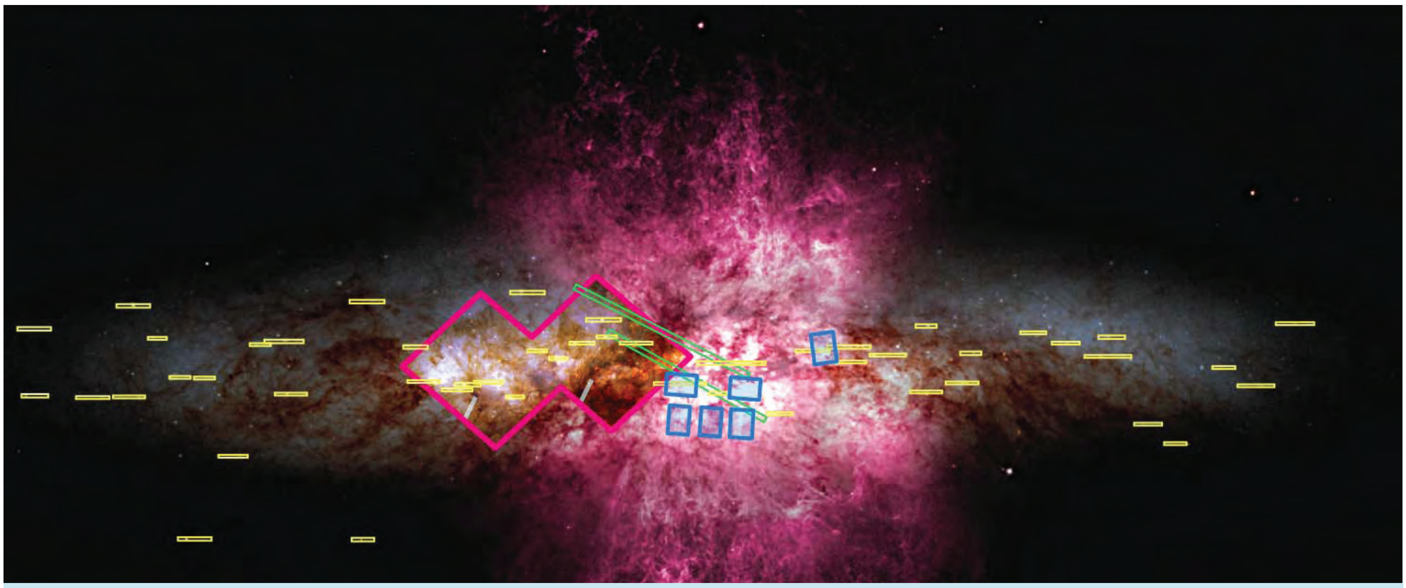


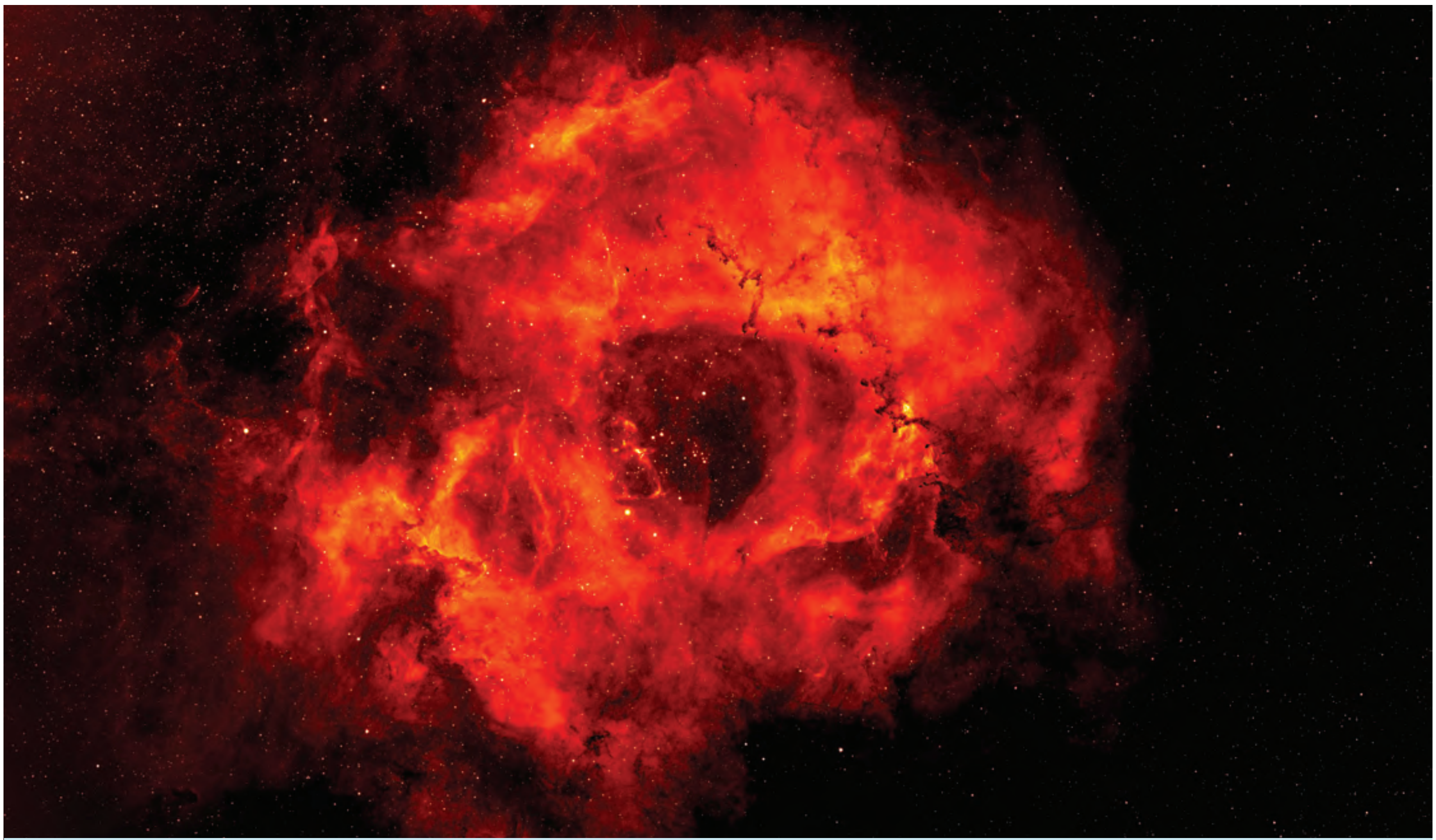
Figure 2: This image of NGC 2237, the Rosette Nebula, is the most detailed image of the famous nebula ever produced. It was created from almost 200 individual CCD images from the INT/WFC Photometric H-Alpha Survey (IPHAS), the deepest and most comprehensive H-Alpha survey of the Northern Galactic Plane ever completed. Inside the nebula lies a cluster of bright massive stars whose strong winds are clearing a hole in the nebula's centre. Ultraviolet light from these stars excites the surrounding nebula, causing it to glow. (Image courtesy of Nick Wright (UCL) / IPHAS).

group in the last are the following:

In dense clouds, it is possible for heavy molecules (especially polar molecules like water) to 'freeze out', on to dust grains. This process encourages chemical reactions at the grain surface which would otherwise be too slow for molecules in the gas phase. The timescale for this freeze-out process is shorter than the star formation timescale, provided no removal or desorption of molecules from the surface of the grain takes place. The group have studied the desorption process and found that the usual assumption of effective removal by cosmic rays is not always valid.

When astronomers observe the most distant parts of the Universe, they are also looking into the past, because of the immense light-travel times. At the largest distances observed which correspond to the early Universe, there seems to be strong evidence of a greatly enhanced formation rate for massive stars. By the use of a sophisticated chemical model of the early Universe, the UCL group have simulated the molecular emissions (radiation) associated with massive star formation.

An important result is that, as long as the number of massive stars in a formation region exceeds that in the Milky Way by a factor of at least 1000, then it should be possible for astronomers to observe the relatively bright molecular emissions from that region.



Star-Forming Galaxies

Figure 3: The starburst galaxy M82 is shown here by combining individual observations at visual and infrared wavelengths from the Advanced Camera for Surveys aboard the Hubble Space Telescope (HST/ACS). The extragalactic astrophysics group at UCL have been studying this galaxy using ground- and space-based observations. The magenta outline shows region B of the galaxy, containing young star clusters which were shown by the group to be ~100 times younger than previously thought. Yellow boxes show the sites of star clusters in the disk of M82, which were the subject of spectroscopic observations using the Gemini telescope. The blue boxes show the inner starburst environment and super star cluster M82-F observed using Gemini (image courtesy M. Westmoquette / I. Konstantopoulos).

Atomic, Molecular, Optical and Positron Physics

The Atomic, Molecular, Optical and Positron Physics group is engaged in experimental and theoretical research that covers a wide breadth in this very active field. Their research spans from the fundamental to the applied and encompasses the following broad topics: positron-, positronium- and electron-collisions, ultracold gases, quantum chaos and statistical physics, ultrafast laser spectroscopy and strong laser interactions, biological physics and optical tweezers, atomic and molecular spectroscopy, and quantum information.

There are currently 19 academic staff actively engaged in research within the AMOPP group with an almost equal division between theory and experiment. Over the last year the group has seen significant growth within the theory section and in particular in quantum information. Dr Dan Browne and Dr Allessio Serafini have joined Prof. Sougato Bose as Lecturers in the quantum theory group. The area of strong laser interactions theory has been strengthened by the arrival of Dr Carla Figueira de Morisson Faria, an EPSRC Advanced Fellow, whose theoretical research interests lie in the interaction of atoms with intense laser fields and ultrashort pulses. She joins Prof. Roy Newell and Dr Jonathan Underwood in the area of ultrafast laser spectroscopy and strong laser interactions. Finally, Dr Thorsten Kohler has joined the group as a Research Fellow of the Royal Society and Lecturer. He leads a theoretical programme that is studying the formation of ultracold molecular gases and the dynamics of the association of molecules in trapped Bose-Einstein condensates and degenerate Fermi gases.

The creation of ultracold molecules and the study of their interactions and applications is a relatively new part of atomic, molecular and optical physics, and this year Prof. Peter Barker describes the creation of cold molecules by optical Stark deceleration. He outlines his current research as well as a newly funded research programme that seeks to cool these molecules to ultracold temperatures into the microKelvin regime bringing together the expertise of several members of the AMOPP group.

Cold molecules

The ability to use lasers to cool atomic gases to ultra-cold temperatures into the range of a millionth of a degree above absolute zero has revolutionized atomic and low temperature physics. At these low temperatures the atoms are almost stationary and behave very differently to the gases at room temperature that we are familiar with. At the very lowest temperatures the atoms that make up the gas behave in some ways as if they are one single atom. In this strange situation, a new state of matter called a Bose-Einstein condensate is formed and its unusual properties are a very active research area worldwide. These very low temperature atomic gases are produced by using the intense light from lasers. In this technique photons from a laser beam are scattered from the atoms with most scattering events taking energy away from the atoms and thus cooling them. In addition to being one of the important techniques for reaching ultra-cold temperatures, and eventually Bose-Einstein condensation, laser cooling has allowed the exploration of the many sensitive interactions between ultra-cold trapped atoms that are not normally observed at everyday room temperatures. For example, the ability to hold these cold gases for long periods using optical fields, has provided a new testing ground for studying important concepts in condensed matter physics. One such example is the transport of particles, such as electrons, through materials which are composed of a series of repeated or periodic structures such as a crystal. This important process can be studied with greater precision because, rather than using a solid structure, a more perfect periodic structure can be made by the interference of light waves from a laser. Instead of electrons however it is the motion of laser cooled, cold atoms that are studied. More recently, this exquisite control over the motion of atoms through laser cooling and trapping has lent itself to testing concepts in the relatively new field of quantum information and quantum computing. In contrast to conventional computers the information in quantum computing is stored and processed in the quantum domain using

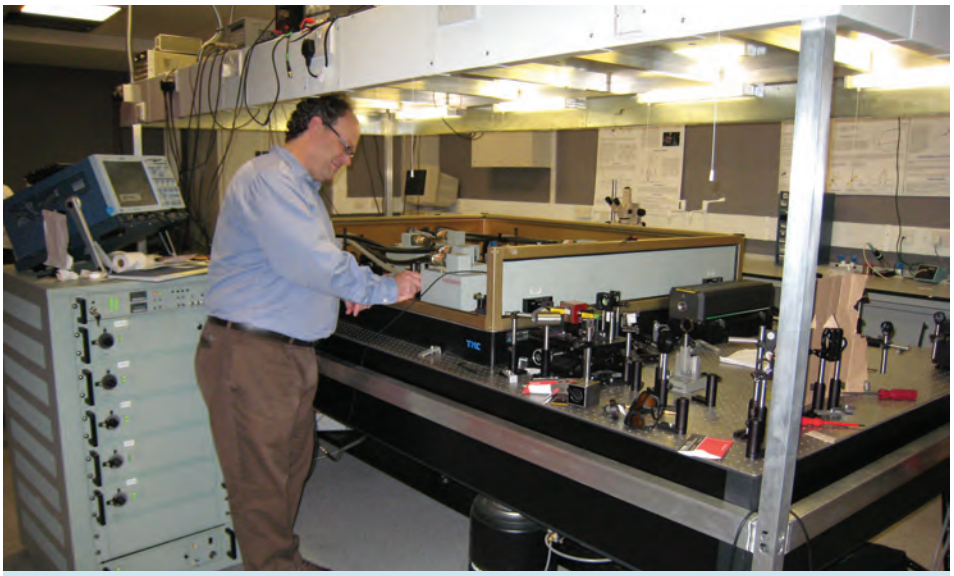


Figure1. Prof. Peter Barker in his newly refurbished laboratory standing by one of the high power lasers used for creating slow, cold molecules. The light produced by the laser is used to grab molecules as the travel at high speed through a vacuum chamber and decelerates them to rest in 3 billionth of a second.

quantum bits called (qubits). Here certain processing tasks can be performed much faster that conventional computing. The AMOPP group at UCL is actively involved in many of these new research areas.

Considerable attention has recently turned to the creation and study of cold and ultra-cold molecules as they offer interactions that do not occur, or, are weak between cold or ultra-cold atoms. One such interaction occurs between polar molecules, which have a permanent dipole moment. In these molecules one part of the molecule is slightly more positively charged than then the other. At ultra-low temperatures it is predicted that these molecules will form a crystal structure because the more positively and negatively charged parts of different molecules will attract each other while the parts of molecules with the same polarity will repel each other thus forming a crystal structure held by mutual attraction and repulsion. Such gaseous crystal cannot form at room temperature because the energy of the moving gas particles at these temperatures is much greater than the energy of attraction and repulsion. Cold molecules are also seen as an ideal way of testing the standard model of particle physics, which is known to be incomplete. One such example is the quest to measure an electric dipole moment (EDM) of the electron using heavy polar molecular gases. Here precision measurements that attempt to detect an EDM using these molecules are being used to test new theories that extend the standard model aiming to give a more complete theory of how the universe works. The ability to perform chemistry in dilute molecular gases at temperatures far below 1 K promises access to chemical processes which cannot be observed at temperatures even as low as one degree above absolute zero. In this new unexplored chemical regime, reaction rates can increase dramatically as the temperature of gas decreases. Ultracold collisions with molecular hydrogen are of particular interest because of their fundamental nature, and their relevance for astrophysics, particularly in star-forming regions where it is now known that temperatures get particularly low. These processes could be the key to solving current astronomical riddles such as how those stars of primordial chemical composition, which are significantly smaller than the sun, can have formed when all current models of the prevailing chemistry only lead the formation of ultra-massive stars.

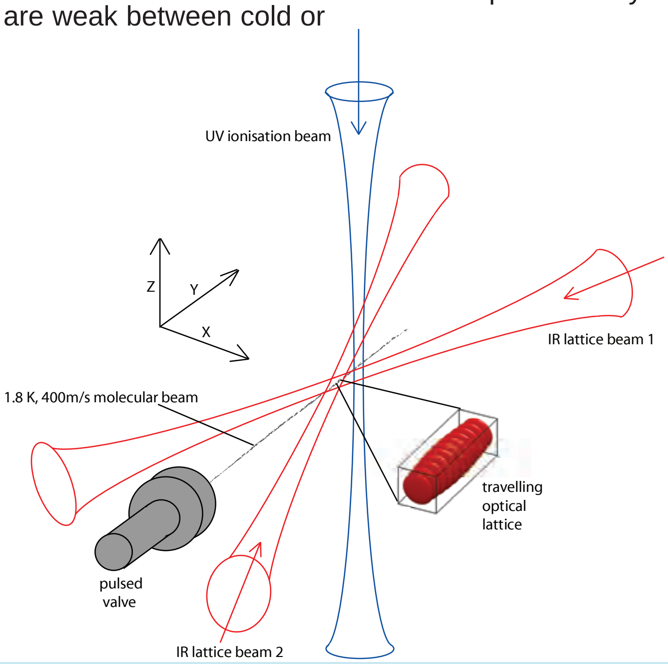


Figure 2. A diagram of the lattice deceleration scheme showing the intersection of two laser beams within the molecular beam to create a lattice. Also shown is the probe laser beam that is used to detect the molecules.

In order to explore these completely new frontiers in physics and chemistry, new methods must be developed to produce ultracold molecules of any type. Unfortunately, laser cooling, as described above for atomic species, cannot be applied to molecules and thus there is now a great challenge to devise new methods for cooling molecules to such low temperatures. Our research has developed a new technique called optical Stark deceleration, which can produce slow and cold molecules of essentially any type (figure 1 shows Prof. Peter Barker standing by the optical stark deceleration laser). This is a two-stage process in which a cold but fast beam of molecules is produced by leaking a small amount of gas into a vacuum chamber. As the gas expands into the vacuum the relatively high temperature (room temperature) of the gas is converted to a gas of low temperature that is now however travelling at high speed. In the second stage of our slowing process we use an intense light field to hold or trap the molecules while decelerating them to rest. This process is somewhat like the fictitious tractor beams on the TV series Star Trek. These intense beams produce a force that acts to push molecules towards the high intensity regions of the light field producing a group of slow, cold molecules bunched together. Since all molecules and in fact any particle behaves in this way, in principle any molecule or atom can be manipulated and slowed in the same manner, opening up the capability of creating essentially any cold molecular species. This has been demonstrated in our experiments, where we have successfully slowed every species that we have placed within the molecular beam. This includes the organic non-polar molecule benzene (C_6H_6) and the weakly polar nitric oxide (NO), as

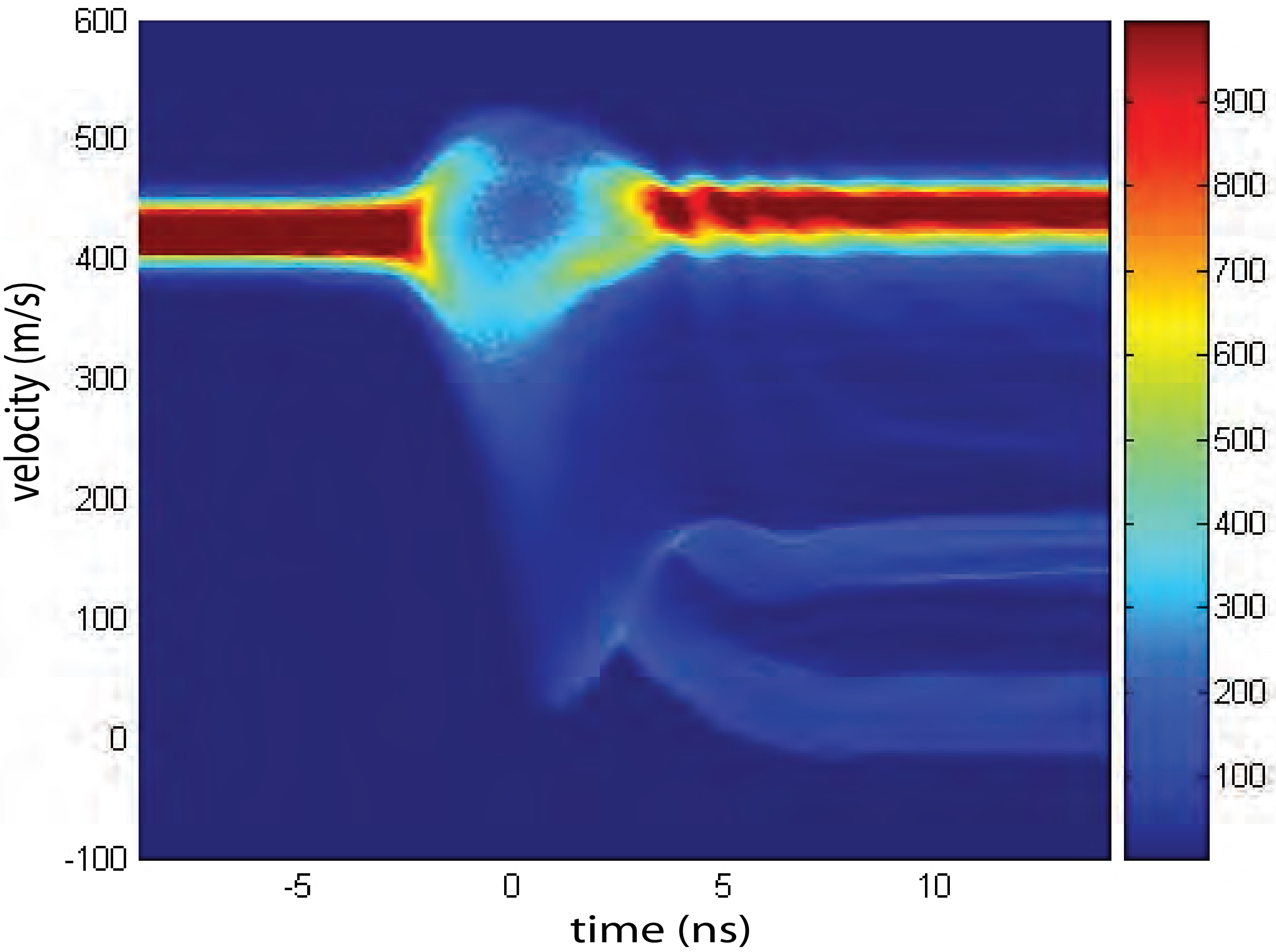


Figure 3. The Velocity Distribution Of Slowed Benzene Molecules, Initially At 2 Kelvin, As Function Of Time Slowed In The Constant Velocity Decelerator. A Small Fraction Of The Molecules Are Transported To Zero Velocity In 3 Nanoseconds.

well as ground state xenon (Xe), the inert buffer gas used to form the molecular beam. For benzene a large average deceleration of 1011g was produced which leaves the molecules intact and in the same rotational and vibrational state that it was in before deceleration. The deceleration of the molecular beam by the lattice is shown in figure 2. Here a fraction of molecules is trapped with a repeating optical trap called an optical lattice. The decelerating lattice is made to travel at half the speed of the molecular beam and the molecules within it begin to oscillate in position and velocity somewhat like the bob of a pendulum in a clock. When the oscillating molecules reach zero velocity, like the pendulum reaching the top of it's swing, the optical fields are rapidly turned off in a few billionths of a second and the molecules remain at rest. At the end of this sequence the molecules can now be trapped and held for long periods exceeding a second.

