Vacation Scholarships 2013

A generous donation from the Mann Foundation in 2012 and earmarked by the Foundation to support the Vacation Research Scholarships (*see* www.medicalresearchscotland.org.uk/bequests.htm#mann), enabled the Trustees to award 49 Undergraduate Vacation Scholarships to be held during summer 2013. The students, their research projects and supervisors of the 45 awards finally accepted are:

Ben Allsop (Neuroscience, Dundee University) supervised by Professor Michael Ashford for a project entitled:
The role of BACE1 in cardiovascular health and disease
Brain deposits of a peptide called Abeta are a characteristic hallmark of Alzheimer's disease (AD). BACE1 is the main enzyme responsible for Abeta production and thus AD development and is a current therapeutic target for AD. We have shown that inhibiting BACE1 reduces obesity and diabetes in mice by improving insulin and leptin actions. There is also a strong link between Cardiovascular disease (CVD) and AD risk. Indeed these diseases have etiology in common including oxidative and inflammatory stress and insulin and/or leptin resistance. Importantly, little is known regarding BACE1-Abeta impact on CVD. This project aims to determine whether BACE1 levels and activity correlate with CV function measures and if reduction in BACE1 activity can improve CV function in obese mice. If true BACE1 levels and/or activity could be a potential biomarker for CVD risk or target for new drug development.

Akvile Bartuskaite (Immunology & Pharmacology, Aberdeen University) supervised by Dr Heather Wallace for a project entitled: ***Polyamine conjugates: a new means of anticancer drug delivery***
One of the problems with current cancer therapy is that the drugs do not just affect the cancer cells they also kill normal cells and produce serious side effects. One of the goals of cancer research is therefore to develop agents that will be specific for the cancer cells only. This project will determine whether we can deliver drugs to cancer cells using a chemical tail which is recognised by cancer cells and kill the cancer cell while having little or no effect on normal cells.

Aimee Bias (Biomedical Engineering, Glasgow University) supervised by Dr Aleksandra Vuckovic, for a project entitled:
Motor imagery based Brain Computer interface for neurorehabilitation of the hand
High level spinal cord injury (tetraplegia) often results in a loss or impairment of hand and arm functions. Tetraplegic patients receive an extensive occupational therapy that often includes electrical stimulation of hand muscles. Electrical stimulator is activated in a predefined manner while patients passively observe its effect. It is believed that active engagement of patients would have a positive effect through engaging preserved motor pathways. Although patients cannot move their hands they can imagine movements. By measuring brain signals a Brain Computer Interface (BCI) can detect this imagined movement and use it as a control signal for an electrical stimulator of muscles. In this project the applicant will work with able-bodied people to develop BCI strategies to control the stimulator.

Vicky Brewis (Cell Biology, Durham University) supervised by Professor David Price at Edinburgh University, for a project entitled: ***Regulation of gene expression in developing cortex by the transcription factor Pax6***
Brain development depends on the actions of proteins called transcription factors that specify the way each cell develops by determining which of its genes are active. Mutations affecting transcription factors disrupt this process and cause major brain defects. In humans, mutations of transcription factor Pax6 cause a syndrome comprising visual, neurological and psychiatric defects. We know little about which genes Pax6 controls. Recently, we found a set of genes whose expression differs in extracts of brain from wild-type and Pax6-mutant mice. The aim here is to study which brain cells change their expression of these genes when Pax6 is lost.

Andrew Burns (Chemistry, Glasgow University) supervised by Professor Sheila Graham, for a project entitled:
Testing for cervical disease in liquid based cytology samples using a panel of viral RNA biomarkers
Human papillomavirus (HPV) infection of skin cells causes mainly warts. However, fifteen special types of HPV can cause cancer of the cervix and are associated with other cancers, especially head and neck cancer. A vaccine exists against two of these special HPVs and is delivered in a school-based vaccination programme to 12-13 year old girls in the UK. Unfortunately, the vaccine will not protect those older people who have already been infected (up to 80% are infected during their lifetime). A percentage of the female population will therefore continue to experience cervical precancers and cancers. So there is strong motivation to develop new methods of testing for cervical disease. This project aims to test the usefulness of detecting HPV messenger RNAs that are indicative of an active infection capable of causing cancer. This is a sensitive approach that could have future clinical applications in differentiating patients at risk of cervical disease progression to cancer.

