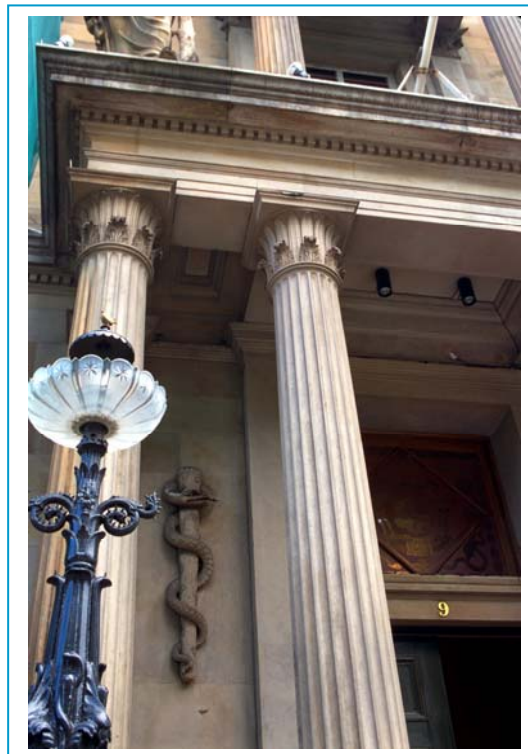


**Nuffield Science Bursaries
for
Schools & Colleges**

Scottish Celebration Event

**Royal College of Physicians
of Edinburgh
Friday 29th August 2008**



TECHFEST-SETPOINT

Promoting Science, Technology, Engineering and Mathematics

Scottish Charity No SC010349



Royal College of Physicians of Edinburgh

IOP Institute of Physics
In Scotland

INTRODUCTION

TechFest-SetPoint would like to take this opportunity to welcome you to the Nuffield School Bursary Scheme Celebration Event.

The Bursary Scheme enables fifth or sixth year secondary school students, who are interested in pursuing a career in Science, Technology, Engineering or Mathematics (STEM), to work alongside practising scientists, technologists, engineers and/or mathematicians in commercial/industrial establishments, research institutions and universities.

The Nuffield Foundation awards each student a bursary to carry out a project which is designed to make a real contribution to the host organisation as well as benefit the students themselves. During the project period the host also undertakes to show the student the full extent of their organisations' work. The projects last, on average, between four and six weeks and take place during the summer vacation.

The Celebration Event offers the students involved in the scheme an opportunity to display what they have achieved during their placement and to meet and discuss it with other bursary students, supervisors and guests. This year has again been another successful year with a total of 75 students taking part in the scheme throughout Scotland.

We are particularly delighted to welcome Mr Anthony Tomei, Director of the Nuffield Foundation as our Guest of Honour and to present the students with their certificates of achievement.

TechFest-SetPoint is proud to be associated with the Nuffield Foundation and to administer the Bursary scheme for the whole of Scotland.

We hope you have a very enjoyable day.

Liz Hodge
Managing Director
TechFest-SetPoint

GUEST OF HONOUR

ANTHONY TOMEI

Anthony Tomei is the Director of the Nuffield Foundation. After university he worked as a Physics teacher in schools in London and in Malaysia (on Voluntary Service Overseas). After a period of postgraduate study he joined the Nuffield Foundation. In 1981 he became assistant director, responsible for the Foundation's programmes in Education and Science. He was appointed director of the Foundation in 1995.

The Nuffield Foundation has an endowment of some £250m and spends around £10m annually. It supports a wide range of innovative projects and programmes, mainly in education and social policy. Being its director is quite possibly the most interesting job in the world.

Nuffield has a long record of development in science education and Anthony has been associated with this for many years. He was responsible for developing many of the Foundation's grant programmes, including the School Science Bursary scheme which is being celebrated today. In 2007 Anthony had a six month sabbatical, which he spent on secondment to the Department for Children, Families and Schools, working on the implementation of the UK's national STEM (Science, Technology, Engineering and Mathematics) Programme.

Anthony has three grown up children, one of whom was a guinea pig for the first ever round of bursaries. Family life apart, his main interests are walking, reading, playing rather ugly tennis and watching Arsenal play beautiful football!

ORDER OF THE DAY

12.00 – 13.00	Registration and display set up
13.00 – 13.15	Welcome
13.15 – 15.15	Viewing of Student Projects
15.30 – 15.50	Student Presentations:- Josephine Holbrook (SAMS) Lee Marshall (RGU) Thomas Davidson (Dundee University) Eleanor Wigham (Edinburgh Zoo) Declan Bryans (Schering Plough)
15.50 – 16.00	Presentation by Sharon Glass:- 2007 Nuffield student & winner of the 2008 BA Science Fair RCUK Laboratory Experience Prize
16.00 – 16.15	Presentation by Anthony Tomei, Director of the Nuffield Foundation
16.15 – 16.25	Certificate Presentation
16.30	Close

PROJECTS

Students marked with an asterisk * are not displaying their projects

Kevin Airens, St Mungo's Academy, Glasgow
University of Glasgow, Department of Chemistry
Professor David Jackson

Hydrogenation of 1& 2-Pentyne

The experiment was the hydrogenation of 1 & 2-pentyne. The aim was to see if doing this caused either a cis- or a trans-pentene to be formed. To carry this out, pentyne was poured into a bubbler and hydrogen was passed over. It was carried over a reactor tube that was cooled down with ice. Inside the reactor tube was a 1% Pd/Al₂O₃ catalyst. The results were recorded in an integrator. After the experiments were completed the results were analysed and it was concluded that no isomers were formed. All of the pentyne was converted into pentane. It was thought that this was because the temperature of the bubbler and reactor tube were too high so perhaps cooling them would allow the cis- and trans- isomers to form.

Gwendolyn Andoh-Kesson, Lochgelly High School, Fife
University of St Andrews, School of Biology, Fife
Dr Rona Ramsay

Calcium is a Specific Activator of Monoamine Oxidase A

Monoamine oxidases (MAO) regulate the level of neurotransmitters that control mood and contraction of blood vessel walls. Inhibitors are antidepressants. Calcium (Ca²⁺), a signalling ion used to transmit nerve impulses and as an intracellular signal to activate specific enzymes, was recently reported to increase the activity of MAO. The action of Ca²⁺ on purified MAO A was investigated. The data show that Ca²⁺ specifically activates MAO A in the range of concentrations likely to occur in the cell, but only when its substrate concentration is low. Other divalent cations inhibit MAO and monovalent cations such as sodium have only a small inhibitory effect. Thus, Ca²⁺ specifically regulates MAO A to increase oxidation of small amounts of neurotransmitter amine.

Andrew Barrie Portobello High School, Edinburgh
Roslin Institute , Department of Genomics & Genetics, Midlothian
Dr Megan Davey, Lynn McTeir

Lung Development in the *talpid*³ Chicken Mutant

*Talpid*³ is a recessive lethal mutation in chickens in the KIAA0586 gene, which causes many developmental defects such as polydactyly (extra digits). We now believe that *talpid*³ is one of a spectrum of developmental disorders caused by a loss of primary cilia, known as ciliopathies. In humans one such disorder, Jeune asphyxiating thoracic dystrophy, leads to respiratory insufficiency and often neonatal death. The primary cause is thought to be abnormal development of the thoracic cage. Here we investigate the development of the lung in *talpid*³, with histological and gene expression analysis and find that lung development is highly abnormal in *talpid*³ embryos. This work suggests that abnormal lung development may also contribute to respiratory insufficiency in Jeunes.

PROJECTS

Janie Baxter, The James Young High School, West Lothian
Royal Zoological Society of Scotland, Edinburgh Zoo
Sarah Robinson, Dr Rob Thomas

Food Preference in Guenons

Three species of captive Guenons were studied at Edinburgh Zoo; The Diana monkeys, Hamlyn's monkeys and L'Hoest monkeys. Data was collected using scan samples at ten second intervals during feeding times for each species. The nature of the interactions with the food was recorded. This data was used to calculate the frequency of interactions with each food category, the average time it took individuals to interact with the food and how often the entire group had the same preference. The results showed that fruit was preferable to all other food categories for all species. They also showed that there was little variation in individual preference and no variation in group preference.

Michael Bommer, St Mungo's Academy, Glasgow
University of Glasgow, Department of Chemistry
Dr Andrew Parkin, Professor Chick Wilson, Dr Lynne Thomas

Co-crystallisations of Benzoic Acid Derivatives with Acetamide – A Systematic Study

Physical properties of crystalline materials can be significantly affected by the way in which the molecules within a crystal arrange themselves. Some materials can show more than one crystal packing arrangement and this is known as polymorphism. This can have significant implications in areas such as the pharmaceutical industry where only one polymorph may be active for a particular application. The occurrence of polymorphism is not well understood but it is known that the conditions of crystal growth such as the solvent used can give rise to the formation of different polymorphs. In this project a series of benzoic acid derivatives were co-crystallised with acetamide from a series of solvents in a systematic approach, with the aim of finding new co-crystal structures and perhaps polymorphs by the formation of different hydrogen bonding motifs. The materials were characterised by differential scanning calorimetry (DSC) to identify whether co-crystals had indeed been formed, and by single-crystal x-ray diffraction.

William Bowers, Dollar Academy, Clackmannanshire
Napier University, Centre for Timber Engineering, Edinburgh
Dr Dan Ridley-Ellis, Dr John Moore, Andrew Lyon

Acoustic Measurement of Stiffness with Reducing Moisture Content

It is useful to be able to non-destructively assess the mechanical properties of wood at all stages from standing tree to dry timber in service. Methods exist for converting values obtained at one moisture content to another, and this project aims to evaluate these for plantation Sitka Spruce (*Picea sitchensis*) grown in Scotland. The stiffness of small clear wood samples were obtained by different acoustic, non-destructive techniques, at different moisture contents from green to 12% and compared to the static values obtained from mechanical testing at 12%. The variation in stiffness with moisture content was discussed and the methods used compared.