Important science has been and will continue to be carried out with cold molecules created by the Stark deceleration method. However, this method is not capable of reaching the ultra-cold regime (< 1 mK) where much of the interesting physics and chemistry is to be found. We are now embarking on a new project that uses the Stark deceleration method but aims to cool molecules to ultra-cold temperatures below the 1 mK barrier using an additional technique called sympathetic cooling. In this latter method, the gas to be cooled is trapped and brought into contact with a colder laser-cooled atomic gas at higher concentration. The heat flows from the hotter molecular gas to the colder atomic gas via collisions, coming to a common temperature that is lower than the original temperature of the hotter molecular gas. This challenging but important project brings together a number of academic staff within the growing AMOPP group including Dr Ferruccio Renzoni, who has considerable expertise in laser cooling and trapping, and Prof. Jonathan Tennyson, whose expertise lies in the calculation of structural properties of complex molecules and how they interact with atoms and other molecules through collisions. We are only at the beginning of a very exciting stage in this research area, however just as the creation of cold atoms has had high impact outside atomic and molecular physics, we expect that growing field of cold molecules will have significant applications in other fields of physics and chemistry.

High Energy Physics

The High Energy Physics group carries out research at the energy frontier using data from accelerators at CERN (Geneva), Fermilab (Chicago) and DESY (Hamburg). They also carry out theoretical research, R&D for new experiments, and have an exciting programme investigating neutrino physics. A new element of this neutrino programme is the ANITA experiment in antarctica, which is described here by Dr. Ryan Nichol and Dr. Amy Connolly.

The ANITA Experiment

The ANITA experiment (ANtarctic Impulsive Transient Antenna) is an ambitious project attempting to turn the entire continent of Antarctica into a gigantic telescope probing the furthest reaches and highest energies of the Universe. The experiment aims to be the first to detect high energy neutrinos of astrophysical origin. Neutrinos are uniquely interesting cosmic messengers, as they are the only stable particles which only interact weakly, and so can traverse vast cosmological distances without being absorbed by matter or deflected by magnetic fields. By measuring high energy neutrinos, we hope to discover the location of the most energetic processes in the Universe, provide clues to what the highest energy charged cosmic messengers are made of, and possibly hint at new physics phenomena at energy scales beyond the reach of the largest particle accelerators on Earth.

The elusiveness of the neutrino provides a great experimental challenge when it comes to designing a detector with which to observe them on their travels across the cosmos. Given the low flux of high energy neutrinos (approximately one per square kilometre of the Earth's surface per year) and the low probability of neutrino interactions (on average a neutrino will travel through hundreds of kilometres of water before interacting), vast detection volumes are necessary in order to detect a reasonable number of neutrino events.

The ANITA experiment takes a novel approach to the problem of how to observe such a large volume of matter, it looks down at the Earth from a high altitude balloon, 37 km above the surface of Antarctica. From this vantage point there is over one million cubic kilometres of Antarctic ice, up to 4 km deep in places, which the experiment observes with its highly sensitive array of radio antennas. These radio antennas are searching for the characteristic radio chirps induced by neutrinos interacting somewhere down below in the Antarctic ice. Previous measurements have shown the Antarctic ice to be transparent to radio signals like those emitted from neutrino interactions, allowing ANITA to peer deep into the ice in its hunt for the particles. Figure 1 shows the ANITA payload in Antarctica shortly before the launch of its debut Antarctic flight.

In June 2006, months before ANITA's first flight, the experiment was extensively tested at Stanford Linear Accelerator Laboratory (SLAC) in California. During the test the instrument recorded radio pulses from a high energy, intensive beam of electrons incident on a 10 tonne block of ice, replicating the radio signal produced by high energy neutrinos interacting in the Antarctic ice. The ANITA test at SLAC was the first time that these radio signals from high energy interactions had been observed in ice. The test confirmed theoretical predictions for the signal properties and the ANITA system was shown to be fully operational and ready to be shipped to Antarctica for its maiden flight.

Each year the circumpolar wind system sets up during the austral summer, and it is this wind system that allows for long duration balloon flights which make multiple orbits of the continent. ANITA was launched from Williams Field, the NASA balloon facility near McMurdo station,

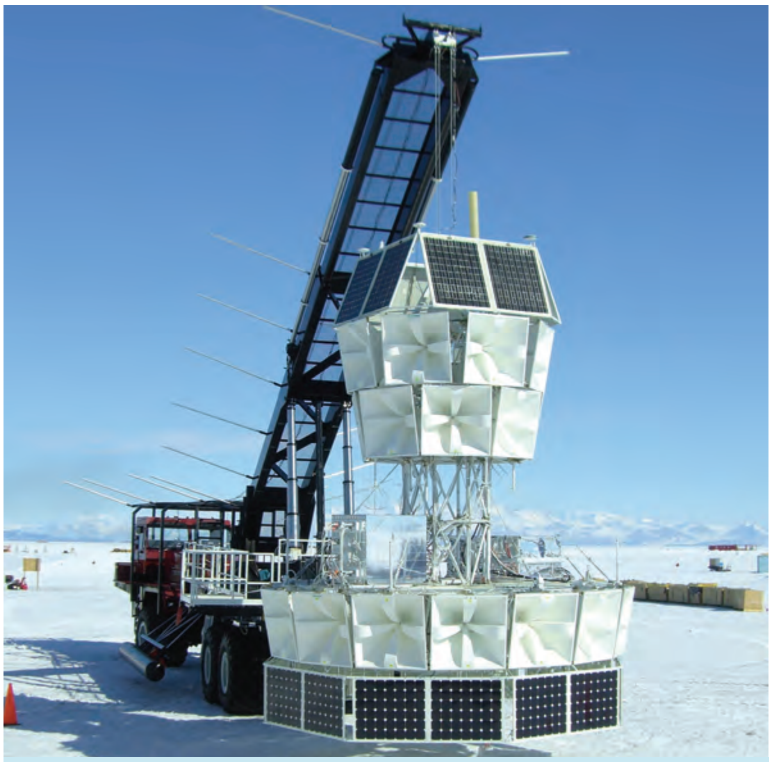


Figure 1: The ANITA balloon payload hanging from the Antarctic balloon launch vehicle prior to the launch in December 2006.

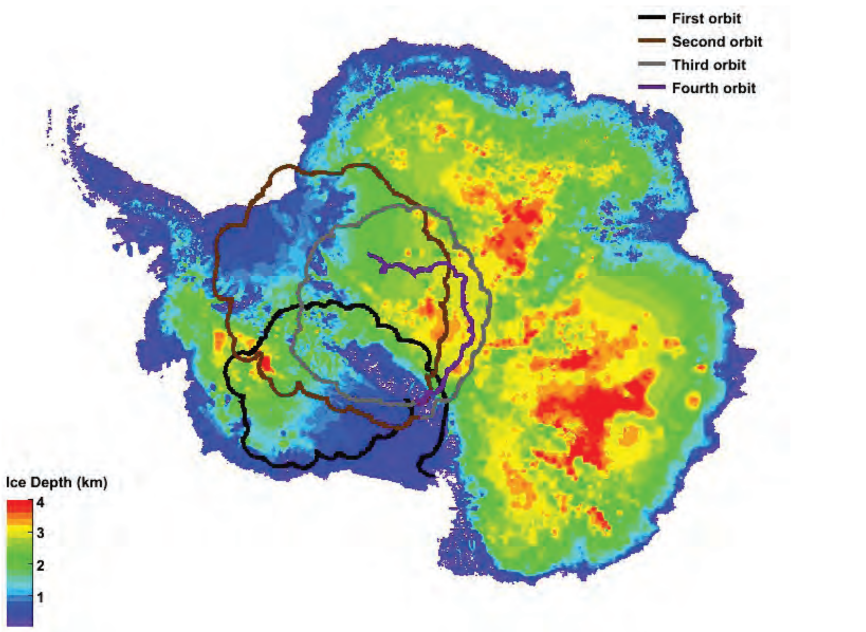


Figure 2: The flight path of the first ANITA flight, superimposed over a map of Antarctica showing the ice depth across the continent. (The ice depth data was taken from the BEDMAP consortium, of the British Antarctic Survey.)

on December 15th, 2006, and enjoyed a 35 day flight above the Antarctic continent. The path taken by the balloon during this flight is shown in Figure 2. During the flight, ANITA recorded data at a rate of a few events per second, consisting predominantly of noise produced either thermally or by human activity on the continent. Some of the data was transmitted back to the base station via satellite, while the remainder of the data was stored on hard drives aboard the instrument. The flight ended by a remote controlled explosive detonation separating the payload from the balloon, and the experiment descended back to ground under a parachute. Figure 3 shows the state of the ANITA payload after its 37 km fall back down to the ice. The ANITA team is now in the process of analyzing the data from the first flight, where it hopes that the first to be seen high energy neutrinos may be among theover eight million events recorded.

ANITA has been approved for a repeat flight, called ANITAII, in the 2008 / 2009 austral summer. ANITAII will have the opportunity to either confirm a highenergy neutrino discovery or try again to observe them for the first time. The first ANITA flight was unusual for Antarctic long duration ballooning in that the path tended towards the western side of the continent where the ice is shallower. The balloon paths are subject to wind patterns and are out of the control of the scientists and engineers that launch the balloons. The ANITA team is hoping for another long flight in 2008, but with a path that circles the continent at higher latitudes so that ANITA may view the colder, deeper ice sheet in the eastern side of the continent.

ANITAII will include additional antennas and a modified triggering scheme that will allow the experiment to push further in its bid to detect the high energy neutrinos.

Work is already underway on planning for the next generation of neutrino astronomy facilities, in both Antarctica and the Mediterranean. These facilities may be the first to truly realise the goals of mapping the cosmos using neutrinos, and of probing fundamental physics, at energy scales far beyond the reach of terrestrial particle accelerators, using a beam of particles provided by some of the most extreme objects in the Universe.

Figure 3: The ANITA payload back on the ice after its 37 km descent by parachute.

Condensed Matter and Materials Physics

The work of the group covers an enormous range of activities, both experimental and theoretical, in the physics of condensed matter. Dr Dorothy Duffy, Prof. Tony Harker, Prof. Des McMorrow, Dr Peter Sushko detail three examples below to show how group members are investigating new ways of probing fundamental quantum mechanical effects, finding novel properties by creating new compounds, and addressing the crucial materials issues raised by fusion reactors.

Novel Probes of Entanglement

One of the most counter-intuitive features of quantum mechanics is entanglement. Two particles can be entangled in such a way that measuring a property of one also determines that same property for the other – this is what Einstein referred to as 'spooky action at a distance.' Einstein devised several thought- experiments to try to show that this phenomenon did not exist, but so far quantum mechanics has been shown to be correct. This property of entanglement is central to new developments such as quantum computing. Now a group of scientists including researchers from UCL have shown how these entangled states can be imaged using a conventional tool of material science – neutron beams produced at particle accelerators and nuclear reactors – in a simple magnet.

At the nano scale, we usually think of magnetism as arising from atoms behaving like little magnets called spins. In ferromagnets – the kind that stick to fridge doors – all of these atomic magnets point in the same direction. In antiferromagnets, the spins spontaneously align themselves opposite to the adjacent spins, leaving the material magnetically neutral overall. In fact this picture is not quite correct because it ignores the uncertainties of quantum mechanics. In quantum mechanics a spin can simultaneously point up and down: it is said to be in a 'superposition' of spin up and spin down states, but if its spin is measured it will turn out to be either up or down. At the same time, two spins can be linked, or entangled, such that even though it is impossible to know the direction of either by itself, they will always point in opposite directions. Then, if they are entangled in such a way that the spins point in opposite directions, if one is measured and found to have its spin pointing upwards the other must have its spin pointing downwards.

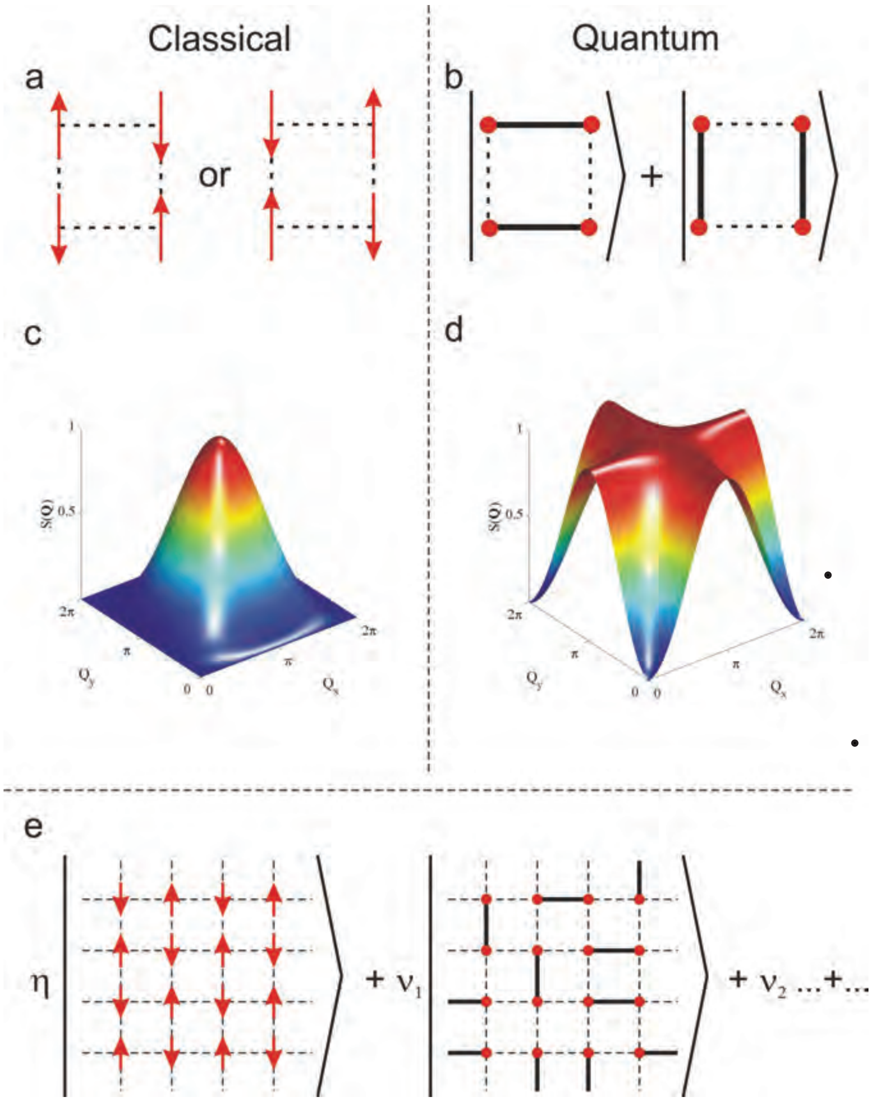


Figure 1: Neutron diffraction can be used to study the entanglement of a square of spins, the tiny bar magnets associated with the electrons in the copper atoms in a particular organometallic crystal. On the left (c) shows a calculated neutron image for these spins when they behave as classical objects (a), while the right (d) shows the image when they are entangled (b). The images are dramatically different in the two cases, taking the form of a nearly circular spot for the classical case and a cross for the quantum, entangled state.

One of the lead investigators at UCL, Prof. Des McMorrow, commented: "When we embarked on this work, I think it is fair to say that none of us were expecting to see such gigantic effects produced by quantum entanglement in the material we were studying. We were following a hunch that this material might yield something important and we had the good sense to pursue it." The next steps will be to pursue the implications for high temperature superconductors, materials carrying electrical currents with no heating and which bear remarkable similarities to the insulating antiferromagnets studied here, and the design of quantum computers.

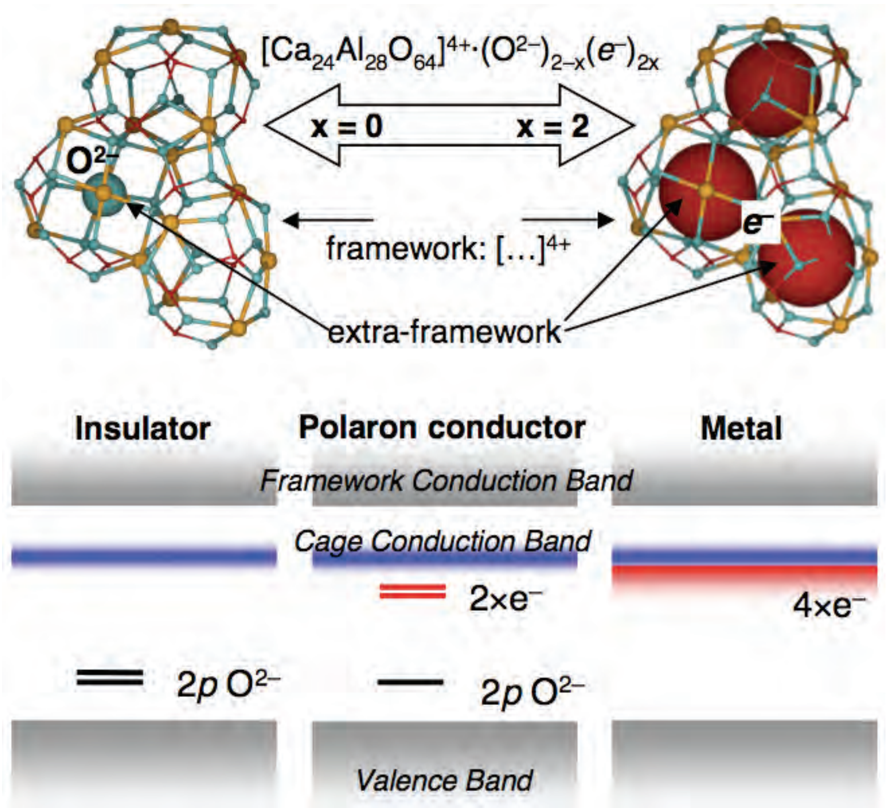


Figure 2: The atomic (top) and electronic (bottom) structures of C12A7 at different concentrations of the extra-framework electron gas. The bottom panel shows the change of the electronic structure from the insulating state (x=0) to a semiconducting state (x≈1), and further to a metallic state (x≈2).

New Electride Materials

Electrides are ionic crystals in which electrons behave rather like negatively charged ions. These new materials hold out the promise of exceptionally good characteristics as cold electron emitters and chemically active agents.
Tremendous efforts have been made to develop organic and inorganic electrides that would be robust enough to be used in practical applications under ambient conditions and at elevated temperatures, but there are still major limitations to their use: organic electrides become unstable at temperatures above –40°C and inorganic electrides offer little possibility of control over the concentration of the electron anions.

The recent development of a new complex oxide 12CaO ▪ $7Al_2O_3$ (C12A7), based on “as cheap as dirt” materials was a major breakthrough in the development of electrides. Its chemical composition can be written as $[Ca_{24}Al_{28}O_{64}]^{4}$+ ▪ $2O^{2}$–, where the positively charged framework $[Ca_{24}Al_{28}O_{64}]^{4}$+ forms a lattice of sub-nanometer cages and negatively charged extra-framework anions, O^{2}–, are randomly distributed over the framework cages.

In a partnership with experimentalists at Tokyo Institute of Technology, UCL physicists including Peter Sushko have created a theoretical model of C12A7 and predicted several interesting effects. For example, when the extra-framework becomes oxygen-deficient, a low-density electron gas is formed in the C12A7 lattice and the material becomes a transparent conductor. In this state the extra-framework electrons form polarons (a combination of a charge and associated distrotion of the crystal): they are localised inside individual cages and diffuse through the lattice by hopping from one cage to another. If the extra-framework is strongly oxygen-deficient the density of the electron gas increases and it delocalises over all cages. Simultaneously with this C12A7 becomes metallic and even superconductive at very low temperatures. This transition is reversible, so that C12A7 can be converted from the metal to an insulator under oxidising conditions.