Jordan Canning (Biomedical Science, Glasgow Caledonian University) supervised by Dr Xinhua Shu for a project entitled: ***Creation of a human RPGR mini promoter for retinitis pigmentosa gene therapy***
The retinitis pigmentosa GTPase regulator (RPGR) gene is the principal single cause of retinitis pigmentosa (RP). Recent gene therapy studies in the RPGR dog models showed that there was a dramatic preservation of retinal structure. Although the therapy was successful, the therapeutic gene used was regulated by a non-specific rather than gene-specific promoter. For rapid clinical translation it would be preferable that the human RPGR gene to be used in therapy is regulated by the specific RPGR promoter. In this project, we plan to create and characterise a mini RPGR promoter for human RP gene therapy.

Hayley Cassidy (Microbiology, Glasgow University) supervised by Dr Andrew Roe for a project entitled:
***Bioluminescent labelling of* Pseudomonas aeruginosa**
We have previously found a drug that interferes with how bacteria attach and infect human cells. We wish to test this in against a range of important pathogens including *Pseudomonas aeruginosa*, which can cause pneumonia in cystic fibrosis patients and is a common cause of infection of burn injuries. The target of this drug is used to inject toxins into human cells. We would like to test this drug in small animal models that are infected with *Pseudomonas aeruginosa*, to see if it has protective properties. In order to do this, we first need to make the bacteria more readily visible, so they can be tracked during an infection. We intend to do this by inserting genes that produce luminescence into the DNA of *P. aeruginosa*. The luminescence genes produce "light" making it possible to detect the bacterium inside a living host. We will then check that the labelled *P. aeruginosa* grows as effectively as the non-luminescent bacteria and test the light producing strain in a waxworm model.

Fatima Chaudhry (Medicine, Cambridge University) supervised by Professor Mary Lumsden at Glasgow University for a project entitled: ***A study on lifestyle risk factors, vascular reactivity and insulin resistance in in young women with polycystic ovaries of South Asian and European origin***
South Asians show a geater risk of developing diabetes and cardiovascular disease at a younger age than Caucasians. As, they are the largest non European ethnic group in Scotland, this could have large health and economic implications. South Asian women, especially middle aged, appear to have the highest background risk of diabetes, but have been largely overlooked. In addition, menstrual and hormonal abnormalities (known as polycycstic ovarian syndrome, PCOS) which are linked with later on diabetes seem to be more frequent in Souh Asian women of reproductive age compared with Caucasians. Therefore, we wish to study the association between lifestyle risk factors and vascular reactivity and the risk of developing diabetes in South Asian and European women of reproductive age with menstrual abnormalities, so as preventative measures can be potentially targeted at an earlier age before the risk of diabetes rises.

Jennifer Conway (Veterinary Medicine, Edinburgh University) supervised by Dr Jane Hope, for a project entitled:
Assessment of gut lymphocyte populations in Johne's disease
Johne's disease (JD) is a chronic gut disease which affects a large number of animals causing significant economic and animal welfare concerns. In order to design effective vaccines to prevent disease we must first understand the changes that occur within infected animals. We propose to study the cells that are associated with the inflammation that is seen in the gut. There are established links between JD in cattle and Crohn's disease in humans. Both Crohn's disease and JD have chronic inflammation in the gut and parallels can be drawn from studies in cattle to aid understanding of human disease.

Rachael Davis (Medicine, Glasgow University) supervised by Professor Muriel Caslake for a project entitled:
The effects of high intensity interval training on cardiovascular biomarkers in conditioned, healthy and sedentary individuals
It is well known that regular exercise can reduce the risk of heart disease and diabetes. Recent research has revealed that individuals can achieve the same health benefits with a few short bursts of intense exercise as with hours of conventional exercise. The aim of this study is to determine the effects of high intensity exercise on risk, and to establish whether previous levels of activity influence the effect. If beneficial results are seen across all fitness levels, the short periods of high intensity exercise are appealing and can be worked into most people's daily routine with ease.