PROJECTS

Louise Bradshaw, Beeslack Community High School, Midlothian
University of Edinburgh, School of Biological Sciences
Dr Paul McLaughlin, Graham Dickson

Tyrosine Phosphorylation in Cholesterol Rich Membrane Domains

Many cells sense and respond to the outside world through signalling proteins (receptors) that span the cell membrane. When these receptors are switched on they activate internal cell machinery that can change the cell's division status or division rate, its shape or even its very survival. Engagement of the machinery is often initiated as the activated receptor acquires covalently bound phosphate groups on its inwardly facing part. An emerging idea is that the receptor and the downstream machinery are in fact localised together in "supercomplexes", in cholesterol-rich patches in the cell membrane. Such an arrangement is much more specific and robust, being less susceptible to "cross-talk" from other signalling pathways. Cholesterol rich fractions were purified on sucrose density gradients by virtue of their different buoyant density and were identified by a cholesterol assay. The extent of receptor phosphorylation was probed using a specific antibody coupled to an enzyme that produced visible light (detected photographically). There was clear enrichment of phosphorylation in the cholesterol-rich regions. A comparison of material from rat and mouse brains showed that rat brain was a much better experimental system to use.

Declan Bryans, Cardinal Newman High School, North Lanarkshire
Schering-Plough Corporation, Lanarkshire
Dr Chris Claxton

The Binding of Drugs to Proteins

The aim of this project was to be able to improve the prediction of the clearance of a certain drug in the human body, by incorporating the free fraction in the incubation. Different methods of microsomal protein binding were investigated.

Rebecca Chapman, Boroughmuir High School, Edinburgh
University of Edinburgh, Department of Respiratory & Inflammatory Pharmacology
Professor Adriano Rossi, Dr Rodger Duffin, Tara Sheldrake

Production and Testing of a Monoclonal Antibody Directed Against CD16 (FcγR111)

CD16, identified as FcγRIIIa and FcγRIIIb members of the Fc receptors, is a cluster of differentiation found on the surface of leucocytes such as neutrophils, natural killer cells, monocytes and macrophages. A mouse hybridoma cell line (3G8) was cultured to produce a supernatant containing a monoclonal antibody directed against CD16. By fixing the antibody to magnetic M450 Dynabeads® precoated with sheep-anti-mouse IgG, human eosinophils could be separated from neutrophils from a mixture of granulocytes isolated from the blood of volunteers. These isolated cell populations could then be used to investigate apoptotic mechanisms in neutrophils and inflammatory mediators secreted by activated eosinophils to further our understanding of the contribution of these cells to respiratory diseases such as asthma and COPD (chronic obstructive pulmonary disease).

PROJECTS

Hannah Cheyne, Hazlehead Academy, Aberdeen
NovaBiotics Ltd, Aberdeen
Dr Derry Mercer, Dr Deborah O'Neill

Development of a Protocol for Molecular Identification of Dermatophytes & Environmental Monitoring

The main aims of this project were to identify environmental microbiological monitoring contaminants of unknown or unconfirmed origin within NovaBiotics laboratories, and for the company to use the protocols and systems developed during this project, and the results obtained, to accurately and reproducibly develop a procedure for the identification of other contaminating microbes and, more importantly, to identify more accurately clinical isolates of microorganisms in the NovaBiotics Microbial Culture Collection.

Matthew Citron, Hyndland Secondary School, Glasgow
University of Glasgow, Department of Physics & Astronomy
Dr Ross Galloway, Dr Morag Casey, Dr Lyndsay Fletcher

Automated Feature Recognition with a Newly-Commissioned Astronomical CCD

In order for it to be used to make quantitative observations, an astronomical CCD camera must be characterised: that is, its sensitivity, uniformity of response and noise level must be determined. We have investigated the performance and characteristics of a digital camera, including the effect of varying the CCD temperature on the level of image noise, and have developed software routines and calibration data to allow astronomical images to be corrected for identified camera imperfections. We have developed software to autonomously identify the location and apparent size of stars in images: this software could be used as the basis for an automated stellar photometry or astrometry system, analysing large numbers of astronomical images to study binary or variable stars with minimal user intervention.

Lauren Connor, St Margaret's High School, North Lanarkshire
Schering-Plough Corporation, Lanarkshire
Dr Jackie O'Connell, Cheryl McAlpine

Development and Validation of a GlyT1b Functional Assay Using FLIPR

The amino acid glycine is an inhibitory neurotransmitter in the mammalian Central Nervous System. It is a required co-agonist with glutamate for the excitatory *N*-methyl-D-aspartate (NMDA) receptors. In neuro-typical subjects glycine and glutamate are co-released into the synaptic cleft; these compounds co-agonise at the NMDA receptor (the postsynaptic neuron). Without glycine, the receptor does not work properly. It is glycine that is the focus of many proposed therapies to enhance NMDA activity in the brains of people with schizophrenia. It is possible that elevation of glycine levels in the synaptic cleft through blockade of GlyT1 increases the effectiveness of the NMDA receptor function; therefore GlyT1 inhibitors may provide cognitive enhancing and antipsychotic effects. My project was to develop and validate conditions in a functional assay compatible with high throughput screening (FLIPR- FLuorescence Imaging Plate Reader).

PROJECTS

***David Curran**, St Ambrose High School, North Lanarkshire
University of Strathclyde, Department of Physics
Dr Carol Trager-Cowan

Spectroscopy of Semiconductor Light Emitting Diodes

Applications of light emitting diodes (LEDs) extend from automotive and street lighting, to lighting in mobile phones, to traffic lights. Future use of LEDs promises to revolutionise lighting in the home and office. In this project the emission spectra of red, green, blue and white light emitting diodes (LEDs) were studied using a luminescence spectrometer. The spectrometer was calibrated with a mercury lamp and a calibrated white light source so that the true variation in intensity of the emission from the LEDs, as a function of wavelength, could be determined.

***James Cusiter**, Mackie Academy, Aberdeenshire
University of Aberdeen, College of Life Sciences & Medicine
Dr Andy Schofield

Teaching Package for Molecular Biology

The purpose of this project was to develop a teaching package suitable for S6 advanced higher biology. A laboratory practical was selected from the cell and molecular biology unit of the curriculum. This practical used gel electrophoresis of DNA treated with restriction enzymes. This project looked at 3 different activities: pre-activities that could be done in schools prior to carrying out the lab practical; the actual design of the practical (different DNA stains were evaluated for this practical); and post-activities that could be done in schools after the practical had been performed.

Thomas Davidson, Harris Academy, Dundee
University of Dundee, Department of Civil Engineering
Dr Jonathan Knappett, Dr Andrew Brennan

Effect of Earthquake Characteristics on Soil Liquefaction

Soil liquefaction is one of the main causes of structural damage during earthquakes. It is therefore important to be able to predict the severity of liquefaction resulting from a given amount of ground shaking. Ground movements due to earthquakes are generally random and vary both in amplitude and frequency. This project investigated the effects of these earthquake characteristics on the development of liquefaction in a systematic way using computer-based simulations of soil behaviour. The results of this study have led to the development of simplified models improving our understanding of the mechanism of liquefaction and which offer great potential for use in engineering design.

PROJECTS

***Ewan Ellis**, Anderson High School, Shetland
Royal Society for the Protection of Birds (RSPB), Shetland
Helen Moncrieff, Juan Brown

Visitors' Reactions to Management Measures for Minimising Disturbance to Seals in Mousa, Shetland

Mousa RSPB reserve is an internationally important haul-out site for common seals (*Phoca vitulina*). This uninhabited island is also a very popular site for visitors. In late summer, common seals haul-out of the sea to moult. During their moult, seals are vulnerable to disturbance as being flushed into the water can cause physiological damage. The site is managed so to minimise disturbance by visitors to seals. Visitor and seals' behaviour were analysed with regard to the management measures in place, such as trail markers and interpretation. This study will help inform future management of the nature reserve.

Katherine Farquhar, Carnoustie High School, Angus
University of Dundee, Department of Civil Engineering
Dr Andrew Brennan, Dr Jonathan Knappett

Mini-centrifuge Modelling of the Settlement of On-Bottom Pipelines on Clays

Offshore pipelines are commonly buried beneath the seabed, but as exploration spreads to increasingly deeper water, so the need for pipelines to be laid directly onto the seabed increases. It is therefore important to understand whether these pipelines will bury themselves over time, or remain prone on the seabed. By performing a series of tests on the mini-centrifuge, soil displacement fields for rough and smooth pipelines were obtained, which will improve calculations of pipe embedment in the future.

Jennifer Ferguson & Cathleen Holligan, Grove Academy, Dundee
University of St Andrews, School of Biology
Professor Kevin Laland, Dr Will Hoppitt

Detecting Social Learning in Budgerigar Populations

Many animals appear to learn lifeskills and foraging techniques from other animals, but it is hard to establish that novel behaviour spreads through social transmission, as opposed to asocial learning. This study aimed to develop a new technique for detecting social transmission in animal populations using order-of-acquisition and association data. We presented small groups of budgerigars with novel, extractive foraging tasks and recorded the latency for each bird to contact the task. If the birds are learning from each other, the order in which they acquire or contact the task might be expected to coincide with their associations, if individuals learn from those with whom they spend time. Unfortunately, no such pattern was observed.

PROJECTS

Julie Fitzpatrick, St Mungo's Academy, Glasgow
University of Glasgow, Wellcome Centre for Molecular Parasitology
Professor Jeremy Mottram, Dr Roderick Walker

Expression of *Leishmania major* cdc2-related Kinase 12 (CRK12)

Leishmania are protozoan parasites that cause disfiguring and fatal disease in humans in the tropics and sub-tropics. New drugs to treat the disease are desperately needed, but there is a lack of validated drug targets. As parasite replication is crucial for establishment of infection, we have been investigating proteins essential for the parasite's cell cycle, such as the cyclin-dependent kinases (CDKs). CDKs are enzymes which catalyse the transfer of a phosphate group from ATP onto a serine or threonine amino acid of a substrate. There are predicted to be 11 CDKs in the *Leishmania* genome one of which is CRK12. This project aimed to clone and express the protein kinase domain of CRK12 and test its enzyme activity.

