



## Margaret Woolloff PhD Scholarship 2020 – Project Details

### *Project Title 1:*

A person-centred frailty monitoring and management pathway for older adults in a rural GP surgery.

### **Main Supervisor:**

Dr Marco Arkesteijn, [maa36@aber.ac.uk](mailto:maa36@aber.ac.uk), Faculty of Earth and Life Sciences

### **Project Description:**

Frailty is a health status that increases the risk and impact of adverse events and makes individuals more vulnerable to quick and sudden declines in functional ability, hospitalisation and death. The importance of frailty is increasingly recognized, and although frailty is not currently a clinical diagnosis, it seems likely to become one in the next 10 years.

The PhD student is to support development and evaluation of a person-centred frailty monitoring and management pathway for older adults in a rural GP surgery, similar to current practice for obesity and diabetes management. Firstly, appropriate biomarkers of frailty (urine, blood, physical assessments, cognitive assessments, etc.) will be established. Secondly, its feasibility for implementation in a rural GP surgery will be determined. Finally, the feasibility of personalised interventions to prevent and reverse frailty will be evaluated in a rural GP surgery.

The PhD student will be supervised by members of the Well-being and health Assessment Research Unit ([www.waru.org.uk](http://www.waru.org.uk)), who work jointly with local GP surgeries in Ceredigion, Mid-Wales, United Kingdom. The supervision team is well placed to provide the PhD student with experiences of working in academia alongside the practical experience of doing primary care based research.

Candidates for the PhD Studentship should demonstrate outstanding qualities in a relevant discipline. They must demonstrate outstanding academic potential as measured normally by either a 1st class honours degree (or equivalent) or a Master's degree with distinction (or equivalent). Please contact the main supervisor for more information.

## ***Project Title 2:***

### **Fast ice flow signatures in ancient and modern bedforms**

#### **Main Supervisor:**

Dr Marie Busfield, [mab102@aber.ac.uk](mailto:mab102@aber.ac.uk), Faculty of Earth and Life Sciences

#### **Project Description:**

Fast flowing corridors of ice (ice streams) are responsible for up to 90% mass loss from today's rapidly receding ice sheets. Streamlined bedforms at the base of these ice streams hold key information about conditions at the ice-bed interface that facilitate fast flow (e.g., frozen/unfrozen substrate, presence of meltwater, stick/slip behaviours). However, subglacial settings remain largely inaccessible for study beneath today's ice sheets. Fortunately, well-preserved palaeo-ice streams allow us to step directly onto the fossilized bed of an ancient ice sheet, and analyse the shape, composition and internal structure of subglacial bedforms in detail.

The Late Palaeozoic Ice Age (~360-260 million years ago) is of particular interest as the last period where global ice sheets completely disappeared during transition from an icehouse to greenhouse world. This project aims to identify the formation mechanism(s) and ice velocity significance of unusually sandy streamlined bedforms of the LPIA in Namibia and South Africa by satisfying three core objectives:

1. To investigate bedform morphology and internal structure using field-based sedimentology, microscopic sedimentary analysis, and mapping of sub-aerial imagery.
2. To assess the link between fast ice flow and ice mass loss by integrating the genetic history of the subglacial bedforms and their overlying deglaciation sequences.
3. To explore the role of sandy substrates in modulating present and future fluctuations in ice velocity and associated mass loss.

The ideal candidate will have a good understanding of clastic sedimentology and/or glacial geomorphology, geological field experience, and knowledge of remote sensing and GIS approaches is desirable.

### *Project Title 3:*

## **Characterisation of the effect of surface termination on nanodiamond for biophysical applications**

### **Main Supervisor:**

Dr Rachel Cross, [rac21@aber.ac.uk](mailto:rac21@aber.ac.uk), Faculty of Business and Physical Sciences

### **Project Description:**

The science focus of this project is on nanocarbons, specifically nanodiamond and the effect of their surface termination for biophysical applications.