Mirela Dimitrova (Biomedical Sciences, Aberdeen University) supervised by Professor Richard Aspden for a project entitled: ***Histology of subchondral bone in osteoarthritis***
Osteoarthritis affects many people as they get older leading to pain and disability. The only 'treatment' is a joint replacement. We know surprisingly little about why the joints become deformed, stiff and painful. We shall obtain the 'ball', from the ball socket joint in the hip, from patients having a hip replacement and use a microscope to look in more detail at the cells in the bone and bone marrow. By understanding the types of cells and where they come from we shall obtain a clearer picture of the changes caused by the disease and what makes it progress.

Thomas Docherty (Biochemistry, Glasgow University) supervised by Professor Neil Bulleid, for a project entitled:
Identification of proteins modified by nitrosylation in the mammalian endoplasmic reticulum
Many neurodegenerative diseases such as Parkinson's or Alzheimer's disease can be caused by cellular damage in specific areas of the brain. A striking aspect of these diseases is that they are associated with an increase in the production of chemicals that, when produced in excess, cause cell death. These chemicals are called include reactive oxygen or nitrogen species. Our understanding of how these chemicals cause disease is limited but it is believed that they modify proteins thereby inhibiting their function. This project aims to identify proteins that are modified by reactive nitrogen species produced during neurodegenerative disease.

Philip Emerson (Medicine, Glasgow University) supervised by Miss Joanne McPeake, for a project entitled:
Liver cirrhosis and predictive scoring tools in critical care
The primary aim of this project is to critically evaluate liver specific and traditional intensive care unit (ICU) scoring tools to determine whether these tools are accurate in predicting outcomes in cirrhotic patients from ICU. Liver cirrhosis is a chronic health problem which has been associated with poor outcome from ICU. Some studies describe mortality rates approaching 100% in this group of patients. However, recent evidence has suggested that mortality rates can be considerably lower, particularly when there are fewer other organs failing. The availability of accurate predictive tools which can aid clinical decision making are vital for patient care.

Aisha Ghaus (Medicine, Glasgow University) supervised by Dr Anna Freel for a project entitled: ***Association between variation at CYP17A1 locus and steroid phenotype: a novel mechanism in essential hypertension?***
High blood pressure (BP) is a common and extremely important public health problem; it is known that high blood pressure is a direct cause of many cases of heart attack and stroke. Steroid hormones are known to play a role in regulating BP and, in excess, can cause high BP and cardiovascular disease. Two recent large genetic studies (>60000 subjects) have shown a link between high BP and an important gene in steroid hormone production. We want to explore this further in a small group of normal subjects and explore whether there is any link between variation in this gene and the pattern of steroid hormones produced by these subjects. If we could show such a link then this could identify a new mechanism contributing to high BP as well as a potential target for new drugs to lower BP.

Konstantin Gizdov (Physics, Aberdeen University) supervised by Dr Alessandro Moura for a project entitled: ***Mathematical modelling of DNA replication in conditions of dNTP scarcity***
DNA replication is crucial for all life on Earth. When it does wrong, the result is abnormal cell division and genomic instability, potentially leading to cancers and other diseases. A key experimental technique to study the dynamics of DNA replication is to use chemicals to turn off the production of dNTPs inside cells – dNTPs are the building blocks of DNA. In this project we will build a mathematical model of DNA replication, which will be used to derive important quantitative information from measured data, such as the replication rate and efficiency of different portions of an organism's genome.

Rebecca Green (Biological Sciences, Edinburgh University) supervised by Dr Christopher Harlow for a project entitled: ***Role of steroid hormones in modulating fibrosis and scarring in the peritoneal cavity***
Patients having surgical procedures in their abdomen, or abdominal infection or inflammation, frequently suffer from post-operative adhesions. These are filmy accumulations of connective tissue forming membranous connections between the wall of the abdomen, gut and other organs, which can cause severe pain, infertility (in women) and bowel obstruction, which start off as a build up of fibrotic material containing collagen. However, when the ovary is injured at ovulation, no such problems occur, we believe as a consequence of a protective effect of locally produced steroid hormones. Using a mouse model of fibrosis, we aim to test whether these steroids (Progesterone and Glucocorticoid) can prevent the fibrosis occuring in the abdominal wall. If successful this could lead to methods of preventing adhesion formation after surgery or infectionwith far reaching implications for reducing suffering and the healthcare burden.