Katie Fullerton, Boroughmuir High School, Edinburgh
Centre for Ecology & Hydrology, Midlothian
Dr Susan Owen

Spatial Heterogeneity of Fluxes of Greenhouse Gases from Grassland

Emissions of greenhouse gases, namely methane (CH₄) and nitrous oxide (N₂O) are monitored by research centres throughout the world. On a routine basis it is possible to sample only from very few patches at each field monitoring site, so it's important to investigate the uncertainty of these field measurements and to identify the causes of the variability. In this project, measurements of CH₄ and N₂O flux were made at two sites near the Centre for Ecology and Hydrology (CEH), Edinburgh. Samples were taken from soil chambers installed in each field. At one site, measurements were made weekly over a period of a month. Soil respiration and soil moisture were also measured, and relationships between these driving variables and greenhouse gas fluxes were investigated. Some strong relationships were found between fluxes and soil moisture and soil respiration, but on some sampling occasions these relationships were masked by episodes of grazing or fertilising of fields.

Steven Fullerton, Beeslack Community High School, Midlothian
Heriot-Watt University, Chemistry Division, Edinburgh
Professor Martin McCoustra, John Thrower

Studying the Molecules of Outer Space in a Chemistry Laboratory

Astronomers have detected around 130 distinct chemical species in the spaces between the stars. Most have been found in regions where new stars and planets are known to be forming. Astrophysicists know that the presence of these chemicals allows the formation of small stars like our Sun, but they need Astrochemists to tell them how such chemicals are formed in the cold, low density darkness of space. In this project, the importance of dust grain surfaces has been studied for two different processes. The first of these is the formation of water, which must occur on grain surfaces to yield the amount observed by astronomers. Also investigated was the chemistry and physics of a family of carbon compounds known as polycyclic aromatic hydrocarbons (PAHs) with water ice under irradiation with ultraviolet light and low energy electrons. In these experiments, the pressures (less than 1 part in 10¹³ of atmospheric pressure) and temperatures (only a few degrees above absolute zero) of the chemically rich regions of interest were recreated in the laboratory.

PROJECTS

Anjali Gangadharan, Boroughmuir High School, Edinburgh
Moredun Research Institution, Division of Virology, Midlothian
Dr David Griffiths, Dr Thonur Leenadevi

Analysis of JSRV Receptor Polymorphism in Sheep

Jaagsiekte sheep retrovirus (JSRV) is a virus that causes lung cancer in sheep. Interestingly, many infected sheep do not develop the tumour, suggesting that these sheep may have some genetic resistance to the virus. Retroviruses are known to interact with numerous cellular proteins during their replication and it is possible that variation in one of the genes encoding these proteins could result in reduced virus replication and contribute to the reduced susceptibility. In this project, we investigated whether there was any sequence variation in the gene encoding the cell surface receptor for JSRV (known as Hyal2) in sheep that were unaffected. The polymerase chain reaction was used to isolate fragments of the Hyal2 gene from affected and unaffected sheep and the sequences of these DNA fragments were determined. We found that all the JSRV-infected sheep studied had the same sequence for Hyal2, regardless of whether they had developed disease. Polymorphisms in Hyal2 are therefore unlikely to be responsible for restricting JSRV replication.

Sabraj Gill, The High School of Dundee
CXR Biosciences Ltd, Dundee
Dr Sarah Waugh, Joanne Quinney, Dr Eddie Doyle

Identification of Basal and β NF-Induced Murine Arylhydrocarbon Receptor (AhR) Expression

AhR is a ligand-activated transcription factor found in the liver. It mediates many biological and toxicological effects of environmental pollutants such as dioxins. Effects include immune suppression and reproductive disruption. Before ligand binding, AhR is found in the cytoplasm. Once binding has occurred it is translocated into the nucleus where it forms a dimer with a second partner protein ARNT, leading to a number of cellular effects including the induction of Cyp1a1. This project aimed to develop methods to allow detection of mAHR at basal and inducible levels. To validate the methods developed, results were confirmed by assessing downstream products Cyp1a1 and Cyp1a2 using established methods.

Rebekah Golding, Balfour High School, Stirling
University of Strathclyde, Institute of Pharmacy & Biomedical Sciences
Dr Val Ferro, Martin Conlon

An Investigation into the Effect of Lovage Plant Extract on Cell Growth

Lovage, scientifically known as *Levisticum officinale*, is a tall, perennial herb belonging to the *Umbelliferae*, the same family as angelica and carrot. Lovage is commonly associated with celery, and has been grown in British gardens for hundreds of years. It has large, green divided leaves that have a strong yeasty scent, (a smell experienced most mornings in the lab!). Little research has been done on the plant's healing qualities and so the project involved an investigation into whether Lovage is cytotoxic to human cells and can affect their growth. Through carrying cell cytotoxicity experiments using Alamar Blue and constructing cell growth curves using Trypan Blue, it was possible to conclude that the plant contains cytotoxic compounds, which can now be investigated further for anti-cancer potential.

PROJECTS

Maire Gorman, Grange Academy, East Ayrshire
University of Strathclyde, Department of Physics
Dr Carol Trager-Cowan

Simulation of Electron Backscatter Diffraction Patterns

The structure of crystals, i.e., whether they are cubic (like gold), or hexagonal (like titanium) can be determined from electron backscatter diffraction (EBSD) patterns obtained in the scanning electron microscope. When an electron beam is incident on a crystal, electrons are backscattered from atomic planes to form a distinctive pattern of bands called Kikuchi bands; sets of overlapping Kikuchi bands make up an EBSD pattern. In this project a computer programme was used to simulate EBSD patterns and the simulated patterns were compared to those obtained experimentally so that the crystal structure and the planes and directions in real crystals could be identified.

Cosmo Grant, The Glasgow Academy
University of Strathclyde, Department of Mathematics
Professor Adam McBride

Cryptography, Cryptanalysis and the Mathematics Behind Them

The security of all confidential information depends on cryptography—methods of encrypting and decrypting information. Areas of number theory like congruences have found application and lead to results like the Chinese remainder theorem, Fermat's little theorem, and Euler's totient function, which are vital to important ciphers. The discovery of asymmetric systems has produced public-key cryptography, such as RSA, which relies on the difficulty of factorising large numbers. Factorisation algorithms were therefore studied and experimentation using Maple on the Pollard Rho factorisation method yielded interesting results with regard to seed and polynomial choice. Modern substitution-permutation networks were also researched, such as DES.

Jennifer Green, Douglas Academy, East Dunbartonshire
University of Glasgow, Wellcome Centre for Molecular Parasitology
Dr Richard McCulloch, Dr Lucio Marcello

DNA Replication Initiation in African Trypanosomes

Replication of the genetic material is arguably the most crucial facet of life, perhaps even the definition of life. In all cells, this process is exquisitely controlled such that normally each chromosome is replicated once per cell division. In eukaryotes, this is complicated by the fact that DNA replication is initiated from multiple origins per chromosome, a process dictated by a conserved cascade of protein factors. At the head of this cascade is a complex of six proteins, termed ORC (origin recognition complex), which acts in conjunction with a further protein, named CDC6, that is related to ORC protein 1. In archaea, this machinery is much simpler, being composed of a composite ORC1/CDC6 protein. Virtually nothing is known about DNA replication in the African trypanosome, a eukaryotic parasite that remains a blight on the health and economy of sub-saharan Africa. Remarkably, trypanosomes appear to have a single ORC1/CDC6 protein, and lack the five other components of the ORC complex, suggesting that their replication machinery may be archaeal-like. Our lab is attempting to verify the function of this protein and to determine the initiation events in trypanosome DNA replication. This project contributed to this aim by generating a set of DNA constructs that will allow us to make ORC1/CDC6 mutants in trypanosomes, thereby testing if (and how) the protein is essential to the life of the trypanosome.

PROJECTS

Mark Gribben, Holy Cross High School, South Lanarkshire
Schering-Plough Corporation, Lanarkshire
Ross Lennen

The Spectroscopic Characterisation of Organic Reference Materials & Development of an Electronic Database

Reference materials are compounds with known chemical, physical and biological properties. They are used routinely in numerous pharmacological assays and analytical chemistry experiments within drug discovery projects. Too often these compounds have been used prior to full characterisation by modern analytical chemistry techniques and where any raw analytical data does exist, it is generally stored in paper format making it unsearchable for future reference. In this work four reference compounds were fully characterised using a variety of analytical techniques. The raw data obtained was fully interpreted and stored electronically using ACD/Labs SpecManager Software to develop a searchable in-house database at Schering-Plough.

Amanda Herron, Park Mains High School, Renfrewshire
University of Glasgow, Faculty of Veterinary Medicine
Professor Michael Stear

Analysis of dqb2 Allele in a Texel Sheep Population

Nematodes can cause death and disease in sheep and cattle. Current treatment relies heavily on regular drug treatment but this option is threatened by the evolution of drug resistance in parasitic nematodes. Another option is to breed livestock for resistance to nematode infection. A candidate gene for selective breeding is the DQB2 locus in the class II region of the major histocompatibility complex. The purpose of this project was to characterize this locus in a population of Texel sheep. Alleles were defined on the basis of DNA sequence in 34 sheep. Five of these sequences corresponded to previously defined sequences in Blackface sheep and 2 alleles were previously undefined. This is the first demonstration of DQB2 alleles in Texel sheep.

Cassandra Hill, Boroughmuir High School, Edinburgh
University of Edinburgh, Molecular Medicine Centre
Dr Cathy Abbott, Dr Helen Newbery

eEF1A2 Binding Proteins in Cancer

Eukaryotic elongation factor 1A2 (eEF1A2) is a protein involved in translation (making of other proteins). A proportion of cancer tissues have been shown to have a higher level of eEF1A2 than normal tissues. eEF1A2 also interacts with many different types of proteins, including peroxiredoxin 1 (PRDX1) and eEF1B δ . I have shown that levels of eEF1A2 do not correlate with those of its binding partners (PRDX1 and eEF1B δ) in cell lines. I have also shown that both eEF1B δ and PRDX1 are upregulated in tumour samples compared with normal tissues, and may be involved in cancer progression.