Materials for Fusion Reactors
As global warming becomes a reality, the quest for a clean, safe, carbon-free source of electricity is becoming urgent. Fusion power fulfils all these criteria, with the added advantage that the fuel supply is plentiful; Deuterium is found in seawater and Tritium can be bred from Lithium, which is abundant in the earth’s crust. There are, however, significant hurdles to be overcome before the dream of

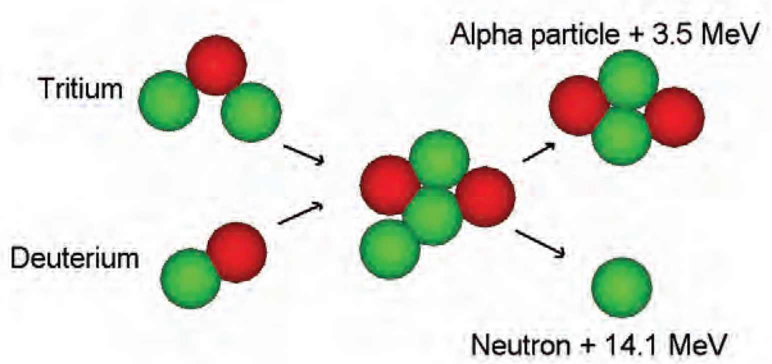


Figure 3: The Deuterium-Tritium fusion reaction

fusion power becomes a reality. One such hurdle is the development of materials that can withstand the high-energy radiation environment. Fusion of Deuterium and Tritium results in the creation of high-energy neutrons and alpha particles.

Much can be learnt about radiation damage in materials from modelling studies. A UCL team led by Dorothy Duffy uses a technique called Molecular Dynamics (MD) to model the effects of a high energy particle colliding with an atom in a material. Initially there is a lot of disorder near the collision and it appears that the crystal has melted in a small region. As time progresses the material recrystallises, however some defects remain in the form of empty sites where there should be atoms (vacancies) and extra atoms squeezed in where an atom would not normally be (interstitials). The accumulation and clustering of these defects will gradually cause embrittlement and perhaps even failure of the material.

Dorothy's team has been working on improving radiation damage simulations by including the effects of electronic excitations. Very high energy particles excite electrons and the effects of these electronic excitations are generally neglected in classical MD simulations. They include the effects by coupling the MD simulations to a coarse-grained representation of the electronic energy. At each simulation step energy is exchanged between the lattice and the electrons and this energy contributes to defect creation, diffusion and recombination. When a material is irradiated with swift heavy ions the electronic temperature is high enough to melt the lattice along the ion path and cylindrical regions of defects, known as ion tracks, are created. The result of one of their simulations of such a track in Iron is shown below.

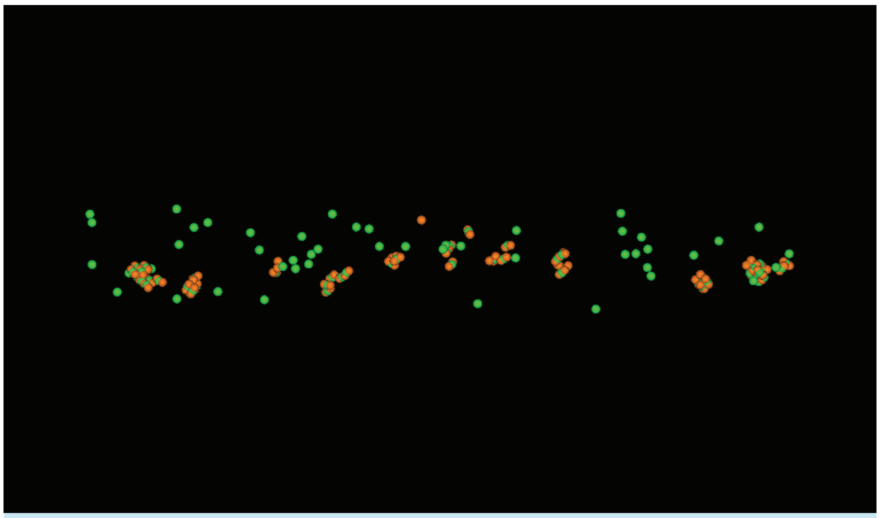


Figure 5: The damage track created by a swift heavy ion in Fe. The green spheres show vacanciesin the crystal and the gold spheres show the presence of extra interstitial species.

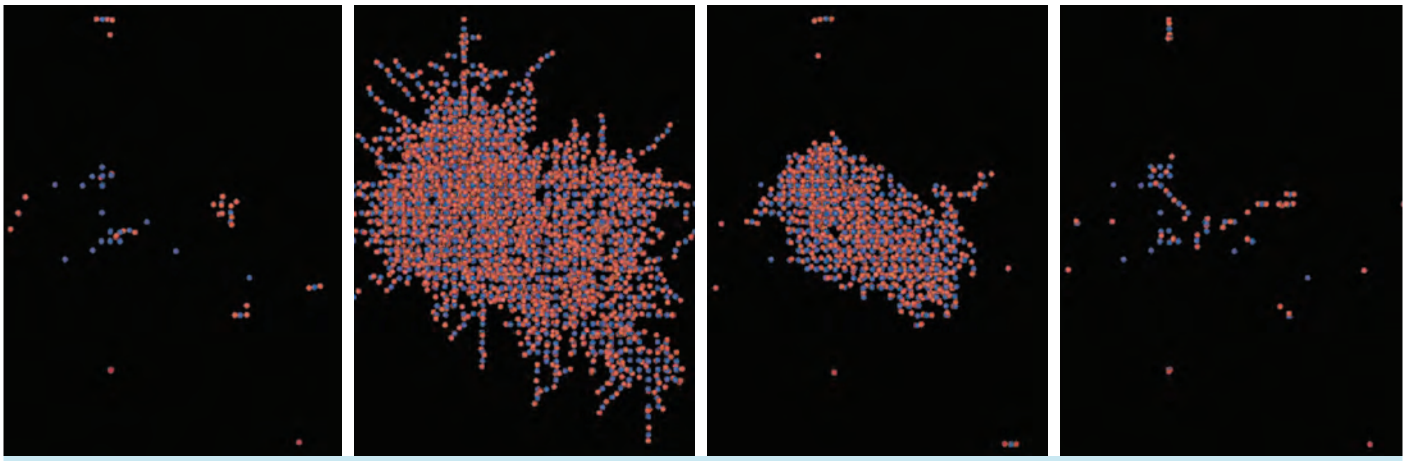


Figure 4: A sequence of snapshots of the damage caused by a 10keV radiation event in Nickel: each dot represents an atom which is displaced by the radiation, and the initial huge damage cluster (left) evolves as the energetic atoms move to leave residual damage (right) .

Active Grants and Contracts (Jan 2007 – Dec 2007)

Astrophysics

The next generation of cosmological surveys (Leverhulme Trust) £42,000 PI: F Abdalla
Studies of the thermospheres and ionospheres: From the earth to the stars (STFC) £1,570,463 PI: A Aylward
Deep spectroscopy and 3D photoionisation modelling of planetary nebulae (Royal Society) £12,000 PI: M Barlow
Stellar duets in theory and observations (American Museum of Natural History) £9,504 PI: M Barlow
The dust enrichment of galaxies: supernovae and evolved stars (STFC) £184,226 PI M Barlow
Formation of massive star clusters and cluster complexes in galaxies (STFC) £250,170 PI: N Bastian
Constraining and testing cosmological models (Royal Society) £205,823 PI: S Bridle
Measuring cosmic shear (STFC) £186,144 PI: S Bridle
The nature of dark matter from cosmic gravitational lensing (Royal Society) £2,010 PI: S Bridle
The mind of the universe: A series of school/public lectures communicating the excitement of cosmic discovery (astronomy, astrophysics cosmology) (STFC) £33,727 PI: F Diego
Smart X-ray optics (EPSRC) £3,072,089 PI: P Doel
Dark energy survey design work (University if Chicago) £10,072 PI: P Doel
Zonal biomorph deformable mirror feasibility study (STFC) £19,640 PI: P Doel
Ultra-thin, lightweight, carbon fibre adaptive mirrors for ELTs (STFC/ATC) £18,000 PI: P Doel
DES Consortium: Purchase of glass blanks (University of Chicago) £93,023 PI: P Doel
DES Consortium: Purchase of glass blanks (University of Portsmouth) £251,500 PI: P Doel
DES Consortium: Purchase of glass blanks (University of Michigan) £69,767 PI: P Doel
Large ultra-thin lightweight, carbon-fibre adaptive mirrors for ELTs (STFC) £347,447 PI: P Doel
DES Consortium: Purchase of glass blanks (University of Pennsylvania) £139,535 PI: P Doel
Astronomy in the classroom: School and observatory visits for KS2, KS3, KS and A Level (STFC) £5,600 PI: M M Dworetsky
Astronomy in the classroom: School and observatory visits (STFC) £13,354 PI: M M Dworetsky
Astronomy in the classroom: School and observatory visits (STFC) £8,200 PI: M M Dworetsky
Development of photon counting L3CCD detector for spectroscopic applications (Royal Society) £6,837 PI: J Fordham
System management support for the UCL astrophysics group (STFC) £96,530 PI: I Howarth
Cosmology with the new generation of photometric redshift surveys (STFC) £186,144 PI O Lahav
Astrogrid 2 (STFC) £22,113 PI O Lahav
The heart of the great attractor and spectroscopic surveys (Royal Society) £3,554 PI O Lahav
A wide-field corrector for the dark energy survey (STFC) £1,762,660 PI: O Lahav
Modelling the universe: From atomic to large scale structures (STFC) £246,803 PI: S Miller
The e-MERLIN radio astronomy revolution: developing the science support tool (Leverhulme Trust) £124,272 PI: R Prinja
UCL astrophysics short term visitor programme 2006-2009 (STFC) £25,661 PI: R Prinja
Star formation and its relationship with the interstellar mediums (STFC) £164,006 PI: J Rawlings
PATT linked grant to sponsor use of ground based telescopes (STFC) £81,164 PI: L J Smith
Massive stars, starbursts and feedback into the environmental galaxies (STFC) £164,230 PI: L J Smith
Detecting biosignatures for extrasolar worlds (STFC) £274,039 PI: G Tinetti
Mapping cosmic evolution with high-redshift clusters (STFC) £251,250 PI: C Van Breukelen
Clumpiness in star forming regions (STFC) £206,257 PI: S Viti
The environment around Herbig-Haro objects: clumpiness and star formation (Royal Society) £5,000 PI: S Viti
Chemistry in galaxies at high redshifts (Leverhulme Trust) £112,381 PI: S Viti
Industrial processes for automated polishing and metrology of complex forms (Royal Society) £84,184 PI: D Walker
Industrial case studentship: C King (EPSRC) £44,700 PI: D Walker
Basic technology: Ultra precision surfaces – A new paradigm (accuracy capability of 1 part 10 to the power of 8) (EPSRC) £1,568,731 PI: D Walker
On-machine metrology for surface fabrication (STFC) £298,258 PI: D Walker
Integrated knowledge centre in ultra precision and structured surfaces (EPSRC) £391,853 PI: D Walker
The development of acoustic detection, reconstruction and signal processing techniques and their application to the search for ultra-high energy cosmic ray neutrinos (Defence Science and Technology Laboratory) £12,930 PI: D Waters
Distinguishing modifications of gravity from dark energy (Nuffield Foundation) £4,800 PI: J Weller
Perenatal events in astronomy (STFC) £4,214 PI: D A Williams

Atomic, Molecular, Optical and Positron Physics

Excited state photoengineering: Virtual crystallography – A new approach to spectroscopy, molecular dynamics and structure (EPSRC) £625,471 PI: A Bain
Photophysics of fluorescently tagged DNA (RAIS) £35,358 PI: A Bain
Trapping and slowing cold molecules in pulsed optical lattices (EPSRC) £77,277 PI: P Barker
Manipulating molecules with optical fields (EPSRC) £237,552 PI: P Barker
Creating ultra-cold molecules by sympathetic cooling (EPSRC) £1,264,848 PI: P Barker
Quantum computation and communication using spin chains and related systems (EPSRC) £97,881 PI: S Bose
Spin chain connectors, entanglement by measurements and mesoscopic quantum coherence (EPSRC) £783,478 PI: S Bose
Quantum information uses of complex systems and limits of the quantum world (Royal Society) £75,000 PI: S Bose
Quantum information processing interdisciplinary research collaboration (EPSRC) £87,678 PI: S Bose
Quantum information processing interdisciplinary research collaboration (EPSRC) £91,493 PI: D Browne
Microstirring of complex ionic liquids with optical tweezers (Royal Society) £12,000 PI: P Jones
Superreserving optical tweezers (Royal Society) £7,174 PI: P Jones
Theory of producing, detecting and designing molecular boase-einstein condensates (Royal Society) £73,833 PI: T Kohler
Positron reaction microscopy (EPSRC) £604,297 PI: G Laricchia
Resonant activation and ratchet effect in dissipative optical lattices (EPSRC) £125,778 PI: F Renzoni
Studying magnetic phase transitions with ultra cold atoms in optical lattices (EPSRC) £57,582 PI: F Renzoni
Cooling of atoms in optical cavities by collective dynamics (EPSRC) £457,631 PI: F Renzoni
Quantum control at the single atom level via adiabatic following of a dark state (Royal Society) £13,910 PI: F Renzoni
International incoming short visit – Prof B Jelenkovic (Royal Society) £2,500 PI: F Renzoni
New rectification mechanisms in cold atom ratchets (Royal Society) £12,000 PI: F Renzoni
The UK RmaX network (STFC) £10,277 PI: P Storey
Quantum states of molecules at dissociation (EPSRC) £240,613 PI: J Tennyson
Complete spectroscopy of water (INTAS) £6,300 PI: J Tennyson
Opacity functions for hot molecules (Royal Society) £12,000 PI: J Tennyson
QUASAAR – Quantitive spectroscopy for atmospheric and astrophysical research (European Commission) £126,788 PI: J Tennyson
A theoretical investigation of positron annihilation in molecules (EPSRC) £188,424 PI: J Tennyson
WWLC weak weather vapour lines contribution to the absorption of atmospheric radiation (European Commission) £109,999 PI: J Tennyson
Dynamic imaging of matter at the attosecond and angstrom scale (EPSRC) £101,769 PI: J Tennyson
Infrared and visible wavelength absorption by water vapour (NERC) £130,616 PI: J Tennyson
Low-mass star formation and evolution in the early universe (STFC) £118,651 PI: J Tennyson
Electron drive processes (Quantemol) £12,930 PI: J Tennyson
An opacity function for ammonia (Leverhulme Trust) £59,480 PI: J Tennyson
Positron scattering from molecules at low energies using R-matrix method (Royal Society) £15,820 PI: J Tennyson
Electron initiated chemistry in biomolecules (EPSRC) £375,727 PI: J Tennyson
CAVIER (NERC) £396,342 PI: J Tennyson
Quantum states of water and dissociation (EPSRC) £88,697 PI: J Tennyson
Line lists for isotopologues of water (Royal Society) £4,162 PI: J Tennyson
Quantum etch plasma simulation (EPSRC) £93,686 PI: J Tennyson
A database for H2160 (Royal Society) £3,362 PI: J Tennyson
Detailed modelling of quantum electron molecule scattering in radioactive waste (RAIS) £26,777 PI J Tennyson
Dynamic imaging of matter at the attosecond and angstrom scales (EPSRC) £70,788 PI: J Underwood
The study and control of condensed phase molecular dynamics via femtosecond laser techniques (Royal Society) £14,138 PI: J Underwood
Joint appointment for Dr Jonathan Underwood (STFC) £184,743 PI: J Underwood

High Energy Physics

Exploring beyond the standard model physics with the ATLAS experiment at the LHC (STFC) £210,217 PI: A Barr
CEDAR: Combined EScience data analysis resource for high energy particle physics (STFC) £326,408 PI: J Butterworth
Experimental high energy physics research at UCL (STFC) £3,448,533 PI: J Butterworth
Development and maintenance of ATLAS run time tester (CCLRC) £45,000 PI: J Butterworth
MCnet – Monte Carlo event generators for high energy particle physics (European Commission) £171,985 PI: J Butterworth
Probing the ultra-high energy universe with neutrinos as cosmic messengers (Royal Society) £121,500 PI: A Connolly
Preparation for and measurement of new physics processes using ATLAS experiment at LHC (STFC) £459,243 PI: C Gwenlan
Core software development for the physics exploitation of the ATLAS detector at LHC (STFC) £298,548 PI: N Konstantinidis

Core software development for the physics exploitation of the ATLAS detector at LHC (STFC) £114,009 PI: N Konstantinidis
Core software development for the physics exploitation of the ATLAS detector at LHC (STFC) £24,290 PI: N Konstantinidis
ARTEMIS – Investigation of the electroweak symmetry breaking and the origin of mass using the first data of ATLAS detector at LHC (European Commission) £228,959 PI: N Konstantinisdis
Atlantis event display (STFC) £25,000 PI: N Konstantinidis
ESLEA: Exploitation of switched lightpaths for Escience applications (EPSRC) £134,810 PI: M
Lancaster
Experimental high energy particle physics research at UCL (STFC) £5,724,079 PI: M Lancaster
Energy spectrometer for the ILC (British Council) £3,696 PI: A Lyapin
Energy spectrometry based on high resolution cavity beam positron monitors for international linear collider (British Council) £3,000 PI: B Maiheu
Accelerator science programme, work package 2.1 (Accelerator Science and Technology Centre) £20,000 PI: D J Miller
The linear collider beam delivery system (STFC) £192,623 PI: D J Miller
Investigating neutrino oscillations with MINOS and neutrino astronomy with ANITA (Royal Society) £438,868 PI: R Nichol
Detection of ultra-high cosmic ray neutrinos with ANITA and investigation of future large scale detectors (STFC) £281,290 PI: R Nichol
QCD phenomenology at hadron colliders and an improved measurement of the top quark mass (STFC) £104,555 PI: E L Nurse
Measurement of the neutrino mass spectrum with oscillation and double beta decay experiments (STFC) £236,269 PI: R Saakyan
NEMO III exploitation (STFC) £52,741 PI: R Saakyan
Design study of the superNEMO experiment (STFC) £753,999 PI: R Saakyan
Development of the ZEUS global tracking trigger at HERA and the ATLAS level 2 trigger (STFC) £225,125 PI: M Sutton
ILIAS – Integrated large infrastructures for astroparticle science (European Commission) £12,096 PI: J Thomas
Construction, calibration and exploitation of the MINOS experiment (STFC) £9,425 PI: J Thomas
Establishment for a new HEP/SS facility for construction of large HEP and SS projects (STFC) £251,151 PI: J Thomas
Deputy chair of science board (STFC) £55,515 PI: J Thomas
Global fits for parton distributions and implications for hadron collider physics (STFC) £150,675 PI: R Thorne
University research fellowship (Royal Society) £123,654 PI: R Thorne
GridPP Tier-2 support (STFC) £42,244 PI: B Waugh
GridPP Tier- 2 support (STFC) £128,479 PI: B Waugh
Studying neutrino oscillations with MINOS experiment (STFC) £115,436 PI: C B Smith
Precise determination of beam energies at a future linear collider (Nuffield Foundation) £5,000 PI: M Wing
European design study towards a global TeV linear collider (European Commission) £81,270 PI: M Wing
CALICE: Calorimetry for the international linear collider (STFC) £138,596 PI: M Wing
Studentship: Sarah Boutle (Deutsches Elektronen-Synchrotron) £37,757 PI: M Wing
EUDET: Detector research and development towards the international linear collider (EuropeanCommission) £207,685 PI: M Wing
LC-ABD Collaboration: Work package 9: Cavity BPM energy spectrometer (STFC) £203,957 PI: M Wing

Condensed Matter and Materials Physics
Many CMMP grants are now held through the London Centre for Nanotechnology.