Constance Gwangwava (Food Science Technology & Management, Heriot-Watt University) supervised by Professor Michael Schweizer for a project entitled: ***Construction of a tool to monitor the influence of diet on cancer-associated microsatellite instability***
It is known that diet can affect health. The aim of the project is to create a reporter system which is capable of indicating whether or not specific dietary components have an influence on maintaining the integrity of the genetic material, DNA. Investigations of the impact of diet on genome integrity can provide information on how dietary choice plays a role in instigating or preventing the onset of diseases, such as cancer, associated with genome instability.

Lloyd Hamilton (Neuroscience, Dundee University) supervised by Dr Sheriar Hormuzdi, for a project entitled: ***Investigating the role of phosphorylation in regulating KCC2 activity levels***
GABA is a very important chemical in the brain whose function when disrupted contributes to the many nervous sytem disorders. Maintaining a proper balance in the levels and activity of this chemical is therefore important. In this context, the function of KCC2 is significant. Through its role in altering levels of chloride in the cell it has the ability to affect GABA function. Thus a variety of means have evolved to control KCC2 function and thereby alter GABA activity. This proposal will examine the role that phosphorylation of KCC2 at specific sites has in changing the strength of KCC2 action. The project has important implications for our understanding of how GABA may be controlled in the normal and diseased brain.

Katie Hoban (Medicine, Edinburgh University) supervised by Dr Maria Valdés Hernández for a project entitled: ***Atlas-based assessment of vascular territories on brain MR images of stroke patients***
On brain MR images, stroke lesions coalesce with other manifestations of white matter disease and inflammation producing the same signal change. Dedicated special MR sequences only allow to distinguish 60% of the strokes during a short period of time after they occur. This makes difficult to locate and delineate stroke lesions and consequently leads to erroneous prognosis, incorrect estimation about the extent of the damage caused by the stroke and may lead to false diagnosis. Brain atlases of the vascular territories of each main artery have been developed previously. With this project we aim to apply them to MR images of stroke patients and, using a multimodality approach developed in-house, validate their aplicability to clinical research on stroke or evaluate modifications and alternatives for further developments.

Kunzah Jamal (Molecular & Cell Biology, Glasgow University) supervised by Dr Helen Wheadon for a project entitled: ***Evaluating patient derived induced pluripotent stem cells (iPSC) for drug screening***
Stem cells occur naturally in the body and function to sustain many of our tissues. These cells have the potential to renew themselves as well as produce more mature specialist cells. When altered these cells can form cancers and are termed 'cancer stem cells' (CSCs). They are resistant to treatment and survive despite our best current therapies, often causing the cancer to re-grow after treatment. Chronic myeloid leukaemia (CML) results from a specific genetic alteration in a single blood stem cell, causing the cell to express an abnormal protein called BCR-ABL. This project will evaluate the efficacy of current CML treatment regimes on CSC models generated from patient cells.

Dimitar Karadzhov (Psychology, Glasgow University) supervised by Dr Klaus Kessler, for a project entitled: ***Investigating the neural basis for checking, selective attention, and working memory in obsessive compulsive disorder, through MEG and TMS***

The most common subtype of Obsessive Compulsive Disorder (OCD) is characterized with repeated checking. Compusive checking behaviours are associated with dysfunction and co-morbid anxiety disorders. Chronic checking symptomatology has been attributed to memory deficits. Neuroimaging techniques have been employed in an attempt to link behavioural and cognitive pathology to structural and physiological abnormalities in the brain. Under this neurocognitive framework, this study aims to identify the biological marker and predictors of the condition. The understaning of the neural underpinnings of OCD has the potential to develop a novel approach to treatment, and advise and reduce the cost of pharmacological experiments.

Phoebe Kirkwood (Medical Science, Edinburgh University) supervised by Dr Norah Spears for a project entitled: ***Investigation of apoptosis on chemotherapy drug-exposed gonads***

During recent decades, there has been a welcome increase in the survival rate of cancer patients, allowing effort to now focus on improving the quality of life of survivors. For the majority of younger patients, a top concern after survival is the impact of any treatment on future fertility, with chemotherapy and radiotherapy both affecting fertility of both males and females. An important first step to determine why fertility is affected is to understand the initial, direct effect of the chemotherapeutic agents. This study will address that, using tissue culture of mouse ovaries as an experimental model.