PROJECTS

Eugenia Ho, Fettes College, Edinburgh
Napier University, Centre for Timber Engineering, Edinburgh
Dr Dan Ridley-Ellis, Dr John Moore, Andrew Lyon

Distortion of Timber with Reduction in Moisture Content

The dimensions of wood change with moisture content, which can cause warping and cracking in service. This project attempts to measure the radial and tangential shrinkage of plantation Sitka Spruce (*Picea sitchensis*) grown in Scotland as the moisture content decreases from green to 0%. This is done by measuring the dimensions of 'small clear' specimens (nominally 25mm x 25mm x 350mm) daily so that it is possible to see the changes in the dimensions over a wide range of moisture contents as they dry from the freshly felled green condition through the fibre saturation point, to equilibrium moisture content indoors, and finally at the oven dried condition. The project also investigates methods of measurement of stiffness and strength.

Josephine Holbrook, Beeslack Community High School, Midlothian
Scottish Association for Marine Science, Dunstaffnage Marine Laboratory, Argyll & Bute
Dr Kim Last,, Dr Anuschka Miller

An Investigation into the Foraging Behaviour of *Nereis diversicolor*

Nereis diversicolor is a marine polychaete worm which lives in sand burrows in the intertidal zone. To forage for food it needs to partially emerge from its burrow - which is associated with the risk of being predated upon. The brown shrimp *Crangon crangon* is a known predator of *N. diversicolor*. In a series of experiments it was demonstrated that both the physical and chemical presence of the shrimp resulted in a significant reduction in out-of-burrow foraging activity in these polychaetes. It was also found that they significantly reduce their foraging after tail loss both recent and historic which is hypothesised to minimize future predation.

Matthew Hooper, Linwood High School, Renfrewshire
University of the West of Scotland, Department of Biological Sciences, Renfrewshire
Dr Richard Thacker

Effects of Botanical Insecticides from the Neem Tree on Caterpillars and Locusts

The neem tree *Azadirachta indica* is native to the Indian sub-continent but is now grown on a worldwide basis in both developed and developing countries. Extracts from this tree have been used for thousands of years in agriculture to assist with pest management. At present, there are no commercial neem formulations that are registered for use in UK agriculture. Extracts from the tree are harmless to vertebrates and are therefore viewed by some as an environmentally acceptable form of pest management. The aim of this project was to evaluate the effects of neem extracts on a tropical and a temperate pest. These pests were the desert locust and the tomato moth.

PROJECTS

Qasim Latif, Kirkcaldy High School, Fife
University of Edinburgh, School of Chemistry
Dr Euan Brechin

Synthesis of Molecular Nanomagnets

In this project I aimed to synthesise Ligands, Iron three triangles and mainly Manganese six complexes. The Manganese polynuclear complexes can show molecular magnetic hysteresis – they act as nanomagnets under certain temperatures. These nanomagnets can then be used as a solution to the superparamagnetic limit problem, allowing computers to function at up to 1000 times faster. The nanomagnets were composed of 1st line transition metals linked into polymetallic arrangements which are linked by organic ligands.

Rachel Law, Alva Academy, Clackmannanshire
University of Stirling, Institute of Aquaculture
Dr Andy Shin, Dr David Little, Mayra Grano Maldonado

Analysis of the Behaviour of the Ectoparasitic Monogenean *Gyrodactylus gasterostei* Infecting 3-Spine Sticklebacks, *Gasterosteus aculeatus*.

This study establishes the transmission strategies employed by detached parasites in the colonisation of new hosts. This study employed the examination of infected hosts using scanning electron microscopy (SEM) and the live observation of the infection process in response to a range of stimuli (shadows, vibration, varying light conditions, infected carcasses). Observations suggest that parasite activity increases in response to host shadow and vibration as a host approaches. Once in close proximity, the parasite then either rapidly extends its body to attach to the ventral surface of a potential host or allows itself to be ingested. A time series following infection suggests that once eaten, the parasite attaches to the inside of the buccal cavity or pharynx and then crawls out onto the skin surface via the gills.

***Ailsa Leen**, The Mary Erskine School, Edinburgh
University of Edinburgh, School of Chemistry
Professor Eleanor Campbell, Dr Andrei Gromov, Dr Oleg Nerushev

Scanning Probe Microscopy Analysis of Single Walled Carbon Nanotubes

Carbon nanotubes are hollow cylinders of pure carbon that are only 1 nanometre in diameter (ca. 1/50000 of the width of a human hair) but can be up to 1cm in length. Carbon nanotubes have many useful properties: they are very lightweight but exceptionally strong and they can be used to make tiny nanoscale electrical devices. It can sometimes be difficult to break-up bundles of nanotubes to obtain individual carbon cylinders. One of the most common techniques is to wrap the nanotubes with organic ("surfactant") molecules to prevent them bundling together. This project looked at the optimum conditions for obtaining individual nanotubes. Individual nanotubes were distinguished from bundles by depositing the material on a flat surface and measuring the height of the deposited structures with an atomic force microscope. The dependence of the relative amount of individual nanotubes compared to bundles on surfactant concentration and type of surfactant molecule was studied.

PROJECTS

Katrin Little, Balfour High School, Stirling
University of Stirling, Institute of Aquaculture
Professor Gordon Bell

An Investigation into the Fatty Acid Composition of a Selection of Commonly Available Foodstuffs

The aim of this project was to investigate the fatty acid composition (with emphasis on n-3 [(Omega 3) polyunsaturated (PUFA) and highly unsaturated fatty acids (HUFA)] of a selection of commonly available foodstuffs. 19 Different products were investigated in total. Lipid was extracted from each food sample, activated by transmethylation and finally quantified by gas liquid chromatography. The results obtained showed that the Scottish Organic Butter contained the most total lipid, and that the "Omega 3 Plus" Margarine contained the highest levels of both Omega 3 and Omega 6 EFAs. The Vietnamese River Cobbler was found to contain the lowest levels of both total lipid and Omega 3. The Tinned Sardines in Brine contained the least Omega 6. Additionally, the results show that the oily fish samples gave the overall "healthiest" n-3/n-6 ratio and that the hens eggs gave the "least healthy" n-3/n-6 ratios.

***Debbie Liu**, Whitburn Academy, West Lothian
Schering-Plough Corporation, Lanarkshire
Grant Wishart

Analysis of Physico-chemical Properties Using Pipeline Pilot

The main aim of the project was to explore the relationship between different physico-chemical properties and solubility levels. A number of properties were chosen to be studied and a dataset of compounds and solubility levels was prepared by the Physchem and CMC groups. To relate the properties and solubility, a number of different graphs were produced - they were viewed and conclusions were drawn from them. A number of rules could subsequently be derived to guide chemists in their quest to avoid synthesising insoluble compounds.

Daniel Lynagh, Turnbull High School, East Dunbartonshire
University of Glasgow, Faculty of Medicine, Vascular Biochemistry
Professor Muriel Caslake, Dr Katia Uliaque, Dorothy Bedford

Rapid Detection of Apolipoprotein E Phenotype

Apolipoprotein E has three alleles coding for proteins E2, E3 and E4. These three alleles result in six phenotypes: E3/3, E4/3, E3/2, E4/4, E4/2 and E2/2. Each of these affects how the body removes cholesterol from the circulation in different ways. Specific E phenotypes have been associated with increased risk of coronary heart disease and Alzheimer's disease. There is also a relatively rare disorder - familial type III hyperlipoproteinaemia in which the individuals are likely to have E2/2 phenotype. The aim of this project was to see if it was possible to speed up the existing method of detection which at present takes 3 days.

PROJECTS

Klim MacKenzie, Bridge of Don Academy, Aberdeen
University of Aberdeen, College of Life Sciences & Medicine
Dr Andy Schofield, Lena Kastl

Methylation and Chemotherapy Drug Resistance in Breast Cancer Cells

The purpose of this project was to investigate whether DNA methylation is involved in the development of resistance to docetaxel (a chemotherapy drug) in breast cancer cells. DNA methylation controls gene expression – methylation switches off gene expression. Previous work has shown that various genes are switched off in cells that are resistant to docetaxel. We want to find out if DNA methylation is the mechanism that is responsible for this gene silencing. Various enzymes, known as DNA methyltransferases, carry out DNA methylation. This project used reverse transcription-polymerase chain reaction (RT-PCR) to investigate the expression of DNA methyltransferases in a laboratory model of docetaxel resistance in breast cancer cells.

Pamela Maher, Lenzie Academy, East Dunbartonshire
University of Glasgow, Faculty of Medicine, Vascular Biochemistry
Professor Muriel Caslake, Dr Katia Uliaque, Grace Stewart

Comparison of Lipid and Lipoprotein Analysis in Fresh and Frozen Samples

Lipoproteins transport fat around the human body and can be separated using ultracentrifugation into subfractions according to flotation in salt solutions of differing densities. The preference is to isolate and analyse lipoprotein subfractions from fresh plasma within a short time frame. However this is not always practical. The aim of this project is to see if frozen samples may be used. Lipoprotein subfractions were isolated by ultracentrifugation using frozen plasma samples that have been previously analysed for lipid composition. Composition analyses were also undertaken in subfractions that had been stored at -80°C. The results were compared to the original data from fresh samples.

Luke Marris, St Margaret's Academy, West Lothian
Heriot-Watt University, Electrical, Electronic & Computer Engineering Division
Dr Neil Robertson, Patrick Harding

Visual Saliency in Computer Vision

The aim of the project was to identify what is salient within an image from a human perspective and find out whether state-of-the-art techniques in computer vision for image landmark detection operate on a model of saliency. A number of computer-based experiments were designed to test the saliency of objects in low resolution images. These included the following scenarios: number plate recognition, person identification and threat detection. Zoom was used to gradually alter the resolution of the object within the image. Volunteers were asked questions about each dataset of images to test the saliency of the objects within the images. The same images were processed by the Scale-invariant Feature Transform (SIFT) computer algorithm which identifies feature points i.e. landmarks within an image which are mathematically distinctive. The results from the two tests were then compared. We concluded that the computer algorithm is not clearly detecting only the points the human interprets as visually salient, but detects more points with increasing resolution, as expected.