Modelling charge transport in conducting polymers and biological systems (IRC Cambridge University) £17,468 PI: D Bowler
New Exploratory Project – Modelling charge transport in conducting polymers and biological systems (IRC Cambridge University) £127,409 PI: D Bowler
NSF: Quantum frustration (EPSRC) £72,907 PI: S Bramwell
THREADMILL – Threaded molecular wires as supramolecularly engineered materials (European
Commission) £310,691 PI: F Cacialli
International conference on materials for advanced technologies 2007 (Royal Society) £1,800 PI: F Cacialli
Exploring new graphitic superconductors: Charge transfer, excitations and dimensionality (EPSRC) £621,904 PI: M Ellerby
Alternative s-matrix approaches for matter in strong laser fields (EPSRC) £310,014 PI: M Ellerby
Studentship for Andrew Walters (STFC) £19,821 PI: D McMorrow
NANOMAN –Control, manipulation on the 1-10nm scale using localised forces and excitations
(European Commission) £135,696 PI: A Shluger
Theoretical calculation on electron states and anion species in nano-porous crystals (Japan Science and Technology Agency) £78,972 PI: A Shluger
Laser materials interaction (Pacific Northwest National Laboratory) £31,000 PI: A Shluger
Development of simultaneous diffraction-conductance measurements at ISIS (CCLRC/STFC) £29,000 PI: N Skipper
Studentship: T Headon (Schlumberger Cambridge Research) £6,000 PI: N Skipper

Physics and Astronomy 2007 Publications

ASTROPHYSICS GROUP

1. F. B. Abdalla, S. Rawlings, Determining neutrino properties using future galaxy redshift surveys, MNRAS 381 1313-1328 (2007).
2. C. Adami, M. P. Ulmer, F. Durret, G. Covone, E. Cypriano, B. P. Holden, R. Kron, G. B. Lima Neto, A. K… Romer, D. Russeil, B. Wilhite, An extension of the SHARC survey, A&A 472 373-381 (2007).
3. M. Aston, Design of large-area OLED displays utilizing seamless tiled components, J. of the Society for Information Display 15 535 (2007).
4. A. D. Aylward, G. J. Millward, A. Lotinga, A.Dobbin, M. J. Harris, Recent Advances in Modelling Space Weather effects on the terrestrial upper and middle atmospheres in -COST 724 final report: Developing the scientific basis for monitoring, modelling and predicting Space Weather, Co-Operation in Science and Technology (2007).
5. R. J. Barber, S. Miller, T. Stallard, J. Tennyson, P. Hirst, T. Carroll, A. Adamson, The United Kingdom Infrared Telescope Deep Impact observations: Light curve, ejecta expansion rates and water spectral features, Icarus 191 371-380 (2007).
6. R. J. Barber, S. Miller, T. Stallard, J. Tennyson, P. Hirst, T. Carroll, A. Adamson, The United Kingdom Infrared Telescope Deep Impact observations: Light curve, ejecta expansion rates and water spectral features, Icarus 187 167-176 (2007).
7. N. Bastian, B. Ercolano, M. Gieles, E. Rosolowsky, R.A. Scheepmaker, R. Gutermuth, Y. Efremov, Hierarchical star formation in M33: fundamental properties of the star-forming regions, MNRAS 379 1302-1312 (2007).
8. N. Bastian, I. Konstantopoulos, L. J. Smith, G. Trancho, M. S. Westmoquette, J. S. Gallagher, Detailed study of the enigmatic cluster M82F, MNRAS 379 1333-1342 (2007).
9. T. A. Bell, S. Viti, D. A. Williams, Molecular line intensities as measures of cloud masses -II. Conversion factors for specific galaxy types, MNRAS 378 983-994 (2007).
10. T. A. Bell, W. Whyatt, S. Viti, M. P. Redman, Search for CO+ in planetary nebulae, MNRAS 382 1139-1144 (2007).
11. M. Benedettini, S. Viti, C. Codella, R. Bachiller, F. Gueth, M. T. Beltr´, A. Dutrey, S. Guilloteau, S., The clumpy structure of the chemically active L1157 outflow, MNRAS 381 1127-1136 (2007).
12. C. Blake, A. Collister, S. Bridle, S. O. Lahav, Cosmological baryonic and matter densities from 600000 SDSS luminous red galaxies with photometric redshifts, MNRAS 374 1527-1548 (2007).
13. P. Bode, J. P. Ostriker, J. Weller, L. Shaw, Accurate Realizations of the Ionized Gas in Galaxy Clusters: Calibrating Feedback, ApJ 663 139-149 (2007).
14. N. V. Boris, L. Sodr´e, Jr., E. Cypriano, W. A. Santos, C. M. de Oliveira, M. West, Searching High-Redshift Large-Scale Structures: Photometry of Four Fields around Quasar Pairs at 1, ApJ 666 747-756 (2007).
15. J. E. Bowey, A. Morlok, M. K¨ohler, M. Grady, M., 2-16μm spectroscopy of micron-sized enstatite (Mg,Fe)$_2$ Si$_2$ O$_6$ silicates from primitive chondritic meteorites, MNRAS 376 1367-1374 (2007).
16. S. Bridle, F. B. Abdalla, The Galaxy-Galaxy Lensing Contribution to the Cosmic Shear Two-Point Function, ApJ 655 L1-L4 (2007).
17. S. Bridle, L. King, Dark energy constraints from cosmic shear power spectra: impact of intrinsic alignments on photometric redshift requirements, N. J. Phys. 444 (2007).
18. L. R. Carlson, E. Sabbi, M. Sirianni, J. L. Hora, A. Nota, M. Meixner, J. S. Gallagher, III, M. S. Oey, A. Pasquali, L. J. Smith, M. Tosi, R. Walterbos, Progressive Star Formation in the Young SMC Cluster NGC 602, ApJ 665 L109-L114 (2007).
19. E. R. Carrasco, E. S. Cypriano, G. B. L. Neto, H. Cuevas, L. Sodr´e, Jr., C. M. de Oliveira, A. Witnessing the Formation of Galaxy Cluster at 0.485: Optical and X-Ray Properties of RX J1117.4+0743 ([VMF 98] 097), ApJ 664 777-790 (2007).
20. D. Eisenstein, J. Loveday, R. Nichol, K. Pimbblet, R. de Propris, I. Roseboom, N. Ross, D. P. Schneider, T. Shanks, D. Wake, MegaZ-LRG: photometric redshift catalogue of one million SDSS luminous red galaxies, MNRAS 375 68-76 (2007).
21. J. E. Dale, B. Ercolano, C. J. Clarke, New algorithm for modelling photoionizing radiation in smoothed particle hydrodynamics, MNRAS 382 1759-1767 (2007).
22. F. Diego, Astronomy in the classroom: School lectures and observatory visits, A&G 48 26-4 (2007).
23. Y. N. Efremov, V. L. Afanasiev, E. J. Alfaro, R. Boomsma, N. Bastian, S.Larsen, M. C. Sanchez-Gil, O. K. Silchenko, B. Garcıa-Lorenzo, C. Munoz-Tunon, P. Hodge, Ionized and neutral gas in the peculiar star/cluster complex in NGC 6946, MNRAS 382 481-497 (2007).
24. B. Ercolano, M. J. Barlow, B. E. K. Sugerman, Dust yields in clumpy supernova shells: SN1987A revisited, MNRAS 375 753-763 (2007).
25. B. Ercolano, N. Bastian, N., G. Stasinska, The effects of spatially distributed ionization sources on the temperature structure of HII regions, MNRAS 379 945-955 (2007).
26. A. Faure, H. N. Varambhia, T. Stoecklin, J. Tennyson, Electron-impact rotational and hyperfine excitation of HCN, HNC, DCN and DNC, MNRAS 382 840-848 (2007).
27. D. R. Flower, G. J. Harris, Three-body recombination of hydrogen during primordial star formation, MNRAS 377 705-710 (2007).
28. E. A. K. Ford, A. L. Aruliah, E. M. Griffin, I. McWhirter, High time resolution measurements of the thermosphere from Fabry-Perot Interferometer measurements of atomic oxygen, Annales Geophysicae 25 1267-1278 (2007).
29. J. M. Girart, S. Viti, The origin of the molecular emission around the southern hemisphere Re 4 IRS - HH 188 region, A&A 470 633-638 (2007).
30. G. J. Harris, A. E. Lynas-Gray, S. Miller, J. Tennyson, Non-grey hydrogen burning evolution of subsolar mass Population III stars, MNRAS 374 337-343 (2007).
31. G. J. Harris, R. Porter, A. E. Lynas-Gray, J. Tennyson, Evolutionary models for two hyper-iron-poor low-mass stars, MNRAS 377 1520-1530 (2007).
32. J. Hearnshaw, D. Wentzel, A. Batten, H., Malasan, J. White, M. K. Hemenway, Y. Kozai, A. Alsabti, P. Martinez, R. Gray, J. Narlikar, J. Fierro, H. Levato, Commission 46: Program Group for the World-Wide Development of Astronomy, Transactions of the I. A.U., Series 26 387-390 (2007).
33. Y. Hoffman, O. Lahav, G. Yepes, Y. Dover, The future of the local large scale structure: the roles of dark matter and dark energy, J. of Cosmology and Astro-Particle Physics 10 16-(2007).
34. I. D. Howarth, N. R. Walborn, D. J. Lennon, J. Puls, Y. Naze, K. Annuk, I,. Antokhin, D. Bohlender, H. Bond, J.-F Donati, L. Georgiev, D. Gies, D. Harmer, A. Herrero, I. Kolka, D. McDavid, T. Morel, I. Negueruela, G. Rauw, P. Reig, Towards an understanding of the Of?p star HD 191612: optical spectroscopy, MNRAS 381 433-446 (2007).
35. F. Islam, E. R. Latimer, S. D. Price, The Formation of vibrationally excited HD from atomic recombination on cold graphite surfaces, J. of Chemical Physics, 127, 064701 (2007).
36. I. Jimenez-Serra, J. Martın-Pintado, A. Rodrıguez-Franco, P. Caselli, S. Viti, T. Hartquist, Revealing the “fingerprints” of the magnetic precursor of C-shocks, Astrophysics and Space Science 399 (2007).
37. M. Kissler-Patig, T. Wilson, N. Bastian, F. D'Antona, R. de Grijs, D. Froebrich, E. Galliano, P. Grosbøl, K. Johnson, E. Keto, R. Klessen, T. Megeath, M. Rejkuba, J. Steinacker, H. Zinnecker, 12 Questions on Star and Massive Star Cluster Formation, The Messenger 129 69-72 (2007).
38. T. T. Koskinen, A. D. Aylward, C. G. A. Smith, S.Miller, Thermospheric Circulation Model for Extrasolar Giant Planets, ApJ 661 515-526 (2007).
39. T. T. Koskinen, A. D. Aylward, S. Miller, Stability Limit for Giant Exoplanet Atmospheres, Nature 450 845-848 (2007).
40. E. Lagadec, A. A. Zijlstra, G. C. Sloan, M. Matsuura, P. R. Wood, J. T. van Loon, G. J. Harris, J. A. D. L. Blommaert, S. Hony, M. A. T. Groenewegen, M. W. Feast, P. A. Whitelock, J. W. Menzies, M. –R. Cioni, Spitzer spectroscopy of carbon stars in the Small Magellanic Cloud, MNRAS 376 1270-1284 (2007).
41. O. Lefevre, T. Padmanabhan, J. Peacock, Y. Suto, D. Scott, Commission 47: Cosmology, Transactions of the I.A.U, Series 26 291-298 (2007).
42. M. B. Lystrup, S. Miller, T. Stallard, C.G. A. Smith, A. D. Aylward, Variability of Jovian ion winds: an upper limit for enhanced Joule heating Annales Geophysicae 25 847-853 (2007).
43. Y. Lyubchik, H. R. A. Jones, Y. V. Pavlenko, E. Martin, I. S. McLean, L. Prato, R. J. Barber, J. Tennyson, Spectral analysis of high resolution near-infrared spectra of ultra cool dwarfs, A& 473 257-264 (2007).
44. R. Massey, C. Heymans, J. Berge, G. Bernstein, S. Bridle, D. Clowe, H. Dahle, R. Ellis, T. Erben, M. Hetterscheidt, F. W. High, C. Hirata, H. Hoekstra, P. Hudelot, M. Jarvis, D. Johnston, K. Kuijken, V. Margoniner, R. Mandelbaum, Y. Mellier, R. Nakajima, S. Paulin-Henriksson, M. Peeples, C. Roat, A. Refregier, J. Rhodes, T. Schrabback, M. Schirmer, U. Seljak, E. Semboloni, L. van Waerbeke, The Shear Testing Programme 2: Factors affecting high-precision weak-lensing analyses, MNRAS 376 13-38 (2007).
45. M. Matsuura, A. K. Speck, M. D. Smith, A. A. Zijlstra, S. Viti, K. T. E. Lowe, M. Redman, C. J. Wareing, E. Lagadec, VLT/near-infrared integral field spectrometer observations of molecular hydrogen lines in the knots of the planetary nebula NGC 7293 (the Helix Nebula), MNRAS 382 1447-1459 (2007).
46. M. Matsuura, A. A. Zijlstra, J. Bernard-Salas, J. W. Menzies, G. C. Sloan, P. A. Whitelock, P. R. Wood, M. –R. L. Cioni, M. W. Feast, E. Lagadec, J. T. van Loon, M. A. T. Groenewegen, G. J. Harris, Spitzer Space Telescope spectral observations of AGB stars in the Fornax dwarf spheroidal galaxy, MNRAS 382 1889-1900 (2007).
47. B. C. Matthews, J. S. Greaves, W. S. Holland, M. C. Wyatt, M. J. Barlow, P. Bastien, C. A. Beichman, A. Biggs, H. M. Butner, W. R. F. Dent, J. Di Francesco, C. Dominik, L. Fissel, P. Friberg, A. G. Gibb, M. Halpern, R. J. Ivison, R. Jayawardhana, T. Jenness, D. Johnstone, J. J. Kavelaars, J. L. Marshall, N. Phillips, G. Schieven, I. A. G. Snellen, H. J. Walker, D. Ward-Thompson, B. Weferling, G. J. White, J. Yates, M. Zhu, A. Craigon, An Unbiased Survey of 500 Nearby Stars for Debris Disks: JCMT Legacy Program, PASP 119 842-854 (2007).
48. H. Melin, S. Miller, T. Stallard, L. M. Trafton, T. R. Geballe, Variability in the Hemission of Saturn: Consequences for ionisation rates and temperature, Icarus 186 234-241 (2007).
49. C. Mendoza, M. J. Seaton, P. Buerger, A. Bellorın, M. Melendez, J. Gonzalez, L. S. Rodrıguez, F. Delahaye,E. Palacios, A. K. Pradhan, C. J. Zeippen, OPserver: interactive online computations of opacities and radiative accelerations, MNRAS 378 1031-1035 (2007).
50. T. Moffat-Griffin, A. D. Aylward, W. Nicholson, Thermal structure and dynamics of the Martian Upper Atmosphere at solar minimum from Global Circulation Model simulations, Annales Geophysicae 25 2147-2158 (2007).
51. S. L. Moll, S. Mengel, R. de Grijs, L. J. Smith, P. A. Crowther, Cluster and nebular properties of the central star-forming region of NGC 1140, MNRAS 382 1877-1888 (2007).
52. Y. Naze, G. Rauw, A. M. T. Pollock, N. R. Walborn, I. D. Howarth, Towards an understanding of the Of?p star HD191612: phase-resolved multiwavelength observations, MNRAS 375 145-153 (2007).
53. H. Okuda, G. Hasinger, M. D. Arnaud, S. Bludman, J. Braga, N. Brosch, L. Gurvits, H. Hasan, G. Helou, I. D. Howarth, H. Inoue, P. Luigi, G. Srinivasan, Commission 44: Space High Energy Astrophysics, Transactions of the I.A.U., Series 26 319-326 (2007).
54. R. Plume, G. A. Fuller, F. Helmich, F. F. S. van der Tak, H. Roberts, J. Bowey, J. Buckle, H. Butner, E. Caux, C. Ceccarelli, E. F. van Dishoeck, P. Friberg, A. G. Gibb, J. Hatchell, M. R. Hogerheijde, H. Matthews, T. J. Millar, G. Mitchell, T. J. T. Moore, V. Ossenkopf, J. M. C. Rawlings, J. Richer, M. Roellig, P. Schilke, M. Spaans, A. G. G. M. Tielens, M. A. Thompson, S. Viti, B. Weferling, G. J. White, J. Wouterloot, J.Yates, M. Zhu, The James Clerk Maxwell Telescope Spectral Legacy Survey, PASP 119 102-111 (2007).
55. R. K. Prinja, S. E. Hodges, D. L. Massa, A. W. Fullerton, A. W. Burnley, Structure and clumping in the fast wind of NGC6543, MNRAS 382 299-307 (2007).
56. M. J. Kaufman, Le Bourlot, F. Le Petit, R. Meijerink, O. Morata, V. Ossenkopf, E.