Emily Knowles (Biological Sciences, Edinburgh University) supervised by Professor Lee Smith for a project entitled: ***Characterisation of a novel mouse model of induced androgen receptor expression***

In additon to its role in male fertility, emerging data has linked changes in testosterone action to increased risk of cardiovascular disease, diabetes, prostate-cancer and several age-related conditions in men. As part of our wider studies to address this, we have generated a unique transgenic mouse in which we can switch on or increase the testosterone signal in any cell-type. The aim of this eight week project is to characterise the reproductive tissues from these mice. Characterisation and validation of this model is an essential step towards further study of the key roles testosterone plays in mens lifelong health.

Ariadni Kouzeli (Immunology, Glasgow University) supervised by Dr Simon Milling for a project entitled: ***Characterisation of IL-23-producing cells in patients with spondyloarthritis***

This project is part of ongoing research on the autoimmune disorder ankylosing spondylitis, which is part of a group of inflammatory disorders termed spondyloarthritis. This disorder affects 200,000 people in the UK, causing symptoms including inflammatory back pain and colitis. Nevertheless, a treatment is yet to be discovered. This project is aiming to investigate the potential involvement of the protein IL-23 by different cells of the immune system in the pathophysiology of ankylosing spondylitis. It is thought that intestinal inflammation is linked with the pathogenesis of ankylosing spondylitis, which is in turn linked with IL-23.

Joanna Main (Pharmacy, Strathclyde University) supervised by Dr Valerie Brunton at Edinburgh University for a project entitled: ***Characterisation of AZD8931 resistant HER2 positive breast cancer cells***

HER2 is a protein that is expressed on around 20% of breast cancers and many studies have shown that if you inhibit the function of HER2 that you can prevent the growth of breast tumours which express HER2. Drugs that target HER2 are used routinely in the treatment of breast cancer. However, the main problem is that resistance can develop to these drugs. AZD8931 is a drug in clinical development which inhibits the function of HER2 and in this project we will identify the ways in which resistance to AZD8931 develops which will help to optimise the use of this drug and maximise the benefit to women with HER2 expressing breast cancer.

Abhinav Mathur (Medicine, Edinburgh University) supervised by Dr Paul Reynolds at St Andrews University, for a project entitled: ***The Role of the Hippo Pathway in Colorectal Cancer***

Cancer is a leading health burden worldwide and more research is needed to understand the factors that drive cancers to grow. The Hippo pathway is a novel chemical signalling pathway inside cells that controls organ size and may lead to cancer formation when it becomes defective. We aim to investigate the role of this pathway in colorectal cancer to find out if it is a major growth driver. Recent data from colorectal cancers in mice provide a link, but are controversial. Our data may be useful to help doctors determine treatment options and may improve patient outcomes.

Gyavira Mbogo (Biomedical Sciences, Aberdeen University) supervised by Dr Jon Collinson for a project entitled: ***The genetic basis of clubfoot***

Congenital talipes equinovarus, usually known as 'clubfoot' is a lower limb abnormality affecting 1 in every 500 babies born in Scotland. Its developmental etiology is poorly known. The abnormality can run in families. We have identified the gene mutated (Limk1) in a mouse model of clubfoot, the pma mouse, and are now screening human clubfoot families for mutations in this gene. The purpose of this project is to determine how Limk1 mutation causes clubfoot. Our preliminary data are that it affects sciatic nerve development, so this will be tested directly by manipulating the gene and observing its effect on limb development in chicken embryos.

Catriona McDonald (Anatomy, Glasgow University) supervised by Dr Emily Ord for a project entitled: ***Impact of miRNA modulation on cerebral cells in an* in vitro *model of hypoxia reoxygenation***

miRNAs have been implicated as key modulators of pathogenesis in numerous diseases. This project aims to assess the role of a specific miRNA, selected from a previously performed openarray, following hypoxic injury in cerebral cells. The study will utilise a neuronal and brain-derived endothelial cell line in a optimised model of in vitro hypoxia / reoxygenation. Using pre-miR's to increase and antagomiRs to knockdown the endogenous levels of the specific miRNA, the mechanistic action of the miRNA can be assessed using a number of previously optimised assays of oxidative stress, apoptosis and cell proliferation.