PROJECTS

Lee Marshall, Alford Academy, Aberdeenshire
The Robert Gordon University, School of Computing
Dr John McCall, Dr Andrei Petrovski, Nicolas Dologieviez

Development of Artificially Intelligent Tank Battle Players using Neural Networks and Particle Swarm Optimisation

The aim of the project was to produce skilful artificial Tank Battle players controlled by neural networks. A 2-dimensional game platform was developed in Java allowing human and artificial players to conduct tank battles. Artificial players were developed by training neural networks in conflict with scripted agents. A range of different neural network architectures was investigated. Particle Swarm Optimisation was used to determine optimal neural network weights. The project was successful in developing AI tanks that could defeat the scripted opponent with a combination of attacking and defensive manoeuvres. The best AI tanks produced are competitive with human players.

Stella McCall, Carnoustie High School, Angus
University of Dundee, Electronic Engineering and Physics Division
Dr David McGloin, Daniel Burnham

Optical Trapping of Aerosols Using Novel Light Beams

Optical tweezers are a tool in which microscopic particles can be trapped using a tightly focused laser beam. One of the newest applications is to trap aerosol particles. This allows the study of individual particles and their properties and how they evolve in time. This is important in understanding the atmospheric chemistry of such particles. In this project the aim was to study how well different types of laser beams were able to trap aerosols. It's primary aim was to compare how normal laser beams, called Gaussian beams, compare with laser beams with a hole in the middle, called Laguerre-Gaussian beams. We found that the Laguerre-Gaussian beams were able to trap more effectively than the Gaussian beams. This should allow more robust studies of aerosols to be carried out in future.

***Jacqueline McKay**, Chryston High School, North Lanarkshire
Schering-Plough Corporation, Lanarkshire
Dr Alison Porter

Due to confidential aspects of this project, neither an abstract nor a poster of Jacqueline's work can be published.

PROJECTS

Lindsey McVey, Turnbull High School, East Dunbartonshire
University of Glasgow, BHF Glasgow Cardiovascular Research Centre
James McCulloch, Dr William Miller

Measurement of Superoxide by ESR in Kidney Tissue in Hypertension

Increasing evidence links the generation of reactive oxygen species (ROS) with a number of diseases, including cardiovascular diseases such as hypertension. Accurate measurement of ROS, such as the superoxide anion, has traditionally been problematic. In this study we assessed the use of the current gold-standard method for ROS detection, electroparamagnetic spin resonance spectroscopy (ESR) in evaluating ROS generation in samples of kidney tissue from a model of hypertension. We found that superoxide generation was higher in kidneys from hypertensive rats than those from control rats. This study shows that ESR is a convenient and robust method for ROS detection in tissues. Furthermore, by applying this method to kidneys from congenic hypertensive rat strains we were able to associate ROS generation with specific genetic regions on rat chromosome 2.

Erin Middleton, The High School of Dundee
SELEX GALILEO, Edinburgh
Dr Kenneth Irwin, Dr Allan Colquhoun, Dr Anthony Glover

Test, the Discipline, Why Do It, What Do You Need and How Is It Done in Relation to AESA Radar?

Test is an incredibly important function within the lifecycle of any product. For complex systems, simulation and modelling may be insufficient to verify system performance and build procedure maturity alone may not guarantee product functionality. Adequate testing is, then, the only way to verify system functionality and performance prior to customer delivery. Test can be an expensive and time consuming process directly affecting product cost and delivery timescales; thus, it is very important to have a test strategy, whereby costs and test times are minimised whilst still providing an adequate level of confidence that the product performs to its design criteria. The test tools employed may range from simple commercial instrumentation to complex special to type designs. The test process for an AESA radar was studied, and in particular an innovation in test engineering was examined in relation to the design, build and operation process. The benefits this new solution provided, in comparison to previous methodologies, was examined and an understanding of the difficulties test development faces in an aggressive production environment achieved.

PROJECTS

Laura Mills, Douglas Academy, East Dunbartonshire
University of Glasgow, Department of Chemistry
Dr Daniel Price

Synthesis and Magnetism of New Nickel Ammonia Oxalates

Previous studies have discovered several new compounds with the general composition $Ni_w(NH_3)_x(ox)_y(H_2O)_z$ (where $ox = C_2O_4^{2-}$), that can be formed from aqueous solutions of nickel chloride, potassium oxalate and ammonia. Some of these compounds have interesting structural features and potentially interesting magnetic properties. The project focuses on the exploration of the synthetic conditions required to make some of these materials, and in producing suitable samples for magnetic characterisation. In particular the 1-D antiferromagnetically coupled chain compound $\beta-Ni(NH_3)_2(ox)_2(H_2O)_2$ has been studied in most detail. The synthesis has been optimised to produce long blue needle-like crystals and samples produced with ultra-high purity Ni revealed a low-temperature ferrimagnetic ordering which has not been seen previously where the Ni purity was limited to 99%. Diamagnetic doping of Ni for Mg produced samples with a range of compositions; $\beta-Ni_{1-x}Mg_x(NH_3)_2(ox)_2(H_2O)_2$. This will allow a more detailed study of the magnetic and thermodynamic behaviour of this compound.

Lucy Milne, Alva Academy, Clackmannanshire
University of Stirling, School of Biological & Environmental Sciences
Dr Luc Bussiere, Dr Matthew Tinsley

The Developmental Consequences of Plasticity in the Feeding Behaviour of *Drosophila melanogaster*

Adaptive plasticity is the ability of a single genotype to produce different optimal phenotypes depending on the environment. We studied plasticity in the feeding behaviour and mouth hook morphology of larval *Drosophila melanogaster* by experimentally manipulating the nutritional quality and texture of the larval food medium. We found that larvae reared on lower quality food increased their feeding rates, but that this did not affect larval mouth hook size, development time, or adult body size. The increase in feeding rates appeared to be adaptive, because within the low food quality treatment only, larvae feeding at high rates achieved the largest size. Whether increased feeding rates trade-off with other aspects of fitness will be the subject of future research.

PROJECTS

Thomas Moens, Portobello High School, Edinburgh
Advanced Pest Solutions Ltd., University of Edinburgh
Dr Alison Blackwell, Dr Kiri Stanley, Melanie Sullivan, David Falconer

Optimisation of Insect Traps for the Management of Potential Vectors of Bluetongue Virus in Scotland

Bluetongue virus is an economically important disease of ruminants, including sheep and cattle. It is transmitted between animals by biting midges and is currently threatening much of England and Wales. Consequently, bluetongue incursion into Scotland, which has a substantial livestock industry, in addition to large numbers of midges, is a significant reality. There are no effective means of midge removal from their natural habitat; widespread application of insecticides is environmentally unacceptable (and often ineffective) and the identification of breeding sites (to specifically destroy juvenile stages) still remains a mystery for many species. Some progress has been made with trapping systems but to date, these have only been verified with species of midges that attack humans, not animals. This project has investigated a range of attractants aimed at optimising current midge traps for potential midge vectors of bluetongue virus. A field-based study has been backed up by morphological and molecular analysis of insect species.

Emma Moore, Oldmachar Academy, Aberdeen
Fisheries Research Services, Marine Laboratory, Aberdeen
Dr John Dunn, Dr Kathryn Cook

Moulting Enzymes in Marine Crustacean Plankton: Can They Be Used to Measure Growth?

Copepods release an enzyme called chitobiase, prior to shedding their exoskeleton. This enzyme breaks down the chitin in the exoskeleton and previous studies show that measuring the concentration of chitobiase in the water can determine the size of the population of copepods. The theory is that the larger the increase in copepod weight during the moult, the more chitobiase is released. This method could also be used to calculate an estimate of other crustaceans' production, such as crabs or shrimps. Copepods of different stages were put in separate containers and their chitobiase release was measured in relation to the increase in weight during the moult. We did find that the chitobiase activity increased as the copepods got older, but we also found there were different relationships between chitobiase activity and the increase in dry weight for all the species involved.

PROJECTS

Charles Moore, Balerno Community High School, Edinburgh
Moredun Research Institution, Division of Virology, Midlothian
Dr Colin Bayne

Molecular Typing of Isolates of *Pasteurella multocida*

The bacteria *Pasteurella multocida* is a major cause of animal infection in a wide range of host species, and is among the most common bacteria involved in animal-human infections. The wide range of hosts susceptible to *P. multocida* and the potential severity of disease make it a major economic factor in the care of livestock, most noticeably fowl, cattle and sheep. Infection with *P. multocida* is often fatal in such animals, and in non-fatal cases there is still noticeable economic loss due to the spoiling of produce and decreased growth and reproduction. Despite the extreme economic consequences of *P. multocida* infection, little is known about the basis of its virulence or how it is so threatening to such a wide variety of species and immune systems. This project is concerned with differentiating between the five serotypes of *P. multocida*, defined by capsule type, namely A, B, D, E and F. The initial aim of this investigation was to firstly confirm infection of *P. multocida* in the samples provided, and then identify the serotype present in the sample by means of PCR techniques and related methods of molecular typing.

John Morrison, Stromness Academy, Orkney
Heriot-Watt University, International Centre for Island Technology, Orkney
Professor Jon Side, Emmanuel Osalusi

Analysis of ADCP Data with a View to Tidal Prediction

Tidal height information is useful in many fields of coastal life; recreational, fishing and commercial vessels rely on tidal height information every day to prevent delays and to plan their movements. Such knowledge is also of vital importance to those involved in the planning of tidal energy projects. This study used data on water elevation from Acoustic Doppler Current Profiler (ADCP) measurements, recorded between 12th March - 13th April 2007, at the European Marine Energy Centre's Fall of Warness tidal test site in Orkney. Harmonic analysis using the method of least squares and iterative use of Fourier analysis on the residuals has enabled a prediction of tidal heights up until 2017. These predictions compare favourably well with commercially available software and the 2008 tide tables for Orkney.