Roueff, G. Shaw, M. Spaans, A. Sternberg, J. Stutzki, W. –F. Thi, E. F. van Dishoeck, P. A. M. van Hoof., S. Viti, M. G. Wolfire, Photon dominated region code comparison study, A&A 467 187-206 (2007).
57. A. Rassat, K. Land, O. Lahav, F. B. A. Abdalla, Cross-correlation of 2MASS and WMAP 3: implications for the integrated Sachs-Wolfe effect, MNRAS 377 1085-1094 (2007).
58. J. F. Roberts, J. M. C. Rawlings, S. Viti, D. A. Williams, Desorption from interstellar ices, MNRAS 382 733-742 (2007).
59. B. Rogers, I. Ferreras, O. Lahav, M. Bernardi, S. Kaviraj, S. K. Yi, Decoding the spectra of SDSS early-type galaxies: new indicators of age and recent star formation, MNRAS 382 750-760 (2007).
60. E. Sabbi, M. Sirianni, A. Nota, M. Tosi, J. Gallagher, M. Meixner, M. S. Oey, R. Walterbos, A. Pasquali, L. J. Smith, L. Angeretti, Erratum: “Past and Present Star Formation in the SMC: NGC 346 and Its Neighborhood”, AJ 133 2430-2430 (2007).
61. E. Sabbi, M. Sirianni, A. Nota, M. Tosi, J. Gallagher, M. Meixner, M. S. Oey, R. Walterbos, A. Pasquali, L. J. Smith, L. Angeretti, Past and Present Star Formation in the SMC: NGC 346 and its Neighborhood, ApJ 133 44-57 (2007).
62. A. Scaife, D. A. Green, R. A. Battye, R. D. Davies, R. J. Davis, C. Dickinson, T. Franzen, R. Genova-Santos, K. Grainge, Y. A. Hafez, M. P. Hobson, A. Lasenby, G. G. Pooley, N. Rajguru, R. Rebolo, J. A. Rubino-Martin, R. D. E. Saunders, P. F. Scott, D. Titterington, E. Waldram, R. A. Watson, Constraints on spinning dust towards Galactic targets with the Very Small Array: tentative detection of excess microwave emission towards 3C396, MNRAS 377 L69-L73 (2007).
63. R. A. Scheepmaker, M. R. Haas, M. Gieles, N. Bastian, S. S. Larsen, H. J. G. L. M. Lamers, ACS imaging of star clusters in 51. I. Identification and radius distribution, A&A 469 925-940 (2007).
64. M. J. Seaton, Updated Opacity Project radiative accelerations, MNRAS 382 245-250 (2007).
65. L. D. Shaw, J. Weller, J. P. Ostriker, P. Bode, The Bound Mass of Substructures in Dark Matter Halos, ApJ 659 1082-1095 (2007).
66. C. G. A. Smith, A. D. Aylward, G. H. Millward, S. Miller, L. E. Moore, An unexpected cooling effect in Saturn’s upper atmosphere, Nature 445 399-401 (2007).
67. L. J. Smith, N. Bastian, I. S. Konstantopoulos, J. S. IIII Gallagher, M. Gieles, R. de Grijs, S. S. Larsen, R. W. O’Connell, M. S. Westmoquette, The Young Cluster Population of M82 Region B, ApJ 667 L145-L149 (2007).
68. L. J. Smith, M. S. Westmoquette, Winds from super star clusters: The interstellar environment in the starburst core of M82, New Astronomy Reviews 51 135-140 (2007).
69. T. Stallard, S. Miller, H. Melin, M. Lystrup, M. Dougherty, N. Achilleos, Saturn’s auroral/polar H^+_3 infrared emission, Icarus 189 1-13 (2007).
70. T. Stallard, C. Smith, S. Miller, H. Melin, M. Lystrup, A. D. A. Aylward, N. Achilleos, M. Dougherty, Saturn’s auroral/polar H_3^+ infrared emission, Icarus 191 678-690 (2007).
71. D. Steeghs, J. Drew, R. Greimel, M. Barlow, B. Gaensicke, J. Drake, A. Witham, The progenitor of Nova Cygni 2007 (=V2467 Cyg), The Astronomer’s Telegram 1031 (2007).
72. M. Takada, S. Bridle, Probing dark energy with cluster counts and cosmic shear power spectra: including the full covariance, N. J. Phys. 446 (2007).
73. J. Tennyson, G. J. Harris, R. J. Barber, S. La Delfa, B. Voronin, B. M. Kaminsky, Ya. V. Pavlenko, Molecular line lists for modelling the opacity of cool stars, Molecular Phys. 105 701 (2007).
74. G. Tinetti, A. Vidal-Madjar, M. –C. Liang, J. –P. Beaulieu, Y. Yung, S. Carey, R. J. Barber, J. Tennyson, I. Ribas, N. Allard, G. E. Ballester, D. K. Sing, F. Selsis, Water vapour in the atmosphere of transiting extrasolar planet, Nature 448 169-171 (2007).
75. G. Trancho, N. Bastian, B. W. Miller, F. Schweizer, Gemini Spectroscopic Survey of Young Star Clusters in Merging/Interacting Galaxies. II. NGC 3256 Clusters, ApJ 664 284-295 (2007).
76. G. Trancho, N. Bastian, F. Schweizer, B. W. Miller, Gemini Spectroscopic Survey of Young Star Clusters in Merging/Interacting Galaxies. I. NGC 3256 Tidal Tail Clusters, ApJ 658 993-998 (2007).
77. Y. G. Tsamis, J. R. Walsh, D. Pequignot, M. J. Barlow, X. –W. Liu, I. J. Danziger, Integral-field Spectroscopy of Galactic Planetary Nebulae with VLT FLAMES, The Messenger 127 53 (2007).
78. S. Viti, C. J. Lintott, Molecular signature of star formation at high redshifts, Astrophysics and Space Science 373-(2007).
79. N. R. Walborn, N. Smith, I. D. Howarth, G. Vieira Kober, T. R. Gull, J. A. Morse, Interstellar Absorption-Line Evidence for High-Velocity Expanding Structures in the Carina Nebula Foreground, PASP 119 156-169 (2007).
80. D. Ward-Thompson, J. Di Francesco, J. Hatchell, M. R. Hogerheijde, D. Nutter, P. Bastien, S. Basu, I. Bonnell, J. Bowey, C. Brunt, J. Buckle, H. Butner, B. Cavanagh, A. Chrysostomou, E. Curtis, C. J. Davis, W. R. F. Dent, E. van Dishoeck, M. G. Edmunds, M. Fich, J. Fiege, L. Fissel, P. Friberg, R. Friesen, W. Frieswijk, G. A. Fuller, A. Gosling, S. Graves, J. S. Greaves, F. Helmich, R. E. Hills, W. S. Holland, M. Houde, R. Jayaward-hana, D. Johnstone, G. Joncas, H. Kirk, J. M. Kirk, L. B. G. Knee, B. Matthews, H. Matthews, C. Matzner, G. H. Moriarty-Schieven, D. Naylor, R. Padman, R. Plume, J. M. C. Rawlings, R. O. Redman, M. Reid, J. S. Richer, R. Shipman, R. J. Simpson, M. Spaans, D. Stamatellos, Y. G. Tsamis, S. Viti, B. Weferling, G. J. White, A. P. Whitworth, J. Wouterloot, J. Yates, M. Zhu, The James Clerk Maxwell Telescope Legacy Survey of Nearby Star-forming Regions in the Gould Belt, PASP 119 855-870 (2007).
81. D. L. Welch, G. C. Clayton, A. Campbell, M. J. Barlow, B. E. K. Sugerman, M. Meixner, S. H. R. Bank, An Extremely Bright Echo Associated with SN 2002hh, ApJ 669 525-533 (2007).
82. M. Westmoquette, Super star clusters, their environment, and the formation of galactic winds, The Observatory 127 362-362 (2007).
83. M. S. Westmoquette, K. M. Exter, L. J. Smith, J. S. Gallagher, Gemini GMOS/IFU spectroscopy of NGC 1569 -I. Mapping the properties of young star cluster and its environment, MNRAS 381 894-912 (2007).
84. M. S. Westmoquette, L. J. Smith, J. S. Gallagher, J. S., Studying the galactic outflow in NGC 1569, MNRAS 1151 (2007).
85.vM. S. Westmoquette, L. J. Smith, J. S. Gallagher, K. M. Exter, Gemini GMOS/integral field unit spectroscopy of NGC 1569 -II. Mapping the roots of the galactic outflow, MNRAS 381 913-931 (2007).
86. M. S. Westmoquette, L. J. Smith, J. S. Gallagher, III, R. W. O’Connell, D. J. Rosario, R. de Grijs, Hubble Space Telescope Space Telescope Imaging Spectrograph Spectroscopy of the Environment in the Starburst Core of M82, ApJ 671 358-373 (2007).
87. D. A. Williams, Molecular Astrophysics of Star Formation, Diffuse Matter from Star Forming
Regions to Active Galaxies -A Volume Honouring John Dyson. Series: Astrophysics and Space Science Proceedings p.19 (2007).
88. D. A. Williams, W. A. Brown, S. D. Price, J. M. C. Rawlings, S. Viti, Molecules, ices and astronomy, A&G 48 25 (2007).
Conference Papers
89. N. Achilleos, C. S. Arridge, H. J. McAndrews, A. Masters, M. K. Dougherty, A. J. Coates, High Latitude Structure of Saturn’s Magnetopause: Cassini Observations, American Geophysical Union, Fall Meeting abstract P53D-01 (2007).
90. C. S. Arridge, K. K. Khurana, C. T. Russell, N. Achilleos, N. Andre, M. K. Dougherty, H. J. McAndrews, Solar wind and rotational effects on the 3d configuration of Saturn’s magnetosphere: Observations, theory, and modelling, in the Cassini era, American Geophysical Union, Fall Meeting abstract SM52A-01 (2007).
91. C. Atkins, P. Doel, J. Yao, D. Brooks, S. Thompson, R. Willingale, C. Feldman, T. Button, D. Zhang, A. James, Active x-ray mirror development at UCL: preliminary results SPIE 6721 (2007).
92. R. J. Barber, D. P. K. Banerjee, N. M. Ashok, J. Tennyson, Use of the BT2 Water Line List to Determine the Rotational Temperature and H2 Column Density of the Circumstellar Envelope.
93. C. Bertucci, K. Szego, J. Wahlund, A. J. Coates, F. M. Neubauer, N. Achilleos, C. S. Arridge, M. K. Dougherty, R. Modolo, Titan in Saturn’s Magnetosheath: Cassini MAG Observations During the T32 Encounter, A.G.U., Fall Meeting abstract P43A-1022 (2007).
94. P. Doel, C. Atkins, S. Thompson, D. Brooks, J. Yao, C. Feldman, R. Willingale, T. Button, D. Zhang, A. James, Large thin adaptive x-ray mirrors, SPIE 6705 (2007).
95. R. W. Hilditch, I. D. Howarth, T. J. Harries, Eclipsing Spectroscopic Binaries in the Small Magellanic Cloud, Astronomical Society of the Pacific Conf. Series 367 85 (2007).
96. I. D. Howarth, Rotation and the Circumstellar Environment, Astronomical Society of the Pacific Conf. Series 361 15-(2007).
97. A. Kaufer, O. Stahl, R. K. Prinja, The Photosphere Wind Connection in HD 64760, Astronomical Society of the Pacific Conf. Series 361 179 (2007).
98. A. Lancon, J. S. Gallagher, R. de Grijs, P. Hauschildt, D. Ladjal, M. Mouhcine, L. J. Smith, P. R. Wood, N. F. Schreiber, Modelling the Near-IR Spectra of Red Supergiant-dominated Populations, Stellar Populations as Building Blocks of Galaxies, Proc. of IAU Symposium 241 152155 (2007).
99. M. Lystrup, S. Miller, N. Dello Russo, R. Vervack, T. Stallard, Ion Density Profiles of Jupiter’s Upper Atmosphere, American Astronomical Society, Division for Planetary Sciences Meeting 39 19.15 (2007).
100. Masters, N. Achilleos, M. K. Dougherty, J. A. Slavin, G. B. Hospodarsky, C.S. Arridge, Global Shape Modelling of Saturn’s Bow Shock, A.G.U., Fall Meeting abstract P43A-1013 (2007).
101. Miller, S., Meeting contribution: Bright lights on giant planets, J. of the British Astronomical Association 117 98-100 (2007).
102. G. H. Millward, A. Richmond, T. Fuller-Rowell, A. Aylward, Modeling the Effect of Changes in the Terrestrial Magnetic Field on the Climatology of the Mid-and Low-Latitude Ionosphere., A.G.U., Fall Meeting abstract SA21B-08 (2007).
103. B. Orozco, A. Carraminana, R. Michel, S. Zazueta, J. L. A. Fordham, Fast photon counting camera for -ray pulsar astronomy, THE FIRST GLAST SYMPOSIUM. American Institute of Phys. Conf. Proc. 921 436-437 (2007).
104. E. Sabbi, M. Sirianni, A. Nota, J. Gallagher, M. Tosi, L. J. Smith, L. Angeretti, M. Meixner, The Initial Mass Function In The Star-Forming Region NGC 346, American Astronomical Society Meeting 210 16.01 (2007).
105. S. C. Searle, R. K. Prinja, D. Massa, The Stellar Winds of Galactic Early Supergiants, Astronomical Society of the Pacific Conf. Series 361 172 (2007).
106. S. J. Thompson, A. P. Doel, D. Brooks, Nickel-Carbon-Fibre Mirror for Large Adaptive Secondaries, Adaptive Optics: Analysis and Methods, Optical Society of America Technical Digest (2007).
107. G, Tinetti, M. Liang, J. Beaulieu, Y. L. Yung, S. Carey, I. Ribas, J. Tennyson, B. Barber, N. Allard, G. Ballester, D. Sing, F. Selsis, Water Vapour In The Atmosphere Of An Extrasolar Planet, American Astronomical Society, Division for Planetary Sciences Meeting 39 29.05 (2007).
108. I. Ugarte-Urra, H. P. Warren, D. Brooks, D. R. Williams, J. W. Cirtain, D. E. McKenzie, M. Weber, H. Hara, L. K. Harra, EIS/Hinode Look At Active Region Dynamics, American Astronomical Society Meeting 210 94.29-(2007).
109. S. Viti, Meeting contribution: Low mass stars, brown dwarfs and hot Jupiters, J. of the British Astronomical Association 117 45-46 (2007).
110. N. R. Walborn, I. D. Howarth, Period for the Of?p Spectrum Alternator HD 191612, Astronomical Society of the Pacific Conf. Series 367 401-(2007).
111. E. E. Woodfield, A. Aruliah, R. Holme, G. Millward, Storm-enhanced neutral wind dynamo effects on the Earth’s magnetic field, A. G.U., Fall Meeting abstract SA11A-0299 (2007).

ATOMIC MOLECULAR AND POSITRON PHYSICS PUBLICATIONS

1. P. A. Thorn, M. J. Brunger, P. J. O. Teubner, N. Diakomichalis, T. Maddern, M. A. Bolorizadeh, W. R. Newell, H. Kato, M. Hoshino, H. Tanaka, H. Cho, Y-K. Kim, Cross sections and oscillator strengths for electron-impact excitation of the $\tilde{A}\ ^1B_1$ electronic state of water, J. Chem. Phys. 126 064306 (2007).
2. J. McKenna, W. A. Bryan, C. R. Calvert, E. M. L. English, J. Wood, D. S. Murphy, I. C. E. Turcu, J. M. Smith, K. G. Ertel, O. Chekhlov, E. J. Divall, J. F. Mccann, W. R. Newell, I. D. Williams, Observing time-dependent vibrational quantum dynamics in deuterium hydride molecular ions, J. Mod. Opt. 54 (7) 1127 (2007).
3. D. S. Murphy, J. McKenna, C. R. Calvert, W. A. Bryan, E. M. L. English, J. Wood, I. C. E. Turcu, W. R. Newell, I. D. Williams, J. F. McCann, Controlling dissociation processes in the D_2^+ molecular ion using high-intensity, ultrashort laser pulses, J. Phys. B: At. Mol. Opt. Phys. 40 (11) S359-S372 (2007).
4. J. McKenna, M. Suresh, D. S. Murphy, W. A. Bryan, L-Y. Peng, S. L. Stebbings, E. M. L. English, J. Wood, B. Srigengan, I. C. E. Turcu, J. L. Collier, J. F. McCann, W. R. Newell, I. D. Williams, intense-field dissociation dynamics of D_2+ molecular ions using ultrafast laser pulses J. Phys. B: At. Mol. Opt. Phys. 40 (13) 2607 (2007).
5. W. A. Bryan, E. M. L. English, J. McKenna, J. Wood, C. R. Calvert, I. C. E. Turcu, R. Torres, J. L. Collier, I. D. Williams, W. R. Newell, Mapping the evolution of optically generated rotational wave packets in a room-temperature ensemble of D_2, Phys Rev A 76 023414 (2007).
6. D. Williams, J. McKenna, J. Wood, M. Suresh, W. A. Bryan, S. L. Stebbings, E. M. L. English, C. R. Calvert, B. Srigengan, E. J. Divall, C. J. Hooker, A. J. Langley, W. R. Newell, Excited ions in intense femtosecond laser pulses: Laser-induced recombination, Phys Rev Lett 99 173002 (2007).
7. W. A. Bryan, J. McKenna, E. M. L. English, J. Wood, C. R. Calvert, R. Torres, D. S. Murphy, I. C. E. Turcu, J. L. Collier, J. F. McCann, I. D. Williams, W. R. Newell, Isolated vibrational wavepackets in D_2^+: Defining superposition conditions and wavepacket distinguishability, Phys Rev A 76 053402 (2007).
8. M. N. Shneider, P. F. Barker, S. F. Gimelshein, Molecular transport in pulsed optical lattices, App. Phys. A89 337 (2007.)
9. H. T. Bookey, M. N. Shneider, P. F. Barker, Spectral Narrowing in Coherent Rayleigh Scattering, Phys. Rev. Lett. 99 133001 (2007).
10. W. Lu, Y. Zhao, P. F. Barker Cooling molecules in optical cavities, Phys. Rev. A 76 013417 (2007).
11. M. N. Schneider, S. F. Gimelshein, P. F. Barker, Separation of binary gas mixtures in a capillary with an optical lattice, Laser Phys. Lett. 4 519 (2007).
12. P. H. Jones, O. M. Marago, E. P. J. Stride, Parametrization of trapping forces on microbubbles in scanning optical tweezers, J. Opt. A: Pure & Applied Optics 9 S278-283 (2007).
13. P. H. Jones, M. Goonasekera, D. R. Meacher, T. Jonckheere, T. S. Monteiro, Directed motion for delta-kicked atoms with broken symmetries: comparison between theory and experiment, Phys. Rev. Lett. 98 073002 (2007).
14. R. Gommers, M. Brown, F. Renzoni, Symmetry and transport in a cold atom ratchet with multifrequency driving, Phys. Rev. A 75 040101 (2007).
15. C. Katan, S. Tretiak, M. H. V. Werts, A. J. Bain, R. J. Marsh, N. Leonczek, N. Nicolaou, E. Badaeva, O. Mongin, M. Blanchard-Desce, Two-Photon Transitions in Quadrupolar and Branched Chromophores: Experiment and Theory, J. Phys. Chem. B 111 9468-9483 (2007).
16. C. Arcidiacono, A. Kover, Z. D. Pesic, J. Beale, G. Laricchia, Double-differential ionization cross-section for H_2O, Radiation Phys. and Chem. 76 431 (2007).
17. T. Boness, M. M. A. Stocklin, T. S. Monteiro, Quantum Chaos with spin chains in pulsed magnetic fields, Prog. Theo. Phys. 166 85 (2007).
18. J. Wang, T. S. Monteiro, S. Fishman, J. Keating, R. Schubert, Fractional h-scaling for quantum kicked rotors without cantori, Phys. Rev. Lett. 99 234101 (2007).
19. D. T. Mullamphy, G. Peach, V. Venturi, I. B. Whittingham, S. Gibson, Collisional broadening of alkali doublets by helium perturbers, J. Phy.s B: At. Mol. Opt. Phys. 40 1141-1152 (2007).
20. C. M. S. Johnas, P. H. Hauschildt, A. Schweitzer, D. F. T. Mullamphy, G. Peach, I. B. Whittingham. The effects of new NaI D line profiles in cool atmospheres, A&A 466 323-325 (2007).
21. C. M. S. Johnas, P. H. Hauschildt, A. Schweitzer, D. F. T. Mullamphy, G. Peach, I. B. Whittingham, The effects of new NaI D line in cool atmospheres, A&A 475 1039-1040 (2007).
22. T. J. Beams, I. B. Whittingham, G. Peach, Autoionization of spin-polarised metastable helium in tight anisotropic traps, Phys. Rev. A 76 1-6 (2007).
23. G. J. Harris, A. E. Lynas-Gray, S. Miller, J. Tennyson, Non-grey hydrogen burning evolution of sub-solar population III stars, Mon. Not. R. Astr. Soc., 374 337-343 (2007).
24. H. Varambia, J. Tennyson, Electron collision with the HCN and HNC molecules using the R-matrix method, J. Phys. B: At. Mol. Opt. Phys. 1211-1233 (2007).
25. G. Tinetti, A. Vidal-madjar, M. C. Liang, J. P. Beaulieu, Y. Yung, S. Carey, R. J. Barber, J. Tennyson, I. Ribas, N. Allard, G. E. Ballester, D. K. Sing, F. Selsis Water vapour in the atmosphere of a transiting extrasolar planet, Nature 448 169-171 (2007).
26. L. Wiesenfeld, A. Faure, M. Wernli, P. Valiron, F. Daniel, M. L. Dubernet, A. Grosjean, J. Tennyson, Recent Advances in calculating molecular collision rates, Astrochemistry- From Laboratory Studies to Astronomical Observations ed. R Kaiser (AIP, 2006).
27. R. J. Barber, S. Miller, T. Stallard, J. Tennyson, P. Hirst, T. Carroll, A. Adamson, The United Kingdom Infrared Telescope Deep Impact observations: Light curve, ejecta expansion rates and water spectral features, Icarus 187 167-176 (2007).
28. A. G. Harvey, J. Tennyson, Electron rescattering from H_2 and CO_2 using R-matrix techniques, J. Modern Opt. 54 1099-1106 (2007).
29. V. Naumenko, F. Mazzotti, O. M. Leshchishina, J. Tennyson, A. Campargue Intercavity Laser Absorption Spectroscopy of D20 between 11400 and 11900 cm^{-1}, J. Molec. Spectrosc. 242 1-9 (2007).
30. B. Veilhelmann, A. N. Maurellis, K. M. Smith, R. N. Tolchenov, J. Tennyson, W. J. van der Zande, Line parameter validation using ground-based solar occultation measurements: water vapour – case study, J. Quant. Spectrosc. Rad. Transf.107349-359 (2007).
31. R. J. Barber, S. Miller, T. S. Stallard, J. Tennyson, Previously unobserved water lines detected in the post-impact spectrum, in 'Deep Impact as a World Observatory Event', eds. U Kaufl and C Sterken, ESO/ Springer-Verlag, (2007).
32. J. Tennyson, G. J. Harris, R. J. Barber, S. La Delfa, B. Voronin, Y. V. Pavlenko, Molecular linelists for modelling the opacity of cool stars, Mol. Phys. 105 701-714 (2007).
33. K. Chakrabarti, J. Tennyson, R-Matrix calculation of the continuum states of carbon Monoxide, J. Phys. B: At. Mol. Opt., 40 2135-2145 (2007).
34. G. J. Harris, R. Porter, A. E. Lynas-Gray, J. Tennyson, Evolutionary models for two hyper-metal-poor low-mass stars, Mon. Not. R. Astr. Soc. 377 1520-1530 (2007).
35. B. A. Voronin, O. V. Naumenko, M. Carleer, P. F. Coheur, S. Fallay, A. Jenouvrier, R. N. Tolchenov, A. C. Vandaele, J. Tennyson, HDO absorption spectrum above 11500 cm^{-1}: Assignment and dynamics, J. Molec. Spectrosc. 244 87-101 (2007).
36. K. L. Baluja, R. Zhang, J. Franz, J. Tennyson, Low-energy positron collisions with water: elastic and rotationally inelastic scattering, J. Phys. B: At. Mol. Phys. 40 3515-3524 (2007).
37. T. Furtenbacher, A. G. Csaszar, J. Tennyson, MARVEL: measured active rotational-vibrational energy levels, J. Molec. Spectrosc 127 154317 (2007).
38. O. Asvany, E. Hugo, S. Schlemmer, F. Muller, F. Kuhnemann, S. Schiller, J. Tennyson, Overtone spectroscopy of H_2D^+ and D_2H^+ using laser induced reactions, J. Chem. Phys 127 154317 (2007).
39. A. Faure, H. N. Varambia, T. Stoecklin, J. Tennyson, Electron-impact rotational and hyperfine excitation of HCN, HNC, DCN, and DNC, Mon. Not. R. Astron. Soc. 382 840-848 (2007).
40. J. Tennyson, D. B. Brown, J. J. Munro, I. Rozum, H. N. Varambia, N. Vinci Quantemol-N: an expert system for performing electron molecule collision calculations using the R-matrix method, J. Phys. Conf. Series 86 012001 (2007).
41. Y. Lyubchik, H. R. A. Jones, Y. V. Pavlenko, E. Martin, I. McLean, L. Prato, R. J. Barber, J. Tennyson, Spectral analysis of high resolution near-infrared spectra of ultra cool dwarfs, Astron. Astrophys. 473 257-264 (2007).
42. M. Plummer, G. D. Gorfinkiel, J. Tennyson eds., Mathematical and Computational Methods in R-matrix Theory, CCP2 Daresbury (2007).
43. J. Tennyson, The molecular opacity problem for models of cool stars and brown dwarfd, eds J L Lemaire, F Combea,(Observatoire de Paris, 2007).
44. C. Figueira de Morisson Faria, High-order harmonic generation in diatomic molecules: a quantum orbit analysis of the interference patterns, Phys. Rev. A. 76 013407 (2007).
45. H. Hetzteim, C. Figueira de Morisson, W. Becker, Interference effects in above-threshold ionization from diatomic molecules: determining the internuclear separation, Phys. Rev. A. 76 023418 (2007).
46. C. Figueira de Morisson Faria, P. Salieres, High order harmonic generation with a strong laser field and an attosecond-pulse train: the Dirac-Delta comb and monochromatic limits, Laser Phys. 17 390 (2007).
47. C. Figueira de Morisson Faria, A. Fring, Non-Hermitian Hamiltonians with real eigenvalues coupled to an electric field: from the time- independent to the time-dependent formulation, Laser Phys. 17 424 (2007).
48.vC. Figueira de Morisson Faria, X. Liu, Speed-up and slow-down collisions in laser-induced nonsequential multiple ionization, J. Mod. Opt. 54 1107 (2007).
49. C. Figueira de Morisson Faria, X. Liu, W. Becker, S-Matrix theory of nonsequential double ionisation, Progress in Ultrafast Laser Science 11, Chapter 4, eds K Yamanouchi, S L Chin, P Agostini, G Ferrante (Springer, Berlin, Heidelberg, New York, 2007).
50. M. D. Lee, T. Kohler, P. S. Julienne, Excited Thomas-Efimov levels in ultracold gases, Phys. Rev. A. 76 012720 (2007).
51. G. Smirne, R. M. Godun, D. Cassettari, V. Boyer, C. J. Foot, T. Volz, N. Syassen, S. Durr, G. Rempe, M. D. Lee, K. Goral, T. Kohler, Collisional relaxation of Feshbach molecules and three-body recombination in Rb-87 Bose-Einstein condensates, Phys. Rev. A. 75 013606 (2007).
52. T. M. Hanna, T. Kohler, K. Burnett, Association of molecules using a resonantly modulated magnetic field, Phys. Rev. A. 75 013606 (2007).
53. J. Eisert, M. B. Plenio, D. E. Browne, S. Scheel, A. Feito, On the experimental feasibility of continuous-variable optical entanglement distillation, Optics and Spectroscopy 103 181 (2007).
54. D. E. Browne, Efficient classical simulation of the Quantum Fourier Transform, New J. Phys. 9 146 (2007).
55. D. E. Browne, E. Kashefi, M. Mhalla, .S Perdix, Generalized Flow and Determinism in Measuremant-based Quantum Computation, New J. Phys. 9 250 (2007).
56. C-Y. Lu, D. E. Browne, T. Yang, J-W. Pan, Demonstration of Shor's quantum factoring algorithm using photonic qubits, Phys. Rev. Lett. 99 250504 (2007).
57. M. Vatnava, D. E. Browne, T. Rudolph, Loss Tolerant Linear optical Quantum Memory By Measuremant Quantum Computing, New J. Phys. 9 203 (2007).
58. D. E. Browne, H. J. Briegel, One –way quantum computation, eds D Bruss, G Leuchs, Lectures on Quantum Information, Wiley, 359-378 (2007).
59. A. Serafini, G. Adesso, Standard forms and entanglement engineering of multimode Gaussian states under locao operations, J. Phys. A: Math. Theor. Phys. 40 8041 (2007).
60. A. Serafini, O. C. O. Dahlsten, D. Gross, M. B. Plenio, Canonical and micro-canonical typical entanglement of continuous variable systems, J. Phys A: Math. Theor. Phys. 40 9551 (2007).
61. A. Serafini, O. C. O. Dahlsten, M. Plenio, Teleportation fidelities of squeezed