Shona Miller (Psychology, St Andrews University) supervised by Professor Julie Harris, for a project entitled: ***Developing a visuo-motor training strategy for reading* via *eccentric viewing***
Age-related macular degeneration results in central loss of vision. Sufferers learn to use regions of the retina spared from damage, in a training technique known as eccentric viewing. Some individuals learn this very quickly, but many do not master it. In this project we seek to develop a more effective training strategy, using normal participants with 'simulated' vision loss (using eye-tracking and computer-displays). We will exploit the natural link between eye and hand movements by coupling a reading task with a pointing task. We predict that eccentric viewing will be achieved faster when reading is coupled with pointing.

Alise Molotova (Genetics, Glasgow University) supervised by Dr Carl Goodyear for a project entitled: ***Evaluation of recombinant molecules for modulation of the myeloid compartment***
The myeloid compartment (a proportion of white blood cells) is actively involved in both the inflammatory and bone erosive aspects of many diseases including rheumatoid arthritis, osteoporosis and multiple myeloma. We have found that the modulation of these cells can inhibit both their inflammatory and erosive nature and thus help to alleviate disease. Research findings from our laboratory have allowed us to design new molecules that can be used to target these cells. The proposed study will evaluate the therapeutic potential of these new molecules.

Louise Nugent (Biomedical Science, Glasgow Caledonian University) supervised by Dr Catherine Wright for a project entitled: ***Cell-cell communication and death in diabetic skin wound healing models***
Gap junctions are small channels directly connecting cells and are important in the skin. Expression of the gap junction protein Cx31.1 is associated with cell death (apoptosis). Apoptosis is raised around diabetic wounds that heal slowly, where Cx43 and Cx26 are disturbed but Cx31.1 expression is unknown. HaCat cells will be cultured in a 'diabetic' environment, with Cx31.1 and apoptosis levels determined at time points following scrape-wounding, and after UV exposure. Exploring the role of Cx31.1 and apoptosis in wound healing allows mechanistic questions to be adressed and contributes to development of novel therapies to improve treatment of diabetic ulcers.

Abisoye Olaifa (Immunology & Pharmacology, Aberdeen University) supervised by Dr Isabel Crane for a project entitled: ***Role of C-reactive protein in age-related macular degeneration***
Age-related macular degeneration (AMD) is a major cause of sight-loss in those over 70 and there is little treatment available for the most common form of the disease. As AMD progresses the retinal pigment epithelium (RPE) degenerates leading to loss of key photoreceptor cells. Although this degeneration involves accumulation of waste products little is known about the exact processes involved making it hard to design effective therapy. To improve this we aim to investigate the protein, C-reactive protein (CRP) which has been shown to build-up in AMD. We will examine whether and how CRP affects RPE cells.

Armin Oskooi (Biomedical Science, Aberdeen University) supervised by Dr Mirela Delibegovic, for a project entitled: ***Understanding the link between inflammation and type 2 diabetes***
Obesity is a major risk factor for development of a number of other metabolic diseases such as diabetes, cardiovascular disease, Alzheimer's and even cancer. It is suggested that this is due to impaired responses to the hormone insulin, creating a state of "insulin resistance". This insulin resistance is associated with increased inflammation in the body, as indicated by an increased number of macrophage cells (involved in inflammatory process) in the fat tissue of obese people. PTP1B is a major regulator of body weight and insulin sensitivity and mice lacking this gene are resistant to development of diabetes and obesity. In this study we aim to investigate the role of macrophage PTP1B in the process of inflammation and insulin resistance by using cell culture models to study these.

Anastasia Pesic (Pharmacology, Glasgow University) supervised by Dr Laura Denby for a project entitled: ***Examination of the role of exosomal miRNA in cell:cell communication in the kidney***
This proposal aims to investigate important molecules called microRNAs (miRNAs) that regulate gene expression and are involved in kidney homeostasis. These molecules have altered expression in kidney disease. The targets of these miRNAs or the miRNAs themselves may represent novel treatment of chronic renal disease. This project seeks to understand how these molecules when contained in extra-cellular vesicles contribute to cell to cell communication within the kidney and therefore more fully understand their role in renal disease.