Tyler Morrison, St Margaret's Academy, West Lothian
Royal Zoological Society of Scotland, Edinburgh Zoo
Sarah Robinson, Dr Rob Thomas

Chimpanzees' (*Pan troglodytes*) Interactions with Plants in Captivity

A group of 11 chimpanzees were watched at Edinburgh Zoo for 10 days. Over this time any and all interactions between the chimps and plants of the enclosure was recorded. The average time spent interacting with plants per day was calculated and the most popular plant and behaviour were discovered. The chimpanzees seemed to like willow very much with eating being a very common occurrence and across all plant species. It was also discovered that, in general, the younger the animal, the more variety there was in the interactions conducted on plants.

PROJECTS

Olivia Moss, Linlithgow Academy, West Lothian
Royal Botanic Gardens, University of Edinburgh
Dr Catherine Kidner, Keith Gardner

Investigation of the Genetics of Begonia Plebeja and Begonia Conchifolia

Begonia is a large genera with over 1500 species. The different species are easily hybridised meaning a progeny can be easily created for research. Plebeja and Conchifolia were chosen for this study as they come from very different habitats. Plebeja comes from a dry forests where as Conchifolia comes from a wet rain forests. The cross studied (Mapping Population, ARB302) was between Begonia Plebeja and Begonia Conchifolia and then back crossed to Conchifolia. Many other crosses were carried out but this cross was chosen to study as it produced the most offspring. During the investigation, PCR reactions were carried out to find out which of the Mapping Population contained a certain gene. The PCR products were cleaned-up and an enzyme was used to cut the gene to see which of the plants contained the same allele of the gene. The entire group was phenotyped to see if there was a connection between the gene found in PCR and a characteristic expressed. Analysis of all the collected data was used to find out whether genes are controlled by a single locus.

Andrew Nash, Lomond School, Argyll & Bute
Scottish Association for Marine Science, Dunstaffnage Marine Laboratory, Argyll & Bute
Dr Ben Wilson, Dr Anuschka Miller

The Mysterious SNAP

The ocean is not a quiet place, and unexplained noises continue to puzzle scientists. This project investigated the source of a mysterious snapping noise commonly picked up in the waters around Oban. Using a hydrophone we identified that the noise is mainly coming from shallow gravel beds. We also identified an intriguing and previously unrecorded pattern demonstrating a relationship between snap rates and the time of day rather than the tide. But the exact source of the noise remains elusive for now.

PROJECTS

Iain Nicol, Anderson High School, Shetland
Royal Society for the Protection of Birds (RSPB), Shetland
Helen Moncrieff, Juan Brown

Establishing a Response-rate to Tape Playback for Application to European Storm Petrel Census *Hydrobates pelagicus**

European storm petrels *Hydrobates pelagicus* are notoriously difficult to census because they nest in hidden crevices and only return to the colony at night. The method of tape playback has been developed, which involves the playing of a recording of a 'singing' storm petrel to a prospective nest site and listening for a reply. A certain proportion of incubating petrels will reply to recordings of their own species when played at the nest site entrance during the day. This proportion needs to be quantified in order to provide a 'correction factor' by which to multiply the total number of responses elicited in any survey. Recordings were played to 44 previously-used and checkable nest sites along sections of dry-stone wall on Mousa on eight days between 21 and 31 July (a period when most birds are thought to be on eggs). The distance between tape player and nest site was systematically varied up to 50cm to test if this has any effect on response-rate and to replicate the method used for the island census (which involved playing a tape every metre). The cumulative number of responses were plotted, and an asymptote established as an estimate of the total number occupied sites. The capture-mark-recapture technique was also used to give an estimate of the total number of occupied sites. Sites were physically checked for occupancy on 28 July, and this figure was compared with the numbers estimated by the previous two methods. A response-rate was established by dividing the mean number of responses per visit by the total number of occupied sites. Factors affecting response-rate were discussed, and comparisons with previous studies and recommendations for the future were made.

Akosua Osafo, Lenzie Academy, East Dunbartonshire
University of Strathclyde, Institute of Pharmacy & Biomedical Sciences
Professor Ravi Kumar, Jagdishbhai Italia

A Process to make Biodegradable Nanoparticles Containing Two Different Molecules of Distinct Physicochemical Properties

Amphotericin B (AMB) is the most effective drug against various systemic fungal infections and leishmaniasis; however, it suffers from low oral bioavailability (0.3% absolute bioavailability). Therefore, AMB is available as intravenous preparation and exhibits severe adverse effects such as hemolysis and nephrotoxicity demanding novel formulations. Visceral leishmaniasis is associated with the enhanced lipid peroxidation and antioxidants have been reported to impart the synergistic antileishmanial activity. Therefore, the present study is an attempt to develop oral co-encapsulated nanoparticulate formulation containing AMB and antioxidant CoQ10 for oral administration. The co-encapsulated nanoparticulate formulation was prepared by nanoprecipitation method using PLGA as matrix material and Vit. E-TPGS as stabilizer employing dimethylformamide and ethyl acetate as cosolvents to solubilize AMB and CoQ10, respectively. This method led to the formation of monodispersed particles of ~160 nm size with over 30% entrapment efficiency at 5 % w/w of initial loading of both AMB and CoQ10.

PROJECTS

***Ambar Pankaj**, Boroughmuir High School, Edinburgh
University of Edinburgh, School of Chemistry
Dr Dominic Campopiano, Scott Baxter

An investigation on the Multi-subunit Enzyme Acetyl-CoA Carboxylase (ACC) from *Escherichia coli*

The project involved an investigation on the multi-subunit enzyme Acetyl-CoA Carboxylase (ACC) from *Escherichia coli*. This enzyme carries out the essential first step in fatty acid biosynthesis in all organisms and is an attractive target for antibiotic drug discovery in bacterial pathogens. The aim was to isolate two subunits - BCCP (Biotin Carboxyl Carrier Protein) and BC (Biotin Carboxylase) from this three subunit complex. Initial work focused on purifying these subunits separately and involved the manipulation of plasmids expressing the encoding genes. Although we were able to express these proteins, we were unable to manipulate them in such a way to fit our needs (the removal of an *N*-terminal His-tag on the BCCP protein). Work then turned to expressing the BCCP:BC complex from a single plasmid as well as investigating the cloning of an *N*-terminally-tagged BC that could be expressed as a complex with untagged BCCP allowing for a simple single step purification.

Mark Patterson, Beeslack Community High School, Midlothian
Heriot-Watt University, Electrical, Electronic & Computer Engineering Division
Professor Marc Desmulliez, Dr David Flynn

Characterisation of the Thermal Behaviour of an Inductor

An inductor is a circuit element that consists of an electrically conductive wire commonly in the form of a coil. Coil-wound inductors usually possess a magnetic core around which the wires are wound; the type of core and winding geometry categorise them. The basic operating principles of inductors are as follows: a current passing through a coil of wire will produce a magnetic field whose variation induces an electromotive force (emf) that opposes the field producing current. This project included a review of inductance and its applications and the experimental characterisation of components under varying conditions. More specifically, characterisation of the inductor under thermal load was studied.

Katrina Pratt, Alva Academy, Clackmannanshire
University of Stirling, School of Biological & Environmental Sciences
Dr Luc Bussiere, Dr Matthew Tinsley, Dr Tim Whalley

Are Longer Sperm More Susceptible to Stress Because They Are Older?

Previous work has demonstrated that in yellow dung flies, *Scathophaga stercoraria*, longer sperm are more susceptible to both thermal stress and damage within the female reproductive tract. This has led to the hypothesis that female immunity plays a role in adaptive spermicide against long-tailed sperm. An alternative explanation is that sperm vary in length depending on their age within testes. We dissected sperm from two regions of the testes of wild males to determine whether they differed in length and stress resistance. Our results confirmed that sperm nearest the ejaculatory duct were longer, suggesting that sperm lengthen as they age. This casts doubt on the adaptive spermicide hypothesis. Further work is needed to establish the relationships between sperm viability, position within the testis, length and age.

PROJECTS

Claire Rafferty, Dumfries Academy
Scottish Agricultural College, Dairy Research Centre, Dumfries
Jennifer Bell, Dr David Roberts

An Investigation of Dairy Calf Behaviour

This behaviour study examined the use that young calves made of a grooming brush, when it was introduced to their environment. Observations of two groups of weaned calves (around 10 weeks of age) were made daily for three weeks. The first week was the control week, when neither group was offered the brush. In week two the brush was with one group of calves and in week three it was with the other group. As well as grooming behaviour, observations were made of activities such as eating, drinking, sleeping, standing and playing. The results showed that, when the brush was in the group of calves, they used it in addition to other grooming behaviour such as licking, and not as a substitute for this. The highest level of interest in the brush was when it was first introduced to the group; this reduced to a lower, but stable, level of use. As brushes like this are usually only offered to adult animals, it demonstrated that even young cattle will use a grooming aid.

Evelyn Robertson, Perth Grammar School, Perth & Kinross
University of Abertay, Dundee, School of Contemporary Sciences
Professor David Bremner

The Production and Decomposition of Hydrogen Peroxide

A method for the determination of hydrogen peroxide in aqueous solutions was developed. This assay was then used to investigate the decomposition of hydrogen peroxide using activated carbon cloth. Furthermore, the generation of hydrogen peroxide using 20 kHz ultrasound from aqueous solutions containing a number of additives was studied. Activated carbon cloth was found to produce hydroxyl radicals through the decomposition of hydrogen peroxide. It was also proven that hydrogen peroxide is produced from water under ultrasound, although in relatively small concentrations.