states from thermodynamical state space measures, Phys. Rev. Lett. 98 170501 (2007).
62. G. Adesso, A. Serafini, F. Illuminati, Optical state engineering, quantum communication, and robustness of entanglement promiscuity in three-mode Gaussian states, New J. Phys. 9 60 (2007).
63. D. G. Angelakis, S. Bose, Generation and verification of high-dimensional entanglement from coupled-cavity arrays, J. Opt. Soc. Am. B 24 266 (2007).
64. K. Shizume, K. Jacobs, D. Burgarth, S. Bose, Quantum communication via a continuously monitored dual spin chain, Phys. Rev. A 75 062328 (2007).
65. D. Burgarth, V. Giovannetti, S. Bose, Optimal quantum-chain communication by end gates, Phys. Rev. A. 75 06327(2007).
66. S. Bose, Quantum communication through spin chain dynamics: an introductory overview, Contemporary Phys. 48 13 (2007).
67. H. Fan, V. korepin, V. Roychowdhury, C. Hadley, S. Bose, Boundary effects on entropy and two-site entanglement of the spin-1 valence-bond solid, Phys. Rev. B. 76 014425 (2007).
68. S. Bose, D. G. Angelakis, D. Burgarth, Transfer of a polaritonic qubit through a coupled cavity array, J. Modern Opt. 54 2307 (2007).
69. D. G. Angelakis, M. F. Santos, S. Bose, Photon-blockade-induced Mott transitions and XY spin models in coupled cavity arrays, Phys. Rev. A. 76 031805 (2007).
70. Conference Papers
71. G. Peach, D. F. T. Mullamphy, I. B. Whittingham, Recent work on line shapes for the spectra of cool stars in Spectral Line Shapes in Astrophysics, ed. L Popovic and M S Dimitrijevic, AIP Conf. Proc. 938 142-147 (2007).
72. N. Doss, J. Tennyson, A. Saenz, S. Jonsell, Molecular effects in neutrino mass measurements, Photonic, Electronic and Atomic Collisions – Proceedings of the XX1V International Conference, eds D Fainstein et al, World Scientific 423-426 (2006).

HIGH ENERGY PHYSICS

Publications listed here are arranged according to collaboration, for the purposes of this review only UCL authors are named.

ATLAS

B. Anderson, L. Asquith, D. Attree, A. Barr, J. Butterworth, T. Byatt, G. Crone, S. Dean, J. Drohan, J. Fraser, C. Gwenlan, O. Harris, N. Konstantinidis, Z. Maxa, E. Nzubontane, E. Ozcan, M. Postranecky, G. Sciacca, P. Sherwood, B. Simmons, S. Stefanidis, M. Sutton, M. Warren, B. Waugh, A. Davison, C. Bernius, A. Richards
1. A. Abdesselam, et al., The optical links of the ATLAS SemiConductor tracker, JINST 2 P09003 (2007).
2. M. Abolins, et al., The ATLAS trigger: Commissioning with cosmic rays, CERN-ATL-DAQ-CONF-2007-024 (2007).
3. Prospects for (non-SUSY) new physics with first LHC data, AIP Conf. Proc. 957 197-200 (2007).
4. A. Ahmad, et al., The Silicon microstrip sensors of the ATLAS semiconductor tracker, Nucl. Instrum. Meth. A 578 98-118 (2007).
5. The ATLAS semiconductor tracker end-cap module, Nucl. Instrum. Meth. A 575 353-389 (2007).
6. A. Abdesselam, et al., The ATAS SCT optoelectronics and the associated electrical services, ATL-INDET-PUB-2007-001 (2007).
7. CDF Collaboration
8. V. Bartsch, D. Beecher, I. Bizjak, B. Cooper, M. Lancaster, S. Malik, E. Nurse, T. Vine, D. Waters, A. Freshville
9. Measurement of inclusive jet cross-sections in Z/gamma*(---> e+ e-) + jets production in p anti-p collisions at s**(1/2) = 1.96-TeV, CDF - Run II Collaboration, [arXiv:0711.3717] FERMILAB-PUB-07-627-E (2007).
10. Search for chargino-neutralino production in p anti-p collisions at 1.96-TeV with high-p(T) leptons, Phys. Rev. Lett. 99 191806 (2007).
11. W production and properties at CDF, CDF - Run II Collaboration, [arXiv:0710.4108] FERMILAB-CONF-07-502-E (2007).
12. Search for resonant t anti-t production in p anti-p collisions at s**(1/2) = 1.96-TeV, [arXiv:0709.0705] FERMILAB-PUB-07-455-E (2007).
13. First Run II Measurement of the W Boson Mass, [arXiv:0708.3642] FERMILAB-PUB-07-444-E (2007).
14. Search for new physics in high mass electron-positron events in p anti-p collisions at s**(1/2) = 1.96-TeV, Phys. Rev. Lett .99 171802 (2007).
15. Search for exclusive gamma gamma production in hadron-hadron collisions, [arXiv:0707.2374] FERMILAB-PUB-07-384-E (2007).
16. Search for a high-mass diphoton state and limits on Randall-Sundrum gravitons at CDF, [arXiv:0707.2294] Phys. Rev. Lett. 99 171801.(2007).
17. Observation and mass measurement of the baryon Xi(b)-, [arXiv:0707.0589] Phys. Rev. Lett. 99 052002 (2007).
18. First measurement of the W boson mass in run II of the Tevatron, [arXiv:0707.0085] Phys. Rev. Lett. 99 151801 (2007).
19. The CDF Consumer Server Logger Upgrade, F.D. Snider, et al., FERMILAB-CONF-07-102-E (2007).
20. First observation of heavy baryons Sigma(b) and Sigma(b)*, [arXiv:0706.3868] Phys. Rev. Lett. 99 202001(2007).
21. Measurement of the p anti-p ---> t anti-t production cross- section and the top quark mass at s**(1/2) = 1.96-TeV in the all-hadronic decay mode, [arXiv:0706.3790] Phys. Rev. D 76 072009 (2007).
22. Search for New Particles Leading to Z+jets Final States in p anti-p Collisions at s**(1/2) = 1.96-TeV, [arXiv:0706.3264] Phys. Rev. D. 76 072006, (2007).
23. Search for Third Generation Vector Leptoquarks in p anti-p Collisions at s**(1/2) = 1.96-TeV, [arXiv:0706.2832] FERMILAB-PUB-07-207-E (2007) 7p.
24. W mass and width measurements at the Tevatron, [arXiv:0705.2920] FERMILAB-CONF-07-150-E (2007) 4p.
25. Limits on Anomalous Triple Gauge Couplings in p anti-p Collisions at s**(1/2) = 1.96-TeV, [arXiv:0705.2247] FERMILAB-PUB-07-123-E (2007) 7p.
26. Measurement of the top-quark mass using missing E(T) + jets events with secondary vertex b-tagging at CDF II, [arXiv:0705.1594], Phys. Rev. D75 111103 (2007).
27. Search for heavy, long-lived particles that decay to photons at CDF, [arXiv:0704.0760] Phys. Rev. Lett. 99 121801 (2007).
28. Polarization of J / psi and psi(2S) mesons produced in p anti-p collisions at s**(1/2) = 1.96-TeV, [arXiv:0704.0638] Phys. Rev. Lett. 99 132001 (2007).
29. Precise measurement of the top quark mass in the lepton+jets topology at CDF II,) [hep-ex/0703045] Phys. Rev. Lett. 99 182002 (2007).
30. Inclusive search for new physics with like-sign dilepton events in p anti-p collisions at s**(1/2) = 1.96-TeV, [hep-ex/0702051] Phys. Rev. Lett. 98 221803 (2007).
31. First Measurement of the Ratio of Central-Electron to Forward-Electron W Partial Cross Sections in p anti-p Collisions at s**(1/2) = 1.96 TEV, [hep-ex/0702037] Phys. Rev. Lett. 98 251801 (2007).
32. Observation of WZ Production, [hep-ex/0702027] Phys.Rev.Lett.98:161801 (2007).
33. Measurement of the Inclusive Jet Cross Section using the k(T) algorithm in p anti-p collisions at s**(1/2) = 1.96-TeV with the CDF II Detector, CDF - Run II, [hep-ex/0701051] Phys. Rev. D 75 092006 (2007), Erratum-ibid. D. 75 119901 (2007).
34. Search for anomalous production of multi-lepton events in p anti-p collisions at s**(1/2) = 1.96-TeV, [arXiv:0706.4448] Phys. Rev. Lett. 98 131804 (2007).
35. Search for Exotic S=-2 Baryons in proton-antiproton Collisions at sqrt(s) = 1.96 TeV, [hep-ex/0612066] Phys. Rev. D 75 032003 (2007).
36. Measurement of the Top Quark Mass in p anti-p Collisions at s**(1/2) = 1.96-TeV using the Decay Length Technique, CDF - Run II, [hep-ex/0612061] Phys. Rev. D 75 071102 (2007).
37. Precision measurement of the top quark mass from dilepton events at CDF II, CDF - Run II Collaboration, [hep-ex/0612060] Phys. Rev. D 75 031105 (2007).
38. Analysis of the quantum numbers J**PC of the X(3872), [hep-ex/0612053] Phys. Rev. Lett. 98 132002 (2007).
39. CDF II production farm project, Nucl. Instrum. Meth. A 572 399-401(2007).
40. Measurement of the top-quark mass in all-hadronic decays in p anti-p collisions at CDF II, T. Aaltonen, et al., [hep-ex/0612026]Phys. Rev. Lett. 98 142001 (2007).
41. Measurement of the B+ production cross-section in p anti-p collisions at s**(1/2) = 1960-GeV, [hep-ex/0612015] Phys. Rev. D. 75 012010 (2007)
42. Measurement of the helicity fractions of W bosons from top quark decays using fully reconstructed t anti-t events with CDF II, CDF II Collaboration, [hep-ex/0612011] Phys. Rev. D 75 052001 (2007).
43. Observation of Exclusive Electron-Positron Production in Hadron-Hadron Collisions, [hep-ex/0611040] Phys. Rev. Lett. 98 112001 (2007).
44. Search for W-prime boson decaying to electron-neutrino pairs in p anti-p collisions at s**(1/2) = 1.96-TeV,) [hep-ex/0611022] Phys. Rev. D. 75 091101 (2007).
45. Measurement of the Ratios of Branching Fractions B(Bs -> Ds pi pi pi) / B(Bd -> Dd pi pi pi) and B(Bs -> Ds pi) / B(Bd -> Dd pi), CDF - Run II Collaboration, [hep-ex/0610045] Phys. Rev. Lett. 98 061802 (2007).
46. Measurement of the Lambda0(b) Lifetime in Lambda0(b) ---> J/psi Lambda0 in p anti-p Collisions at s**(1/2) = 1.96-TeV, [hep-ex/0609021] Phys. Rev. Lett. 98 122001 (2007).
47. Search for V+A current in top quark decay in p anti-p collisions at s**(1/2) = 1.96-TeV, [hep-ex/0608062] Phys. Rev. Lett. 98 07200 (2007).

LINEAR COLLIDER

D. Attree, F. Gournaris, M. Lancaster, A. Lyapin, B. Maiheu, S. Malton, D. J. Miller, M. Postranecky
48. Summary of the 2007 CALICE test beam at CERN, CALICE Collaboration, CERN-SPSC-SR-023 (2007) 9p.
49. CALICE Si-W EM calorimeter: Preliminary results of the testbeams 2006, CALICE Collaboration, [arXiv:0709.2516] (2007) 8p.
50. CALICE Report to the Calorimeter R&D Review Panel, CALICE Collaboration, [arXiv:0707.1245] ILC-DET-2007-024 (2007) 77p.
51. Scintillator tile hadron calorimeter with novel SiPM readout, CALICE Collaboration, [arXiv:0704.3514] Nucl. Instrum. Meth. A 582 451-456 (2007)

MINOS P. Adamson, B. Anderson, D. Attree, G. Crone, M. Dorman, A. Holin, M. Kordosky, J. Koskinen, R. Saakyan, C. Smith, J. Thomas, D. Tovee, P. Vahle
52. A Study of Muon Neutrino Disappearance Using the Fermilab Main Injector Neutrino Beam, [arXiv:0711.0769] FERMILAB-PUB-07-577-E (2007) 57p.
53. Measurement of neutrino velocity with the MINOS detectors and NuMI neutrino beam, Phys. Rev. D 76 072005 (2007).
54. Measurement of neutrino velocity with the MINOS detectors and NuMI neutrino beam, [arXiv:0706.0437] MINOS-DOCDB-2582 (2007) 5p.
55. Measurement of the atmospheric muon charge ratio at TeV energies with MINOS, [arXiv:0705.3815] Phys. Rev. D 76 052003 (2007).
56. Charge-separated atmospheric neutrino-induced muons in the MINOS far detector, [hep-ex/0701045] Phys. Rev. D 75 092003 (2007).
57. Hadronic interaction modelling in MINOS, [hep-ex/0701009] AIP Conf. Proc. 896 185-194 (2007).

NEMO

R. Saakyan, G. Sciacca, J. Thomas, S. King, L. Jenner, B. Anderson, D. Attree, J. Fraser, G. Crone, V. Vasiliev, M. Krauer, S. Williamson
58. Search for bb decay with NEMO 3 and SuperNEMO experiments, NEMO 3 Collaboration, [arXiv:0710.5090] (2007) 4p.
59. Measurement of double beta decay of Mo-100 to excited states in the NEMO 3 experiment, [hep-ex/0609058] Nucl. Phys. A 781 209-226 (2007).

OPAL

D. J. Miller, P. Sherwood, J. Thomas

60. Bose-Einstein study of position-momentum correlations of charged pions in hadronic Z0 decays, [arXiv:0708.1122] Eur. Phys. J. C 52 787-803 (2007)
61. Search for Dirac magnetic monopoles in e+e- collisions with the OPAL detector at LEP2, [arXiv:0707.0404] CERN-PH-EP-2007-019 (2007) 14p.
62. Search for invisibly decaying Higgs bosons in e+ e- ---> Z0 h0 production at s**(1/2) = 183-GeV - 209-GeV, [arXiv:0707.0373] CERN-PH-EP-2007-018 (2007) 21p.
63. Inclusive Jet Production in Photon-Photon Collisions at s(ee)**(1/2) from 189 to 209-GeV, [arXiv:0706.4382] CERN-PH-EP-2007-016 (2007) 17p.
64. Inclusive production of charged hadrons in photon-photon collisions, [hep-ex/0612045] Phys. Lett.B. 651 92-101 (2007).
65. Search for invisibly decaying Higgs bosons with large decay width using the OPAL detector at LEP, [hep-ex/0610056] Eur. Phys. J. C 49 457-472 (2007).
THEORY
B. Martin, R. Thorne, G. Watt, C. Wilkin
66. V. Kurbatov, et al., Energy dependence of forward 1S0 diproton production in the pp -> pp pi0 reaction , [arXiv:0712.1186] (2007) 12p.
67. R. S. Thorne, The Role of uncertainties in parton distribution functions, [arXiv:0711.2986] (2007) 10p.
68. A. Sherstnev, R. S. Thorne, Parton Distributions for LO Generators, [arXiv:0711.2473] CAVENDISH-HEP-2007-12 (2007) 40p.
69. Y. Maeda, et al., Kaon Pair Production in Proton--Proton Collisions, [arXiv:0710.1755] (2007).
70. G. Watt, A.D. Martin, M.G. Ryskin, Diffractive parton distributions: The Role of the perturbative Pomeron, [arXiv:0708.4126] IPPP-07-52 (2007) 8p.
71. C. Wilkin, et al., Is there an eta He-3 quasi-bound state? [arXiv:0707.1489] Phys. Lett. B. 654 92-96 (2007).
72. C. D. White, R. S. Thorne, A Global Fit to Scattering Data with NLL BFKL Resummations, [arXiv:0706.2609] Munich, Deep-inelastic scattering 361-36 (2007).
73. R.S. Thorne, A. Sherstnev, C. Gwenlan, Parton distributions for LO calculations, [arXiv:0706.2131] Munich 2007, Deep-inelastic scattering369-37(2007).
74. A.D. Martin, W.J. Stirling, R.S. Thorne, G. Watt, Update of parton distributions at NNLO, [arXiv:0706.0459] Phys. Lett. B. 652 292-299,2007.
75. R.S. Thorne, A.D. Martin, W.J. Stirling, G. Watt, Parton distributions for the LHC, [arXiv:0706.0456] Munich 2007, Deep-inelastic scattering 305-30 (2007).
76. C.D. White, R.S. Thorne.A Global Fit to Scattering Data with NLL BFKL Resummations, [hep-ph/0611204] Phys. Rev. D. 75 034005 (2007).
77. Y. N. Uzikov, J. Haidenbauer, C. Wilkin, Dynamics of S(0)-1 diproton formation in the pd ---> {pp}(s)n and pN ---> {pp}(s) pi reactions in the GeV region, [nucl-th/0611006] Phys. Rev. C. 75 014008 (2007).
78. A.D. Martin, M.G. Ryskin, G. Watt, Diffractive parton distributions from H1 data, [hep-ph/0609273] Phys. Lett. B. 644 131-135 (2007).
ZEUS S. Boutle, J. Butterworth, T. Jones, J. Loizides, S. Miglioranzi, D. Nicholass, M. Sutton, C. Targett-Adams, M. Wing
79. P.D. Allfrey, et al., The design and performance of the ZEUS global tracking trigger, Nucl. Instrum. Meth. A. 580 1257-1282 (2007).
80. Measurement of D+- meson cross sections in deep inelastic scattering using the ZEUS micro vertex detector, Munich 2007, Deep-inelastic scattering, 2 809-81 (2007).
81. I. Brock, et al., The design and performance of the ZEUS Micro Vertex detector, [arXiv:0708.3011] Nucl. Instrum. Meth. A. 581 656-686 (2007).
82. Exclusive rho0 production in deep inelastic scattering at HERA, [arXiv:0708.1478] PMC Phys. A1:6, (2007).
83. Dijet production in diffractive deep inelastic scattering at HERA, [arXiv:0708.1415] Eur. Phys. J. C. 52 813-832 (2007).
84. Three- and four-jet final states in photoproduction at HERA, [arXiv:0707.3749] DESY-07-102 (2007) 50p.
85. Forward-jet production in deep inelastic ep scattering at HERA, [arXiv:0707.3093] Eur. Phys. J. C 52 515-530 (2007).
86. High-E(T) dijet photoproduction at HERA, [arXiv:0706.3809] Phys. Rev. D 76 072011 (2007).
87. Bose-Einstein Correlations of Charged and Neutral Kaons in Deep Inelastic Scattering at HERA, [arXiv:0706.2538] Phys. Lett. B. 652:1-12 (2007).
88. Measurement of (anti)deuteron and (anti)proton production in DIS at HERA, [arXiv:0705.3770] DESY-07-070 (2007) 27p.
89. Multijet production at low x(Bj) in deep inelastic scattering at HERA, [arXiv:0705.1931] cl. Phys. B 786 152-180 (2007).
90. Measurement of D mesons production in deep inelastic scattering at HERA, [arXiv:0704.3562] JHEP 0707 074 (2007).
91. Diffractive photoproduction of D*+-(2010) at HERA, [hep-ex/0703046] Eur. Phys. J. C 51 301-315 (2007).
92. Measurement of D*+- meson production in e+- p scattering at low Q**2, [hep-ex/0702034] Phys. Lett. B. 649 111-121 (2007).
93. Leading neutron energy and pT distributions in deep inelastic scattering and photoproduction at HERA, [hep-ex/0702028] Nucl. Phys. B. 776 1-37 (2007).
94. Measurement of K0(S), Lambda, anti-Lambda production at HERA, [hep-ex/0612023] Eur. Phys. J. C. 51 1-23 (2007).
95. Measurement of open beauty production at HERA in the D* muon final state, [hep-ex/0609050] Eur. Phys. J. C 50 299-314 (2007).
96. Measurement of azimuthal asymmetries in neutral current deep inelastic scattering at HERA, [hep-ex/0608053] Eur. Phys. J. C 51 289-299 (2007).
97. Inclusive-jet and dijet cross-sections in deep inelastic scattering at HERA, [hep-ex/0608048] Nucl.Phys.B765:1-30 (2007).
98. Measurement of prompt photons with associated jets in photoproduction at HERA, [hep-ex/0608028] Eur. Phys. J. C 49 511-522 (2007).
99. Measurement of neutral current cross sections at high Bjorken-x with the ZEUS detector at HERA, [hep-ex/0608014] Eur. Phys. J. C 49 523-544 (2007).