Hanna Rooslien (Psychology, Glasgow University) supervised by Professor Stephany Biello for a project entitled: ***Sleepless in Glasgow: How do homeostatic sleep mechanisms interact with the circadian timing system?***
The most widely recognised consequence of disruption of the internal timekeeping (circadian) system is the sleep disruption that appears and diminishes quality of life. Robust, synchronised circadian rhythms are critical for health. Disrupted circadian rhythms are associated with early mortality, cardiovascular disease, and progression of cancer. We have only minimal understanding of the fundamental mechanisms underlying how disruptions to an organism's sleep patterns influence circadian timing and vice versa. Understanding alterations in the characteristics of stimuli that facilitate the interaction of sleep with the internal timing system will lead to recommendations to improve synchronisation and ultimately health.

Alice Rowan (Biomedical Sciences, Dundee University) supervised by Dr Andrew Irving for a project entitled: ***Identification and characterisation of novel lipid-sensing, cannabinoid receptors***
Receptors that sense endogenous lipids are important in norman brain function and in human disase. The endogenous substances which target these receptors are currently under debate. The project aims to continue current investigation of lipid-sensing receptor function at a cellular level. The investigation of these receptors is significant as current research has suggested that they may have a role in the signalling pathways involved in pain, cancer and multiple sclerosis.

Aiden Seeley (Biomedical Sciences, Aberdeen University) supervised by Professor Meip Helfrich for a project entitled: ***Studying bone using electron microscopy: new insights with new methods?***
Electron Microscopy is a method by which microscopical details of tissues and the individual cells that make up these tissues can be seen. While light microscopes can magnify such details by up to a thousand times, electron microscopes can magnify up to hundreds of thousands of times. In this project we will use two new methods to study bone tissue in the electron microscope: a method to freeze tissue under high pressure and then study very thin sections of that tissue to look inside the bone cells and a method to study the holes within bone by filling these with resin and imaging the "casts" that are created. We will use mouse bone to optimise the methods and then apply these to the study of bone obtained from patients with bone disease, such as osteoarthritis and osteoporosis. We aim to get new knowledge about the microanatomy of this bone using these methods while the student will gain in-depth knowledge of bone tissue including in bone disease.

Eilidh Simpson (Medicine, Dundee University) supervised by Dr Neil Henderson at Edinburgh University, for a project entitled: ***Investigation of the role of hepatic stellate cell alpha-v integrins during liver regeneration using a novel conditional genetic system***
Liver disease represents a massive healthcare burden worldwide. The liver has a unique ability to regenerate and integrins are molecules that allow cells to communicate with each other and also with areas of scarring within the liver. I will help to investigate whether a specific integrin (alpha-v) has an important role in suppressing liver regeneration in liver disease using an established novel genetic strategy in mice to manipulate levels of alpha-v integrins in specific cells within the liver during the regenerative process. Increasing our understanding of this process will facilitate the design of highly specific therapies to promote liver regeneration in patients.

Aleksandra Staniszewska (Medicine, Aberdeen University) supervised by Professor Julie Brittenden for a project entitled: ***Dimethylarginines and all cause mortality in patients with peripheral arterial disease***
This study aims to evaluate for the first time if endogenous proteins called methyl-arginines present in the blood can act as biomarkers of mortality in patients with hardening of their leg arteries (peripheral arterial disease). These proteins inhibit the production of nitric oxide which regulates the stickiness of the blood and the appropriate functioning of the walls of blood vessels. Patients with peripheral arterial disease have abnormalities in their blood and blood vessels. The ability to identify high risk patients may allow more individual targeted therapy.

Semjon Sidorov (Immunology, Glasgow University) supervised by Dr Charles McSharry for a project entitled: ***Is steroid-refractory asthma among cigarette smokers mediated by activation of the aryl-hydrocarbon receptor?***
Asthma is severe in ~10% of patients who don't respond well to steroid treatment. Understanding what causes this poor response will identify new treatment. We have shown that cigarette-smoking is associated with poor clinical responses to steroids. This project aims to replicate this poor steroid response in the lab using cigarette-smoke extract on experimental human lung cells, and to reverse this using blockers of smoking-related inflammation. Restoring good clinical response to steroids will greatly improve health care for asthma among smokers. Better understanding of steroid responses will direct development of new or additional drugs for inflammatory diseases.