Holly Scott-Fenwick, Lenzie Academy, East Dunbartonshire
University of Glasgow, Faculty of Veterinary Medicine
Professor Michael Stear

Gene Sequencing for Nematode Resistance in Blackface Sheep

Efficient and welfare-friendly farming requires the control of nematodes. Currently sheep are treated with anthelmintic drugs to control nematodes but nematodes are evolving resistance to the drugs used to treat them. Some farmers are now breeding sheep for resistance to nematodes. Selective breeding would be easier if some of the genes responsible for resistance could be identified. One candidate gene is the DQB2 locus in the class II region of the major histocompatibility complex on chromosome 20. Variation in this gene among sheep of the Blackface breed was studied. The DNA from the second exon of the DQB2 gene was amplified by the polymerase chain reaction, purified and sequenced. 10 alleles were identified; 7 had been previously defined in Blackface, 2 had previously been defined, but only in Merino sheep and one allele had not been seen before. Several additional sequences appeared novel but have still to be confirmed.

PROJECTS

Filip Sianos, Lenzie Academy, East Dunbartonshire
University of Glasgow, Wellcome Centre for Molecular Parasitology
Dr Tansy Hammarton, Sophie May

Production of Recombinant Protein for Putative Kinase (TbSLK1)

African Trypanosomiasis, or sleeping sickness, is a fatal disease. It's caused by *Trypanosoma Brucei*, African eukaryotic parasites. The disease is very hard to defend against, as the parasites have a complex protein coat covering the cell, which regularly mutates changing the cells' antigenic markers. Medication available is effective against the parasites, but can be deadly to humans. The DNA of the parasite has been decoded, and research has been organised to find proteins essential for the parasite's survival which could be potential drug targets, harmless to humans.

Ravneet Sidhu, The Glasgow Academy
Glasgow Caledonian University, Department of Biological Sciences
Dr Alistair Sutherland

Preparation of a Quality Control Panel of *Clostridium difficile* Strains for Molecular Diagnostics

Infection by the spore forming bacterium *Clostridium difficile* can be rapidly diagnosed by detecting specific DNA sequences in patient's faeces using several published PCR methods. This is faster than traditional culture of the bacterium (which is a strict anaerobe) and is becoming popular in diagnostic labs. As such, it is important to ensure that labs across the world are using comparative methodology that can sensitively and specifically detect DNA in samples. A quality control programme for molecular diagnostics is therefore proposed. In this study the optimum growth times were examined for several strains of *C. difficile* in order to determine how best to obtain high counts of bacteria while keeping sporulation low. The cultures were then examined to determine if they could be killed either by heating or by exposure to air for the purpose of sending safe, inactivated samples to labs around the world. At the same time the inactivation method must not damage the bacterial DNA to be tested by the labs. The inactivation steps were therefore compared by PCR to determine which could allow quality DNA to be retained. Additionally, sodium taurocholate treatment was examined as a means to induce spore germination and thus allow spores to be inactivated as well as vegetative cells.

PROJECTS

***James Sinclair**, Anderson High School, Shetland
North Atlantic Fisheries College, Shetland
Gregg Arthur, Kenneth Gifford

Age-Length Relationship of Shetland Ballan Wrasse (*Labrus bergylta*) and Ultrasonography as a Non-invasive Tool for Sex Determination

There is a re-kindled interest in the aquaculture industry to control ectoparasite burdens on farmed Atlantic salmon using wrasse as cleaner fish. There is an insufficient stock of wild Ballan Wrasse around the Shetland Islands to supply this pursuit so the NAFC Marine Centre is starting a Ballan Wrasse breeding program. Ballan Wrasse are protogynous hermaphrodites, where they change gender from female to male. The trigger(s) for sex-inversion are not understood, but it would appear that the frequency of males increased in fish that are in their late-teens. The current project examined the age-length frequency of a Shetland stock of Ballan Wrasse and tested Ultrasonography as a tool to determine gender.

***Robert Smith**, Anderson High School, Shetland
Royal Society for the Protection of Birds (RSPB), Shetland
Helen Moncrieff, Juan Brown

Estimating the Number of European Storm Petrels *Hydrobates pelagicus* Breeding on Mousa

European storm petrels nest on Mousa in internationally important numbers. It is important to monitor trends in their population, which is itself a barometer of the wider marine environment. In July 2008 an estimate of the total island population was attempted by diurnal tape playback, repeating a survey carried out in 1996 (and repeated in 2004). The limitations of tape playback as a technique for censusing storm petrels are considered and comparisons with previous studies made.

Graeme Sneddon, Hutchesons' Grammar School, Glasgow
University of Glasgow, Wellcome Centre for Molecular Parasitology
Professor Sylke Müller, Dr Janet Storm

Genetic Engineering of the Phosphoenolpyruvate Carboxylase Gene and its Importance in New Anti-Malarial Drug Development

Malaria is one of the most devastating tropical diseases and kills about 1 million people every year. It is caused by *Plasmodium*, a protozoan, intracellular parasite that is transmitted by the female *Anopheles* mosquito. Current treatment is not always effective and therefore, it is imperative to identify new potential drug targets and assess their importance for parasite survival, so that new strategies for the improvement of malaria treatment can be developed. The enzyme phosphoenolpyruvate carboxylase (PEPC) is involved in carbon dioxide fixation, an unusual function that is absent from the human host, and appears to be essential for *Plasmodium* survival. These features are ideal pre-requisites for a potential drug target. The 5' and 3' flanking regions of the *PEPC* gene were amplified by polymerase chain reaction (PCR), their size analysed by agarose gel electrophoreses and subsequently subcloned into a PCR-cloning plasmid. Further, the catalytic domain of the *PEPC* gene was amplified by PCR and subcloned into a plasmid that allows recombinant expression of *Plasmodium* PEPC in *Escherichia coli*, so that it can be utilised for biochemical studies. The construction of these plasmids will permit to study an important enzyme in the metabolism of *Plasmodium* and could lead to parasite-specific drug design.

PROJECTS

Alia Sohail, Balfour High School, Stirling
University of Strathclyde, Department of Pure & Applied Chemistry
Professor Pete Skabara, Greg McEntee, John Forgie

General Methods of Characterisation, Purification and Electropolymerisation

Organic semiconductors represent a class of material that will revolutionise the electronics industry. The flexibility of these plastic substrates means that future devices such as solar cells and television screens will be paper thin and can be rolled up or folded away without physical degradation. The production of these devices involves a series of multidisciplinary tasks, but this project has focused on the chemistry side of the work. A high degree of purity is essential for the components to work predictably and function over a long lifetime. Crystallisation is a cheap and efficient process of purification and some simple organic compounds have been purified with this technique. Polymers have been grown by electrochemical oxidation on indium doped tin oxide glass. Characterisation has been performed by cyclic voltammetry, an electrochemical method to determine the redox states of materials.

Eleanor Wigham, Linlithgow Academy, West Lothian
Royal Zoological Society of Scotland, Edinburgh Zoo
Sarah Robinson, Dr Rob Thomas

Olfactory Enrichment and Fur Rubbing in Brown Capuchins

Brown capuchins rub certain plant material into their fur, the exact reason to why they do this is unknown, although it is widely agreed that it has a medicinal function. Fur rubbing is a natural behaviour which can be stimulated in captivity by placing certain foods in their enclosure. Providing items to stimulate natural behaviours in captive animals is called enrichment. We investigated whether smell alone would cause fur rubbing behaviour, by providing captive brown capuchins with an artificial substitute for a food item. We then recorded if this artificial substitute would stimulate a fur rubbing response such as that of the real food item. We supplied groups consisting of either 5 or 7 individual monkeys with real food items - leek, garlic, lime or orange and recorded their behaviour using the observer computer program. The program recorded what behaviours occurred, when and in some cases the duration of the behaviour. The same was then carried out but the food item was replaced by filter paper which had been rubbed with one of the four food items. The results were then compared. It was found that there was a decrease in the occurrence of all behaviours when using the filter paper; the only exception was the occurrence of smelling which increased in both groups and brief contact behaviour which increased in one of the groups. The collated time spent fur rubbing by the monkeys was a lot less when the filter paper was given compared to that when the real food item was given. Garlic stimulated the most fur rubbing, while oranges caused the least fur rubbing. It was found that scent does play a part into why capuchins fur rub, but there are other factors which determine whether or not a food item will be used for fur rubbing.

PROJECTS

***Victoria Wilson**, Douglas Academy, East Dunbartonshire
University of Glasgow, Faculty of Veterinary Medicine
Professor Michael Stear

Analysis of the *dqb2* Gene in a Population of Texel Sheep

The class II region of the major histocompatibility complex plays an important role in determining the specificity of the immune response. In particular it helps determine whether sheep are able to respond effectively to nematode infection. As nematodes are among the most important diseases of livestock, understanding the genetic structure of this region may help in the control of nematode infections. I studied the *DQB2* locus, one of the most important genes within the class II region. Five of the identified alleles corresponded to previously recognized genes but two alleles were novel. One of the novel genes was found in 14 Texel sheep while the other was present in one Texel and four Blackface sheep. There were major differences in gene frequency between Texel and Blackface sheep. Some alleles were common in both breeds, some were common only in Texels, while some were common only in Blackface sheep.

Haixi Yan, The Glasgow Academy
University of Glasgow, Institute of Biomedical & Life Sciences
Professor Marshall Stark, Dr Femi Olorunniji, Arlene MacPherson

A New Method for Analysis of Protein Binding to DNA

Complexes of proteins bound to DNA are often detected as bands on gels after electrophoresis. The DNA is usually made radioactive, so the bands can be detected easily (for example, with photographic film). However, use of radioactivity is costly and hazardous, and the 'labelled' DNA molecules have a short useful life as the ³²P isotope used decays within a few days. The project is to investigate the use of DNA molecules with an attached fluorescent group as an alternative to radioactivity. Fluorescent bands on gels can be detected by a 'fluorimager' instrument available in this lab. We aimed to assess whether the fluorescently modified DNA molecules form well-defined complexes with a DNA-binding protein called Tn3 resolvase, and determined the range of DNA concentrations at which this detection method is useful.