CONDENSED MATTER AND MATERIAL PHYSICS

1. D. T. Adroja, J. G. Park, E. A. Goremychkin, K. A. McEwen, N. Takeda, B. D. Rainford, K. S. Knight, J. W. Taylor, Jeongmi Park, H. C. Walker, R. Osborn, P. S. Riseborough, Observation of two spin gap energies in the filled skutterudite compound $CeOs4Sb_{12}$, Phys. Rev. B 75 014418 (2007).
2. D. T. Adroja, J.G. Park, K. H. Jang, H. C. Walker, K. A. McEwen, T. Takabatake, Study of nonFermiliquid behaviour near the ferromagnetic quantum critical point in $CePd_{0.15}Rh_{0.85}$, J. Magnetism and Magnetic Materials 310 858 (2007).
3.vA. Akrap, T. Weller, M. Ellerby, S. S. Saxena, G. Csanyi, L. Forro C6Yb and graphite: A comparative high pressure transport study, Phys. Rev. B. 76 045426 (2007).
4. D. Alfe, M. J. Gillan, Ab initio statistical mechanics of surface adsorption and desorption: I H_2O on M_gO (001) at low coverage, J.Chem. Phys. 127 114709 (2007).
5. D. Alfe, M. J. Gillan, G. D. Price, Temperature and composition of the Earth's core, Contemporary Phys. 48 63 (2007).
6. J. S. Bhatt, I. J. Ford, Investigation of M_gO as a candidate for the primary nucleating dust species around Mstars, MNRAS 382 291-298 (2007).
7. V. Bodrozic, M. Roberts, N. Phillips, J. H. Burroughes, S. Mian, F. Ca-cialli, The influence of subgap features in the electromodulation and builtin voltage measurements of polyfluorene blue light emitting diodes with anodic charge injection layers, J. App. Phys. 101 084507 (2007).
8. S. Boutet, I. K. Robinson, Radiation Induced Collapse of Protein Crystals, J. of Synchrotron Radiation 13 17 (2006).
9. S. Boutet, I. K. Robinson, Precrystallization Clusters of Holoferritin and Apoferritin at Low Temperature, Phys. Rev. E 75 021913 (2007).
10. D. R. Bowler, J. H. G. Owen, Molecular interactions and decomposition pathways of NH_3 on Si(001), Phys. Rev. B 75 155310 (2007).
11. D. R. Bowler, A. S. Torralba, T. Miyazaki, T. Ohno, M. J. Gillan, Linear-scaling DFT calculations with the Conquest code, Psik Newletter (June 2007).
12. D. T. Bowron, J. L. Finney, Association and Dissociation of an Aqueous Amphiphile at Elevated Temperatures, J. Phys. Chem. B 111 9838-9852 (2007).
13. J. C. Brookes, F. Hartoutsiou, A. P. Horsfield, A. M. Stoneham, Can hu-mans recognize odor by phonon assisted tunneling?, Phys. Rev. Lett. 98 038101 (2007).
14. C. Cazorla, M. J. Gillan, S. Taioli, D. Alfe, Ab initio melting curve of molybdenum by the phase coexistence method, J. Chem. Phys. 126 194502 (2007).
15. J. Chang, A. P. Schnyder, R. Gilardi, H. M. Ronnow, S. Pailhes, N. B. Christensen, Ch. Niedermayer, D. F. McMorrow, A. Hiess, A. Stunault, M. Enderle, B. Lake, O. Sobolev, N. Momono, M. Oda, M. Ido, C. Mudry, J. Mesot, Magneticfieldinduced excitations and renormalized spin gap of the underdoped superconductor $La_{1.895}Sr_{0.105}CuO_4$, Phys. Rev. Lett. 98 077004 (2007).
16. N. B. Christensen, H. M. Ronnow, D. F. McMorrow, A. Harrison, T. G. Perring, M. Enderle, R. Coldea, L. P. Regnault, G. Aeppli, Quantum dynamic and entanglement of spins on a square lattice, Proc. of the Na-tional Academy of Sciences 104 15264-15269 (2007).
17. N. B. Christensen, H. M. Ronnow, J. Mesot, R. A. Ewings, N. Momono, M. Oda, M. Ido, M. Enderle, D. F. McMorrow, A. T. Boothroyd, Nature of the magnetic order in the chargeordered cuprate $La_{1.48}Nd_{0.4}Sr_{0.12}CuO_4$, Phys. Rev. Lett. 98 197003 (2007).
18. F. C. Coomer, V. BondahJagalu, K. J. Grant, A. Harrison, G. J. McIntyre, H. M. Ronnow, R. Feyerherm, T. Wand, M. Meisner, D. Visser, D. F. McMorrow, C. Cramer, Neutron diffraction studies of magnetic correlations in the S=1/2 square Heisenberg antiferromagnets $(d_6\_5CAP)_2CuCl_4$ and $(d_65CAP)_2CuBr_4$, Phys. Rev. B 75 094424 (2007).
19. R. Cubitt, J. S. White, M. Laver, M. R. Eskildsen, C. D. Dewhurst, D. Mck. Paul, A. J. Crichton, M. Ellerby, C. Howard, Z. Kurban, F. Norris, Smallangle neutron scattering measurements of the vortex lattice in CaC6, Phys. Rev. B. 75 140516 (2007).
20. D. M. Duffy, A. M. Rutherford, Including the effects of electronic stopping and electronion interactions in radiation damage simulations, J. Phys.: Condensed Matter 19 016207 (2007).
21. D. M. Duffy, A. M. Rutherford, Including the effects of electronic stopping and electronion interactions in cascade simulations, M R S Symposium Proc. 981 0981-JJ04-06 (2007).
22. T. A. J. Duke, F. J. Ulicher, Critical oscillators as active elements in hearing, in Active Processes and Otoacoustic Emissions in Hearing, eds. G. A. Manley, R. R. Fay, A. N. Popper, Springer (2007).
23. A. S. Eggeman, S. A. Majetich, D. Farrell, Q. A. Pankhurst, Size and Con-centration Effects on High Frequency Hysteresis of Iron Oxide Nanoparticles, IEEE Transactions on Magnetics 43 2451-2453 (2007).
24. W. J. Feast, F. Cacialli, A. T. H. Koch, R. Daik, C. Lartigau, R. H. Friend, D. Beljonne, J. L. Bredas, Control through chain microstructure of luminescence in conjugated polymers, J. Mat. Chem. 17 907-912 (2007).
25. R. Felici, N. M. Jeutter, V. Mussi, F. Buatier de Mongeot, C. Boragno, U. Valbusa, A. Toma, Y. Wei, C. Rau, I. K. Robinson Insitu study of the dewetting behavior of Nifilms on oxidized Si(001) by GISAXS, Surface Science 601 4526-30 (2007).
26. Y. Feng, R. Jaramillo, G. Srajer, J. C. Lang, Z. Islam, M. S. Somayazulu, O. G. Shpyrko, J. J. Pluth, H. K. Mao, E. D. Isaacs, G. Aeppli, T. F. Rosenbaum, Pressuretuned spin and charge ordering in an itinerant antiferromagnet, Phys. Rev. Lett. 99 137201 (2007)
27. T. Fennell, S. T. Bramwell, D. F. McMorrow, P. Manuel, A. Wildes, Pinch Points and Kastelyn transitions in kagome ice, Nature Phys. 3 566 (2007).
28. L. Fernandez Barquın, R. Garcia Calderon, B. Farago, J. Rodrıguez- Carvajal, A. Bleloch, D. McComb, R. Chater, Q. A. Pankhurst, Neutron spin echo evidence of mesoscopic spin correlations among Fe(Cu) fer-romagnetic nanoparticles in a silver diamagnetic matrix, Phys. Rev. B. 76 172404 (2007).
29. L. Fernandez Barquın, R. Garcıa Caldeon, Q. A. Pankhurst, M. H. Mathon, SANS evidence of magnetic correlations among nanoparticles in granular $Fe_{22}Cu_{14}Ag_{64}$, J.

Magnetism and Magnetic Materials 310 2518-2520 (2007).
30. L. Fernandez Barquın, A. Yedra, S. N. Kaul, M. L. FdezGubieda, J. F. W. Mosselmans, Q. A. Pankhurst, X-ray absorption analysis of core/shell magnetic Fe, Co)-B nanoparticles of amorphous and crystalline structure obtained by chemical reduction, J. NonCrystalline Solids 353 733-737 (2007).
31. J. L. Finney, Bernal and the structure of water, J. Phys.: Conf. Series 57 40-52 (2007).
32. J. L. Finney, Joseph Rotblat: the Nuclear Physicist, In Joseph Rotblat: Visionary for Peace eds.. R. Braun, R. Hinde, D. Krieger, H. Kroto, S. Milne, Wiley VCH, Weinheim, Germany, 15-29 (2007).
33. J. L. Finney, Sculpting ice molecule by molecule, In Findings on Ice, eds. H. Aardse, A. van Baalen, Pars Foundation and Lars Mller Publishers, Amsterdam and Baden, 79-83 (2007)
34. J. L. Finney, Dual Use: Can We Learn from the Physicists' Experience?, In A Web of Prevention, eds.. B. Rappert, C. McLeish, Earthscan, London and Sterling VA, 67-76 (2007).
35. Ø. Fischer, M. Kugler, I. MaggioAprile, C. Berthod, C. Renner, Scanning tunneling spectroscopy of high temperature superconductors, Rev. of Modern Phys. 79 353 (2007).
36. H. Fox, M. J. Gillan, A. Horsfield, Methods for calculating the desorption rate of an isolated molecule from a surface: Water on MgO(001), Surface Science 601 5016-5025 (2007).
37. J. L. Gavartin, A. L. Shluger, Modeling $HfO_2/SiO_2/Si$ interface, Microelectronic Engineering 84 2412-2415 (2007).
38. M. J. Gillan, D. R. Bowler, A. S. Torralba, T. Miyazaki, Order-N first-principles calculations with the Conquest code, Computer Phys. Com-munications 177 14 (2007).
39. L. Giordano, P. V. Sushko, G. Pacchioni, A. L. Shluger, Electron trapping at point defects on hydroxylated silica surfaces, Phys. Rev. Lett. 99 136801 (2007).
40. L. Giordano, P. V. Sushko, G. Pacchioni, A. L. Shluger, Optical and EPR properties of point
defects at a crystalline silica surface: Ab initio embeddedcluster calculations, Phys. Rev. B. 75 024109 (2007)
41. P. Gryko, M. Liang, I. K. Robinson, Observation of Interference Effects in Coherent Diffraction of Nanocrystals under X-ray Standing Wave Illumination, J. Synchrotron Radiation 14 471-476 (2007).
42. R. Harder, M. A. Pfeifer, G. J. Williams, I. A. Vartaniants, I. K. Robinson, Orientation variation of surface strain, Phys. Rev. B. 76 115425 (2007).
43. D. Hautot, Q. A. Pankhurst, C. M. Morris, A. Curtis, J. Burn, J. Dobson, Preliminary observation of elevated levels of nanocrystalline iron oxide in the basal ganglia of neuroferritinopathy patients, Biochimica et Biophysica Acta, Molecular Basis of Disease 1772 21-25 (2007).
44. K. Hayashi, P. V. Sushko, D. Munoz Ramo, A. L. Shluger, S. Watauchi, I. Tanaka, S. Matsuishi, M. Hirano, H. Hosono, Nanoporous crystal $12CaO \cdot 7Al_2O_3$:
A playground for studies of ultraviolet optical absorption of negative ions, J. Phys. Chem. B. 111 1946-1956 (2007).
45. S. Heutz, C. Mitra, W. Wu, A. J. Fisher, A. Kerridge, M. Stoneham, A. H. Harker, J. Gardener, H. H. Tseng, T. S. Jones, C. Renner, G. Aeppli, Molecular Thin Films: A New Type of Magnetic Switch, Advanced Materials 19 3618-3622 (2007).
46. R A Hinde, J L Finney, Sir Joseph (Jozef) Rotblat 4 November 1908 31 August 2005, Biographical Memoirs of Fellows of the R S 53 309-326 (2007).
47. B. W. Hoogenboom, K. Suda, D. Fotiadis, A. Engel, The supramolecular assemblies of voltagedependent anion channels in the native membrane, J. Molecular Biology 370 246-255 (2007).
48. C. A. Howard, J. C. Wasse, N. T. Skipper, H. Thompson, A. K. Soper, The Solvation Structure of Fulleride $C^{5}{}_{60}-$Anions in Potassium Ammonia Solution, J. Phy. Chem. C. 111 5640-5647 (2007).
49. S. Hussain, I. J. Youngs, I. J. Ford, The electromagnetic properties of nanoparticle colloids at radio and microwave frequencies, J. Phys. D: App. Phys. 40 5331-5337 (2007).
50. R. Jaramillo, T. F. Rosenbaum, E. D. Isaacs, O. G. Shpyrko, P. G. Evans, G. Aeppli, Z. Cai, Microscopic and Macroscopic Signatures of Antiferromagnetic Domain Walls, Phys. Rev. Lett. 98 117206 (2007).
51. A. Kerridge, A. H. Harker, A. M. Stoneham, Electron dynamics in quantum gate operation, J. Phys.: Condensed Matter 19 282201 (2007).
52. A. V. Kimmel, P. V. Sushko, A. L. Shluger, Structure and spectroscopic properties of trapped holes in silica, J. NonCrystalline Solids 353 599--604 (2007).
53. A. V. Kimmel, P. V. Sushko, A. L. Shluger, M. M. Kuklja, Effect of charged and excited states on the decomposition of 1,1diamino2,2-dinitroethylene molecules, J. Chem. Phys. 126 234711 (2007).
54. N. N. Kovaleva, A.V. Boris, P. Yordanov, A. Maljuk, E. Bruecher, J. Strempfer, M. Konuma, I. Zegkinoglou, C. Bernhard, A. M. Stoneham, B. Keimer, Optical response of ferromagnetic $YTiO_3$ studied by spectral ellipsometry, Phys. Rev. B 76 155125 (2007).
55. H. C. Lin, A. J. Fisher, Entanglement in general twomode continuous-variable states: local approach and mapping to a twoqubit system, Phys. Rev. A. 76 042320 (2007).
56. H. C. Lin, A. J. Fisher, Configurationspace location of the entanglement between two subsystems, Phys. Rev. A. 75 032330 (2007).
57. O. Lipscombe, S. M. Hayden, B. Vignolle, D. F. McMorrow, T. G. Perring, Persistence of highenergy magnetic excitations in the overdoped superconductor $La_{2-x}SrxCuO_4$ (x=0.22), Phys. Rev. Lett. 99 067002 (2007).
58. P. A. Lock, N. T. Skipper, Computer Simulation of the Structure and Dy-namics of Phenol in Sodium Montmorillonite Hydrates, European J. Soil Science 58 958966 (2007).
59. A. Lovell, N. T. Skipper, S. M. Bennington, R. I. Smith, A highresolution neutron scattering study of the hydrogendriven metalinsulator phase transition in KC8Hx, J. Alloys and Compounds 446447 397-401 (2007).
60. F. Loviat, H. M. Ronnow, C. Renner, G. Aeppli, T. Kimura, Y. Tokura, The surface layer of cleaved bilayer manganites, Nanotechnology 18 044020 (2007).
61. E . J. McEniry, D. R. Bowler, D. Dundas, A. P. Horsfield, C. G. Sanchez, T. N. Todorov, Dynamical simulation of inelastic quantum transport, J. Phys.: Condensed Matter 19 196201 (2007).
62. K. A. McEwen, H. C. Walker, M. D. Le, D. F. McMorrow, E. Colineau, F. Wastin, S. B. Wilkins, J. G. Park, R. I. Bewley, D. Fort, Understanding the quadrupolar structures of UPd3, J. Magnetism and Magnetic Ma-terials 310 718 (2007).
63. K. P. McKenna, P. V. Sushko, A. L. Shluger, Inside powders: A theoret-ical model of interfaces between MgO nanocrystallites, J. Am. Chem. Soc. 129 86008608 (2007).
64. K. P. McKenna, P. V. Sushko, A. L. Shluger, Dynamics of lowcoordinated surface atoms on gold nanocrystallites, J. Chem. Phys. 126 154704 (2007).
65. K. P. McKenna, P. V. Sushko, A. L. Shluger, Transient atomic configura-tions of supported gold nanocrystallites at finite temperature, J. Phys. Chem. C 111 2823-2826 (2007).
66. D. Mannix, D. F. McMorrow, A. Boothroyd, R. Ewings, L. Paolasini, C. Mazzoli, S. B. Wilkins, X-ray resonant scattering studies of multiferroic TbMnO3 in applied fields, J. Magnetism and Magnetic Materials (2007).
67. D. Mannix, D. F. McMorrow, A. Boothroyd, S. W. Lovesey, K. S. Knight, D. Prabhakaran, R. Ewings, B. Janousova, C. Mazzoli, L. Paolasini, S. B. Wilkins, X-ray resonant scattering study of the order parameters in multiferroic $TbMnO_3$, Phys. Rev. B. 76 184420 (2007).
68. T. Miyazaki, D. R. Bowler, R. Choudhury, M. J. Gillan, Density functional calculations of Ge(105): Local basis sets and O(N) methods, Phys. Rev. B 76 115327 (2007).
69. M. Muller, S. Stankic, O. Diwald, P. V. Sushko, A. L. Shluger, Effect of protons on the optical properties of oxide nanostructures, J. Am. Chem. Soc. 129 12491-12496 (2007).
70. M. A. Pfeifer, G. J. Williams, I. A. Vartanyants, R. Harder, I. K. Robinson, Threedimensional mapping of a deformation field inside a nanocrystal, Nature 442 6366 (2006).
71. A. Poynor, L. Hong, I. K. Robinson, S. Granick, Z. Zhang, P. A. Fenter, How water meets a hydrophobic surface, Phys. Rev. Lett. 97 266101 (2006).
72. D. Munoz Ramo, J. L. Gavartin, A. L. Shluger, G. Bersuker, Intrinsic and defec-tassisted trapping of electrons and holes in HfO_2: an ab initio study, Microelectronic Engineering 84 2362-2365 (2007).
73. D. Munoz Ramo, A. L. Shluger, J. L. Gavartin, G. Bersuker, Theoretical prediction of intrinsic selftrapping of electrons and holes in monoclinic HfO_2, Phys. Rev. Lett. 99 155504 (2007).
74. D. Munoz Ramo, J. L. Gavartin, A. L. Shluger, G. Bersuker, Spectroscopic properties of oxygen vacancies in monoclinic HfO_2 calculated with periodic and embedded cluster density functional theory, Phys. Rev. B 75 205336 (2007).
75. C. Rau, V. Crecea, K. M. Peterson, P. R. Jemian, C. P. Richter, U. Neuhausler, G. Schneider, X. Yu, P. V. Braun, I. K. Robinson, A hard X--ray KB-FZP Microscope for Tomography with Sub-100-nm Resolution, in Developments in Tomography V, ed. U Bonse, Proc. SPIE 63181G 1-6 (2006).
76. C. Rau, I. K. Robinson, C. P. Richter, Visualizing soft tissue in the mam-malian cochlea with partial coherent hard X-rays, Microscopy Research and Technique 69 660-665 (2006).
77. H. M. Ronnow, J. Jensen, R. Parthasarathy, G. Aeppli, T. F. Rosenbaum, D. F. McMorrow, C. Kraemer, Magnetic excitations near the quantum phase transition in the Ising ferromagnet $LiHoF_4$, Phys. Rev. B. 75 054426 (2007).
78. C. Ruegg, D. F. McMorrow, B. Normand, H. M. Ronnow, S. E. Sebas-tian, I. R. Fisher, C. D. Batista, S. Gvasaliya, C. Niedermayer, J. Stahn, Multiple Magnon Modes and Consequences for the Bose Einstein Con-densate in $BaCuSi_2O_6$, Phys. Rev. Lett. 98 017202 (2007).
79. A. M. Rutherford, D. M. Duffy, The effect of electronion interactions on radiation damage simulations, J. Phys.: Condensed Matter 19 496201 (2007).
80. J. E. Sadleir, S. R. Bandler, R. P. Brekosky, J. Chervenak, E. Figueroa--Feliciano, F. Finkbeiner, N. Iyomoto, R. L. Kelley, C. A. Kilbourne, J. M. King, F. S. Porter, I. K. Robinson, T. Saab, D. J. Talley, Bismuth X-ray absorber studies for TES microcalorimeters, Nuc. Inst. Meth. Phys. Research A 559 447-449 (2006).
81. C. G. Salzmann, P. G. Radaelli, A. Hallbrucker, E. Mayer, J. L. Finney, New hydrogen ordered phases of ice, in Physics and Chemistry of Ice, ed. W. F. Kuhs, The R S of Chem., Cambridge, 521-528 (2007).
82. L. Sardone, C. Sabatini, G. Latini, F. Barigelletti, G. Marletta, F. Cacialli, P. Samori, Scanning Force Microscopy and optical spectroscopy of phase-segregated thin films of poly(9, 9'dioctylfluorene-alt--benzothiadiazole) and poly(ethylene oxide), J. Mat. Chem. 17 1387--1391 (2007).
83. L. Sardone, C. Williams, H. L. Anderson, G. Marletta, F. Cacialli, P. Samori, Phase Segregation in Thin Films of Conjugated Polyrotaxane-Poly(ethylene oxide) Blends: A Scanning Force Microscopy Study, Ad-vanced Functional Materials 17 927932 (2007).
84. R. Schlapak, D. Armitage, N. SaucedoZeni, G. Latini, H. Gruber, P. Mesquida, F. Cacialli, M. Hohage, S. Howorka, Preparation and Characterisation of Dense Films of Poly(amidoamine) Dendrimers on Indium Tin Oxide, Langmuir 23 8916-8924 (2007).
85. A. Shluger, T. Trevethan, Microscopy atomic fingerprinting, Nature 446 34-35 (2007).
86. O. G. Shpyrko, E. D. Isaacs, J. M. Logan, Y. Feng, G. Aeppli, R. Jaramillo, H. C. Kim, T. F. Rosenbaum, P. Zschack, M. Sprung, S. Narayanan, A. R. Sandy, Direct measurement of antiferromagnetic do-main fluctuations, Nature 447 68-71 (2007).
87. D. M. Silevitch, D. Bitko, J. Brooke, S. Ghosh, G. Aeppli, T. F. Rosenbaum, A ferromagnet in a continuously tunable random field, Nature 448 567-570 (2007).
88. D. M. Silevitch, C. M. S. Gannarelli, A. J. Fisher, G. Aeppli, T. F. Rosenbaum,