Delaram Varzi (Medicine, Aberdeen University) supervised by Dr Rebecca Barr for a project entitled: ***Investigation of the relationship between osteoarthritis and osteoporosis using Dual energy X-ray Absorptiometry (DXA) images***
Osteoarthritis and osteoporosis are diseases affecting joints and bones. Osteoarthritis is currently measured on X-rays and osteoporosis on bone scans (DXA) however, Aberdeen University has shown that DXA can be used to assess osteoarthritis. The aim of this project is to use DXA scans and patient data, collected as part of an osteoporosis screening study, to measure osteoarthritis and to investigate the relationship between these two diseases. This has the potential to reduce the number of hospital visits and, by screening for two diseases using a single DXA scan, to reduce the amount of radition that patients are exposed to.

Sara Wagner Valladolid (Neuroscience, Glasgow University) supervised by Dr Guillaume Rousselet, for a project entitled: ***Modelling 3D dynamic mental representations of facial expressions of emotion in the ageing brain***
Over a lifetime, the brain ages as dramatically as the body (Grady, 2008), resulting in the decline of the basic but essential task of interpreting social signals. With an increasingly ageing population, it is therefore imperative to understand this group´s complexities of emotion communication. Using a unique 3D computer graphics platform and reverse correlation technique uniquely developed Glasgow University (Yu *et al.*, 2012), we will model dynamic mental representations of facial expressions (e.g., Jack *et al.*, 2012, *PNAS*) of ageing individuals. Here, we gain unique access to the "minds eye" of individuals across the lifespan, with implications for therapeutic interventions.

Ruaridh Winstanley (Biomedical Engineering, Glasgow University) supervised by Dr Henrik Gollee for a project entitled: ***Ultrasound feedback for diagnosis and rehabilitation in neurological disease***
In neuromuscular disease, such as spinal cord injury (SCI), small changes in muscle function due to natural recovery, plasticity, or rehabilitation, can indicate the potential for improved regeneration. Sensitive diagnostic tests are needed to detect small motor changes which are currently undetectable with traditional clinical grading and other techniques such as electromyography. Real-time analysis of ultrasound muscle imaging has the potential to resolve changes in muscle control not revealed by other methods. In addition, real-time feedback can result in improvements in rehabilitation outcome. The research in this project will contribute to the development of real-time ultrasound analysis, as a potential gold standard, to resolve changes in muscle control not revealed by other methods.

On Fai Arthur Woo (Medicine, Glasgow University) supervised by Dr Emilie Combet for a project entitled: ***Studying the impact of ageing and disease on the colonic metabolism of dietary phytochemicals using advanced models of colonic fermentation***

Inflammation is a common denominator to several diseases including cancer. Eating a balanced diet is known to decrease the risk of developing the disease, however, there is no identified mechanism for this protective effect. Over the last decade, the impact of gut bacteria on health and disease has become apparent. However, because of the size and length of the gut, the study of the interactions between gut contents and gut tissues is virtually impossible in humans, without involving highly invasive techniques. This project will focus on the use of advanced in vitro models of the gut, combining optimal conditions for the growth of gut bacteria alongside human gut cells, in order to study the processing of plant phytochemicals by gut bacteria, and the impact of the resulting molecule on the health of the gut cells in the model.

Hannah Wright (Electrical & Mechanical Engineering, Strathclyde University) supervised by Dr Anthony McClusky for a project entitled: ***Development of microfluidic devices for use in personalised medicine research on cancer biopsies***

A major drawback to the development of personalised therapies for cancer is the lack of sufficient biopsy material for testing anti-cancer treatments. The aim of this project is to develop novel drug screening methods for cancer based on the use of microfluidic devices, which allow the control and manipulation of fluids on a small (sub-microlitre) volume. This approach could allow the assessment of a wide range of drugs on single-cells in a miniaturised and controlled environment. This could be highly advantageous for the efficient analysis of patient samples and for the general development of personalised tumour treatment.