ASSOCIATED SCHOOLS AND STUDENTS

Aberdeen	Bridge of Don Academy	Klim MacKenzie
	Hazlehead Academy	Hannah Cheyne
	Oldmachar Academy	Emma Moore
Aberdeenshire	Alford Academy	Lee Marshall
	Mackie Academy	James Cusiter
Angus	Carnoustie High School	Katherine Farquhar Stella McCall
Argyll & Bute	Lomond School	Andrew Nash
Clackmannanshire	Alva Academy	Rachel Law Lucy Milne Katrina Pratt
	Dollar Academy	William Bowers
Dumfries & Galloway	Dumfries Academy	Claire Rafferty
Dundee	Grove Academy	Jennifer Ferguson Cathleen Holligan
	Harris Academy	Thomas Davidson
	The High School of Dundee	Sabraj Gill Erin Middleton
East Ayrshire	Grange Academy	Maire Gorman
East Dunbartonshire	Douglas Academy	Jennifer Green Laura Mills Victoria Wilson
	Lenzie Academy	Pamela Maher Akosua Osafo Holly Scott-Fenwick Filip Sianos
	Turnbull High School	Daniel Lynagh Lindsey McVey
Edinburgh	Balerno Community High School	Charles Moore
	Boroughmuir High School	Rebecca Chapman Katie Fullerton Anjali Gangadharan Cassandra Hill Ambar Pankaj

ASSOCIATED SCHOOLS AND STUDENTS

Edinburgh	Fettes College	Eugenia Ho
	Portobello High School	Andrew Barrie Thomas Moens
	The Mary Erskine School	Ailsa Leen
Fife	Kirkcaldy High School	Qasim Latif
	Lochgelly High School	Gwendolyn Andoh-Kesson
Glasgow	Hutchesons' Grammar School	Graeme Sneddon
	Hyndland Secondary School	Matthew Citron
	St Mungo's Academy	Kevin Airens Michael Bommer Julie Fitzpatrick
	The Glasgow Academy	Cosmo Grant Ravneet Sidhu Haixi Yan
Midlothian	Beeslack Community High School	Louise Bradshaw Steven Fullerton Josephine Holbrook Mark Patterson
North Lanarkshire	Cardinal Newman High School	Declan Bryans
	Chryston High School	Jacqueline McKay
	St Ambrose High School	David Curran
	St Margaret's High School	Lauren Connor
Orkney Islands	Stromness Academy	John Morrison
Perth & Kinross	Perth Grammar School	Evelyn Robertson
Renfrewshire	Linwood High School	Matthew Hooper
	Park Mains High School	Amanda Herron
Shetland Islands	Anderson High School	Ewan Ellis Iain Nicol James Sinclair Robert Smith
South Lanarkshire	Holy Cross High School	Mark Gribben

ASSOCIATED SCHOOLS AND STUDENTS

Stirling	Balfron High School	Rebekah Golding Katrin Little Alia Sohail
West Lothian	Linlithgow Academy	Olivia Moss Eleanor Wigham
	St Margaret's Academy	Luke Marris Tyler Morrison
	The James Young High School	Janie Baxter
	Whitburn Academy	Debbie Liu

HOST ORGANISATIONS & SUPERVISORS

Aberdeen	Fisheries Research Services, Marine Laboratory	Dr John Dunn Dr Kathryn Cook
	NovaBiotics Ltd	Dr Derry Mercer Dr Deborah O'Neill
	The Robert Gordon University, School of Computing	Dr John McCall Dr Andrei Petrovski Nicolas Dologieviez
	University of Aberdeen, College of Life Sciences & Medicine	Dr Andy Schofield Lena Kastl
Argyll & Bute	Scottish Association for Marine Science, Dunstaffnage Marine Laboratory	Dr Kim Last Dr Ben Wilson Dr Anuschka Miller
Dumfries & Galloway	Scottish Agricultural College, Dairy Research Centre	Jennifer Bell, Dr David Roberts
Dundee	CXR Biosciences Ltd	Dr Sarah Waugh Dr Eddie Doyle Joanne Quinney
	University of Abertay, Dundee	Professor David Bremner
	University of Dundee, Department of Civil Engineering	Dr Andrew Brennan Dr Jonathan Knappett
	University of Dundee, Electronic Engineering & Physics Division	Dr David McGloin Daniel Burnham
Edinburgh	Advanced Pest Solutions	Dr Alison Blackwell Dr Kiri Stanley Melanie Sullivan David Falconer
	Heriot-Watt University, Electrical, Electronic & Computer Engineering Division	Professor Marc Desmulliez Dr David Flynn Dr Neil Robertson Patrick Harding
	Heriot-Watt University, Chemistry Division	Professor Martin McCoustra John Thrower
	Napier University, Centre for Timber Engineering	Dr Dan Ridley-Ellis Dr John Moore Andrew Lyon
	Royal Botanic Gardens, University of Edinburgh	Dr Catherine Kidner Keith Gardner
	Royal Zoological Society of Scotland, Edinburgh Zoo	Sarah Robinson Dr Rob Thomas

HOST ORGANISATIONS & SUPERVISORS

Edinburgh	SELEX GALILEO	Dr Kenneth Irwin Dr Anthony Glover Dr Allan Colquhoun
	University of Edinburgh, Department of Respiratory & Inflammatory Pharmacology	Professor Adriano Rossi Dr Rodger Duffin Tara Sheldrake
	University of Edinburgh, Molecular Medicine Centre	Dr Cathy Abbott Dr Helen Newbery
	University of Edinburgh, School of Biological Sciences	Dr Paul McLaughlin Graham Dickson
	University of Edinburgh, School of Chemistry	Professor Eleanor Campbell Dr Euan Brechin Dr Dominic Campopiano Dr Andrei Gromov Dr Oleg Nerushev Scott Baxter
Fife	University of St Andrews, School of Biology	Professor Kevin Laland Dr Will Hoppitt Dr Rona Ramsay
Glasgow	Glasgow Caledonian University, Department of Biological Sciences	Dr Alistair Sutherland
	University of Glasgow, Department of Chemistry	Professor David Jackson Professor Chick Wilson Dr Andrew Parkin Dr Daniel Price Dr Lynne Thomas
	University of Glasgow, Department of Physics & Astronomy	Dr Ross Galloway Dr Morag Casey Dr Lyndsay Fletcher
	University of Glasgow, Faculty of Medicine, Vascular Biochemistry	Professor Muriel Caslake Dr Katia Uliaque Dorothy Bedford Grace Stewart
	University of Glasgow, Faculty of Veterinary Medicine	Professor Michael Stear
	University of Glasgow Wellcome Centre for Molecular Parasitology	Professor Jeremy Mottram Professor Sylke Müller Dr Tansy Hammarton Dr Richard McCulloch Dr Lucio Marcello Dr Janet Storm Dr Roderick Walker Sophie May
	University of Glasgow, BHF Glasgow Cardiovascular Research Centre	James McCulloch Dr William Miller

HOST ORGANISATIONS & SUPERVISORS

Glasgow	University of Glasgow, Institute of Biomedical & Life Sciences	Professor Marshall Stark Dr Femi Olorunniji Arlene MacPherson
	University of Strathclyde, Department of Mathematics	Professor Adam McBride
	University of Strathclyde, Department of Physics	Dr Carol Trager-Cowan
	University of Strathclyde, Department of Pure & Applied Chemistry	Professor Pete Skabara Greg McEntee John Forgie
	University of Strathclyde, Institute of Pharmacy & Biomedical Sciences	Professor Ravi Kumar Dr Val Ferro Martin Conlon Jagdishbhai Italia
Lanarkshire	Schering-Plough Corporation	Dr Chris Claxton Dr Alison Porter Ross Lennen Grant Wishart
Midlothian	Centre for Ecology & Hydrology	Dr Susan Owen
	Moredun Research Institution, Division of Virology	Dr Colin Bayne Dr David Griffiths Dr Thonur Leenadevi
	Roslin Institute, Department of Genomics & Genetics	Dr Megan Davey Lynn McTeir
Orkney	Heriot-Watt University, International Centre for Island Technology	Professor Jon Side Emmanuel Osalusi
Renfrewshire	University of the West of Scotland, Department of Biological Sciences	Dr Richard Thacker
Shetland	North Atlantic Fisheries College	Gregg Arthur Kenny Gifford
	Royal Society for the Protection of Birds (RSPB)	Helen Moncrieff Juan Brown
Stirling	University of Stirling, Institute of Aquaculture	Professor Gordon Bell Dr David Little Dr Andy Shin Mayra Grano Maldonado
	University of Stirling, School of Biological & Environmental Sciences	Dr Luc Bussiere Dr Matthew Tinsley Dr Tim Whalley

ACKNOWLEDGEMENTS

The success of the Nuffield School Bursary Scheme and the Celebration Event depends on many people and we would like to thank the following for their valued contribution:-

- Anthony Tomei of the Nuffield Foundation for taking time out from his very busy schedule to be with us today as our Guest of Honour and for presenting the students with their certificates of achievement;
- The Nuffield Foundation for providing the bursaries to enable students to carry out research projects and work alongside practising scientists, technologists, engineers or mathematicians;
- The wide variety of organisations throughout Scotland for allowing the bursary projects to take place;
- All supervisors and their colleagues who have given up their valuable time to supervise, encourage and support the students during their placements, in writing their reports and producing such wonderful posters on display at the Celebration Event today;
- The students who have chosen to share their hard work and research experiences with us today. We hope that they will continue their careers in the **S**cience, **T**echnology, **E**ngineering or **M**athematics disciplines;
- The Institute of Physics in Scotland and the Nuffield Foundation for their generous additional funding towards this year's celebration event;
- The Royal College of Physicians for allowing us to hold the Celebration Event in this lovely venue. Thanks must also go to the College staff for all their help and support;
- All TechFest-SetPoint staff who have greatly assisted in the running of this event.

THANK YOU

www.techfestsetpoint.org.uk
www.nuffieldfoundation.org/scb
www.iopscotland.org

PARTNERS