Quantum Projection in an Ising spin liquid, Phys. Rev. Lett. 99 057203 (2007).
89. O. Sobolev, G. J. Cuello, G. RomanRoss, N. T. Skipper, L. Charlet, Hy-dration of Hg^{2+} in aqueous solution studied by neutron diffraction with isotopic substitution, J. Phys. Chem. A. 111 5123-5125 (2007).
90. I. Solomonov, M. Osipova, Y. Feldman, C. Baehtz, K. Kjaer, I. K. Robin-son, G. T. Webster, D. McNaughton, B. R. Wood, I. Weissbuch, L. Leis-erowitz, Crystal nucleation, growth, and morphology of the synthetic malaria pigment betahematin and the effect thereon by quinoline ad-ditives: The malaria pigment as a target of various antimalarial drugs, J. Am. Chem. Soc.129 2615-2627 (2007).
91. L. M. Stadler, R. Harder, I. K. Robinson, C. Rentenberger, H. P. Karn-thaler, B. Sepiol, G. Vogl, Coherent X-ray diffraction imaging of grown--in antiphase boundaries in $Fe_{65}Al_{35}$, Phys. Rev. B. 76 014204 (2007).
92. L. Stella, M. Meister, A. J. Fisher, A. P. Horsfield, Robust nonadiabatic molecular dynamics for metals and insulators, J. Chem. Phys.127 214104 (2007).
93. A. M. Stoneham, Making sense of scent, Materials Today 10 64 (2007).
94. A. M. Stoneham, How soft materials control harder ones: Routes to Bio-organisation, Reports on Progress in Physics 70 1055-1097 (2007).
95. A. M. Stoneham, Future Perspectives for Diamond for Physics and Applications of CVD Diamond, eds. S. Koizumi, M. Nesladek, C. E. Nebel, Wiley-VCH Accepted, in press (2007).
96. A. M. Stoneham, Theory of Defects in Solids, Oxford University Press (2007).
97. A. M. Stoneham, J. L. Gavartin, Dynamics at the Nanoscale, Materials Science and Engineering 27 972-980 (2007).
98. A. M. Stoneham, J. Gavartin, D. Munoz Ramo, A. L. Shluger, The vul-nerable nanoscale dielectric, Physica Status Solidi A – Applications and Materials Science 204 653662 (2007).
99. A. M. Stoneham, J. Gavartin, A. L. Shluger, A. V. Kimmel, D. Mumoz Ramo, H. M. Ronnow, G. Aeppli, C. Renner, Trapping, selftrapping and the polaron family, J. Phys.: Condensed Matter 19 255208 (2007).
100. A. M. Stoneham, A. H. Harker, G. Aeppli, Novel quantum devices Quantum Connectors, British Patent Application 07142052 Filing Date and Priority Date 20 July 2007.
101. A. M. Stoneham, A. H. Harker, G. Aeppli, Novel quantum devices Quantum Devices, British Patent Application 07142060 Filing Date and Priority Date 20 July 2007.
102. M. L. Sushko, A. L. Shluger, Dipoledipole interactions and the structure of selfassembled monolayers, J. Phys. Chem. B 111 4019-4025 (2007).
103. M. L. Sushko, A. L. Shluger, DLVO theory for likecharged polyelec-trolyte and surface interactions, Materials Science and Engineering C - Biomimetic and Supramo-lecular Systems 27 1090-1095 (2007).
104. P. V. Sushko, D. M. Ramo, A. L. Shluger, Electronic structure and spectroscopic properties of interstitial anions in the nanoporous complex oxide 12CaO . $7Al_2O_3$, Physica Status Solidi A – Applications and Materials Science 204 663-669 (2007).
105. P. V. Sushko, A. L. Shluger, Electronic structure of insulatorconfined ultrathin Si channels, Microelectronic Engineering 84 20432046 (2007).
106. P. V. Sushko, A. L. Shluger, M. Hirano, H. Hosono, From insulator to electride: A theoretical model of nanoporous oxide 12CaO .$7Al_2O_3$, J. Am. Chem. Soc. 129 942951 (2007).
107. M. Sutherland, N. Doiron-Leyraud, L. Taillefer, T. Weller, M. Ellerby, S. S. Saxena, Bulk evidence for singlegap swave superconductivity in the intercalated graphite superconductor C_6Yb, Phys. Rev. Lett. 98 067003 (2007).
108. S. Taioli, C. Cazorla, M. J. Gillan, D. Alfe, Melting curve of tantalum from first principles calculations, Phys. Rev. B. 75 (2007).
109. H. Thompson, A. K. Soper, M. A. Ricci, F. Bruni, N. T. Skipper, The ThreeDimensional Structure of Water Confined in Nanoporous Vycor Glass, J. Phys. Chem. B. 111 5610-5620 (2007).
110. T. Trevethan, L. Kantorovich, J. Polesel-Maris, A. Gauthier, A. L. Shluger, Multiscale model of the manipulation of single atoms on insulat-ing surfaces using an atomic force microscope tip, Phys. Rev. B. 76 085414 (2007).
111. T. Trevethan, A. L. Shluger, Building blocks for molecular devices: Organic molecules on the MgO (001) surface, J. Phys. Chem.C 111 1537515381 (2007).
112. T. Trevethan, M. Watkins, L. N. Kantorovich, A. L. Shluger, Controlled manipulation of atoms in insulating surfaces with the virtual atomic force microscope, Phys. Rev. Lett. 98 028101 (2007).
113. T. Trevethan, M. Watkins, L. N. Kantorovich, A. L. Shluger, L. Polesel-Maris, S. Gauthier, Modelling atomic scale manipulation with the noncontact atomic force microscope, Nanotechnology 17 5866-5874 (2006).
114. T. Trevethan, M. Watkins, A. L. Shluger, L. Polesel-Maris, S. Gauthier, L. N. Kantorovich. A comparison of dynamic atomic force microscope setups for performing atomic scale manipulation experiments, Nanotechnology 18 345503 (2007).
115. M. H. Upton, A. C. Walters, C. A. Howard, K. C. Rahnejat, M. Ellerby, J. P. Hill, D. F. McMorrow, A. Alatas, B. M. Leu, K. Wei, Phonons in superconducting CaC6 studied via inelastic X-ray scattering, Phys. Rev, B 76 220501(R) (2007).
116. I. A. Vartanyants, I. K. Robinson, I. McNulty, C. David, P. Wochner, T. Tschentscher, Coherent X-ray Scattering and Lensless Imaging at the European XFEL Facility, J. Synchrotron Radiation 14 453470 (2007).
117. B. Vignolle, S. M. Hayden, D. F. McMorrow, H. M. Ronnow, B. Lake, C. Frost, T. G. Perring, Two energy scales in the spin excitations of the highTc superconductor $La_{2\_x}Sr_xCuO_4$, Nature Phys. 3 163 (2007).
118. K. Vigor, D. Farrell, A. Huhalov, B. Tolner, H. Kogelberg, Q. A. Pankhurst, I. Parkin, R. Begent, K. Chester, Antibodynanoparticle conjugation for hyperthermic treatment of tumours, J. Plastic, Reconstructive and Aesthetic Surgery 60 S9S9 (2007).
119. A. C. Vila Verde, M. M D Ramos, A M Stoneham, The role of mesoscopic modelling in understanding the response of dental enamel to mid infrared radiation, Phys. in Medicine and Biology 52 2703-2717 (2007).
120. H. C. Walker, K. A. McEwen, P. Boulet, E. Colineau, J. C. Griveau, J. Rebizant, F. Wastin, Magnetic and electrical properties of DHCP $NpPd_3$ and (U, Np)Pd_3, Phys. Rev. B. 76 174437 (2007).
121. H. C. Walker, K. A. McEwen, E. Colineau, J. C. Griveau, F. Wastin, A new route to quantum criticality in (U, Np)Pd3, J. Magnetism and Magnetic Materials 310 751 (2007).
122. M. B. Watkins, A. S. Foster, A. L. Shluger, Hydrogen cycle on CeO_2 (111) surfaces: Density functional theory calculations, J. Phys. Chem. C 111 1533715341 (2007).
123. C. H. Webster, L. M. Helme, A. T. Boothroyd, D. F. McMorrow, S. B. Wilkins, C. Detlefs, B. Janousovla, M. J. McKelvy, Influence of static JahnTeller distortion on the magnetic excitation spectrum of PrO_2, Phys. Rev. B. 76 134419 (2007).
124. F. Wilhelm, N. Jaouen, A. Rogalev, W. G. Stirling, R. Springell, S. W. Zochowski, A. M. Beesley, S. D. Brown, M. F. Thomas, G. H. Lander, S. Langridge, R. C. C. Ward, M. R. Wells, X-ray magnetic circular dichroism study of uranium/iron multilayers, Phys. Rev. B. 76 024425 (2007).
125. G. J. Williams, M. A. Pfeifer, I. A. Vartanyants, I. K. Robinson, Internal structure in Au nanocrystals resolved by 3D inversion of coherent X-ray diffraction, Phys. Rev. B. 73 094112 (2006).
126. G. J. Williams, M. A. Pfeifer, I. A. Vartanyants, I. K. Robinson, Effectiveness of iterative algorithms in recovering phase in the presence of noise, Acta Crystallographica A 63 3642 (2007).
127. G. Xu, C. Broholm, Y. A. Soh, G. Aeppli, J. F. DiTusa, Y. Chen, M. Kenzelmann, C. D. Frost, T. Ito, K. Oka, H. Takagi, Mesoscopic phase coherence in a quantum spin fluid, Science 317 10491052 (2007).
128. W. Zhang, I. K. Robinson, Grazing exit small angle X-ray scattering on grain formation in polycrystalline metal films, Zeitschrift fur Kristallogra-phie 222 6014 (2007)
Conference Proceedings
129. C. LosertValiente Kroon, I. J. Ford, Stochastic birth and death equations to treat chemistry and nucleation in small systems, Proc. of the 17th International Conf. on Nucleation and Atmospheric Aerosols, Galway, Ireland, (2007).
130. C. Rau, V. Crecea, K. M. Peterson, P. R. Jemian, C. P. Richter, U. Neuhausler, G. Schneider, X. Yu, P. V. Braun, I. K. Robinson, A Full-Field KB-FZP Microscope for Hard X-Ray Imaging with Sub 100 nm Resolution, Proc. of the 8th International Conf. on X-ray Microscopy, eds. S, Aoki, Y, Kagoshima, Y, Suzuki, IPAP Conf. Series 7 7-8 (2006).
131. A. M. Stoneham, Thinking about Diamond, MRS Proc. 956 1-10 (2007).
132. H. Y. Tang, I. J. Ford, Calculation of cluster free energies using the Jarzynski relation, Proc. of the 17th International Conf. on Nucleation and Atmospheric Aerosols, Galway, Ireland, (2007).

Staff

Astrophysics Group

Professors:
A D Aylward, M J Barlow, I D Howarth, O Lahav, S Miller, R K Prinja, J M C Rawlings

Readers and Senior Lecturers:
A L Aruliah, A P Doel, M M Dworetsky, I Furniss, L J Smith, S Viti, D D Walker

Lecturers:
N Achilleos, S L Bridle, J Weller.

Royal Society Dorothy Hodgkin Fellow:
N Rajguru

STFC Research Fellows:
N Bastian, C van Breukelen, G Tinetti (Aurora Fellow)

Senior Research Fellows:
F Deigo, J Yates (Honorary)

Research Fellows:
F B Abdalla, E Bayet, D Fenech, E Griffin, P Guio, W Hongchang, G Hutsi, C King, E Serra Cypriano, T Spain, T Stallard, S J Thompson, I Tsamis, L Voigt, R Wesson, M Westmoquette, J Yao, G Yu

Support Staff:
D Brooks, J R Deacon, R Evans, I McWhirter

PhD Students:
A Abate, M Andrews, M Antonik, T Arnesen, C Atkins, M Austin, Z Awad, T Bell, M Benedettini, K Biner, J Burnett, M Callender, C Dunn, A Efstathiou, J Fabbri, S Farrens, E Ford, A Hales Gebrim, S Hodges, F Islam, B James, C Jenner, A Kiakotou, C King, D Kipping, I Konstantopoulos, T Koskinen, C Lintott, A Lotinga, M Lystrup, W Nicholson, M North, J Noss, M Ramos Lerate, A Rassat, J Roberts, P Stobbart, D Stock, J Tang, S Thomas, M Vasta, A Wellbrock, M Westmoquette, W Whyatt, N Wright, E Yigit, I Yiu

Atomic, Molecular, Optical and Positron Physics

Professors:
P Barker, S Bose, G Laricchia, T S Monteiro, W R Newell, J Tennyson

Readers:
A J Bain, F Renzoni,

Lecturers:
D Browne, C Figueira De Morisson Faria, P H Jones, T Kohler, A Serafini, J Underwood

Senior Research Fellow:
O L Polyansky

Marie Curie Research Fellow:
B A Voronin

Research Fellows:
J Anders, D Armoogum, P Barletta, R J Barber, C Creffield, A Dora, N Doss, J Franz, G J Harris, R Kelly, M D Lee, R Marsh, J Munro, J Mur-Petit, D Murtagh, H T Ng, N Nicolaou, L Petrov, R Tolchenov

Support Staff:
R Jawad, D Rage,

PhD Students:
C Arcidiacono. L Austen, M Barber, R Bastin, J Beale, B Boatman, T Boness, S Brawley, M Brown, D Burgarth, L Cook, D Cooke, N Coppendale, H Dhanoa, N Doss, P Douglas, E English, J Garcia Coello, R Gommers, C Hadley, G Halmova, A Harvey, N Hussain, S La Delfa, V Lebedev, N Leonczek, L Lodi, D Murtagh, N Nicolaou, C Piccarreta, P Phoonthong, I Procino, S Purcell, J Reslen, T Shaaran, B Silva, T Sochi, M Stocklin, H Varambhia, R Venn, H Wichterich, A Wickenbrock, A Williams, R Zhang

High Energy Physics

Professors:
J M Butterworth, J A Thomas

Readers and Senior Lecturers:
N Konstantinidis, M A Lancaster, R Saakyan, D N Tovee, M Wing

Lecturers:
A Barr, M Campanelli, R S Thorne, D S Waters,

Royal Society University Research Fellows:
A Connolly (USA/Canada Research Fellow), R Nichol

STFC Advanced Fellows:
C Gwenlan, M Sutton

STFC Fellows:
E Nurse, C B Smith

Principal and Senior Research Fellow:
A Hill, P Sherwood, M Sutton

Research Fellows:
V Bartsch, I Bizjak, Z Daraktchieva, S J H Dean, M Dorman, J Evans, R Flack, M A Kordosky, J H Loizides, A Lyapin, B Maiheu, J W Monk, E Ozcan, P Vahle, V Vasiliev, G Watt

Support Staff:
B E Anderson, D J Attree, G Crone, T J Fraser, T J Hoare, Z Maxa, E E Nzuobontante, M Postranecky, F Sciacca, B M Simmons, M R Warren, B M Waugh

PhD Students:
L Asquith, C Bernius, D Beecher, S Bevan, S Boutle, T Byatt, A Davison, M Dorman, A Freshville, F Gournaris, O Harris, A Holin, D Houseman, M Kauer, S King, D Koskinen, S Malton, S Malik, M Mottram, M Nash, D Nicholass, A Richards, T Riddick, E Stefanidis, C Taylor, T Vine

Condensed Matter and Materials Physics

Professors:
G Aeppli, F Cacialli, T A Duke, J L Finney, A J Fisher, I J Ford, M J Gillan, K A McEwen, D F McMorrow, Q A Pankhurst, I K Robinson, A Shluger, N T Skipper

Readers and Senior Lecturers:
D R Bowler, S W Zochowski, T Harker

Lecturers:
B Hoogenboom, C Hirjibehedin, D Duffy, M Ellerby

EPSRC Advanced Fellow:
S Lynch

Research Fellows:
S Brovelli

PhD Students:
R Aldus, M Avellino, R Bean, N Beglitis, W Beyhum, J Brookes, B Bryant, I Chapman, J Chivall, R Choudhury, D Credgington, A Dunn, F Ehlers, F Fabrizi, O Fenwick, T Forrest, S Gane, J Gardener, A Garvin, A Grimwood, T Headen, M Howe, D Humphrey, A Kalampokidis, M Kallumadil, S Khakshouri, S Kuhn, Z Kurban, J Lardge, M Le, S Leake, H Lin, C Losert-Valiente Kroon, A Lovell, A Ma, M del Mar Rodriguez, D McCutcheon, A Mehonic, E Milner, N Moore, T Mowat, S Natarajan, L Parrott, K Rahnejat, A Ramlakan, A Rutherford, A Sena, N Shuttleworth, R Springell, R Sivasubramaniam, H Tang, P Taylor, L Thomas, L Tong, P Trevisanutto, A Walters, M Warner, D Wheatley, M Wilkinson, G Winroth, M Wolf, J Wood, W Wu, C Yim

Teaching

Director of Postgraduate Studies:
A J Fisher

Director ofTeaching:
M J Barlow

Director of Undergraduate Physics Laboratories:
N T Skipper

Principal Teaching Fellow:
M Coupland

Co-ordinator 1st year Undergraduate Lab:
C Bull

Laboratory Superintendent:
J O'Brien

Laboratory Technicians:
B T Bristoll, M J Palmer, M A Sterling, D Thomas

Admissions Tutors:
S W Zochowski (Physics and Astronomy), F Cacialli (MSc students), M J Gillan (Postgraduate research students), M Coupland (Part-time students),M M Dworetsky (Astronomy Certificate)

Programme Tutors:
I Ford (Physics), I Furniss (Astronomy), A P Doel (MSc students), R K Prinja (Natural Sciences), M Coupland (Part-time Physics), M M Dworetsky (Astronomy Certificate)

University of London Observatory

Director: M M Dworetsky
Manager: P K Thomas
Demonstrators: S J Boyle, S J Fossey
Computing and Experimental Officer: T Schlichter
Technical Support: M Pearson
Secretary: V Peerless

MAPS Workshop

Superintendent: R Gollay
Technicians: J Benbow, J Dumper, J F Percival

Administrative Staff

Accounts: M Dar
Assistant Administrator: N Zmanay
Departmental Administrator: H Wigmore
Examinations Co-ordinator and Webmaster: K Heyworth
Finance Officer: A Barczak-Dziedzic
Science Centre Organiser: S Kadifachi
Secretary Group Astrophysics: K Nakum
Secretary Groups AMOP & HEP: C Johnston
Undergraduate Teaching Co-ordinator: T Saint
Undergraduate Teaching Secretary: M Mohamad

Visiting Professor and Emeritus Professional Staff

M Burt, A Bokensburg, I M Buckley-Golder, F W Bullock, S F Fox, D H Davis, M J Duff, R S Ellis, M Esten, W M Glencross, T C Griffith, GV Groves, J E Harries, M R Haynes, C Hilsum, J W Humberston, D C Imrie, T W Jones, G E Kalmus, B R Martin, D J Miller, G Peach, P G Radaelli, A C Smith, A K Soper, A M Stoneham, P J Storey, C Wilkin, D A Williams, A J Willis

Pursuing Excellence in Education and Research

www.phys.ucl.ac.uk