Nanodiamonds are enabling the exploitation of diamond's unique properties at ever decreasing length scales in applications such as quantum optics, biosensors and drug delivery. With their high surface: bulk atomic ratio, the surface termination is a crucial design parameter in all of these applications, an example of which is controlling their attachment to specific biomolecules or aggregation in specific biological sites. The Nitrogen-Vacancy, which can be commonly found in nanodiamonds, also allows for in-situ biosensing from the actual drug-delivery technique itself, allowing for a singular delivery to be conducted, placing nanodiamonds at the forefront of medical nanotechnology.

Our group has demonstrated the effect of surface termination on nanodiamonds on the attachment of a number of biomolecules such as Fluorouracil (5FU), a molecule commonly used in a range of cancer drug treatments. The research in this project is interdisciplinary with potential impact in improved drug delivery and other biological applications. This project compliments our current research in use of nanodiamond interactions with natural pigments, such as chlorophyll, for improved energy capture of visible light.

Using electron and optical spectroscopic characterisation techniques the main research challenges are to:

- Develop scalable processes for surface termination of nanodiamonds.
- Study the surface characteristics of differently terminated nanodiamonds.
- Study the effect of termination on the interaction between nanodiamonds and biomaterials to better understand the delivery mechanism of the nanodiamonds in the body for biophysical applications.

***Project Title 4:***

**Migrant workers and healthcare in post-Brexit UK**

**Main Supervisor:**

Dr Catrin Wyn Edwards, [cwe6@aber.ac.uk](mailto:cwe6@aber.ac.uk), Faculty of Arts and Social Sciences

**Project Description:**

The PhD project, 'Migrant workers and healthcare in post-Brexit UK', focuses on the multi-level governance of migrant health workers in the UK along with their experiences and treatment. It aims to understand the impact of an increasingly 'hostile environment' where the NHS has found itself increasingly entangled with the Home Office (Shahvisi, 2019) and well-entrenched narratives that link 'uncontrolled' and 'unlimited immigration' to the state of the health service on the experiences of migrants. The comparative study will adopt a two-pronged approach to the research; it will adopt a top-down approach to understand the responses of a range of actors such as the UK government, devolved governments and healthboards and trusts to migration, and will also adopt a bottom-up analysis of how migrants working in healthcare sector experience the 'hostile environment' along with their workplace integration and relations.

***Project Title 5:***

**Development of on-farm molecular tools for sustainable parasite control in livestock.**

**Main Supervisor:**

Dr Rhys Aled Jones, [raj22@aber.ac.uk](mailto:raj22@aber.ac.uk), Faculty of Earth and Life Sciences

**Project Description:**

Helminth parasites are among the greatest threats to sustainable livestock production, impacting animal productivity, welfare and ruminant methane emissions. In particular, gastrointestinal nematode and liver fluke infections are estimated to cost the UK livestock industry up to £300 million annually. In the absence of vaccines, farmers are heavily dependent on anthelmintic treatment to successfully control helminth infections. However, this practise is threatened by widespread anthelmintic resistance which has developed due to extensive over-treatment. This excessive use of anthelmintics is fuelled by limited capabilities to diagnose helminth infection and to evaluate future infection risk, often stimulating farmers to blanket treat animals against helminths unnecessarily. In recent years, major progress has occurred in the development of molecular based tools to diagnose helminth infections in livestock and to evaluate infection risk within fields via environmental DNA (eDNA) analysis. These tools have the potential to direct the optimal treatment of livestock, thus reducing resistance development. However, these techniques are often complex, expensive and reliant on laboratory-based equipment to be utilised, and thus their uptake has been poor compared to traditional parasitology methods. This PhD project will aim to develop a simple and rapid on-farm DNA extraction and analysis protocols capable of extracting and analysing helminth DNA from ruminant faecal samples and eDNA from the grazing environment. These developed methods will be tested on their ability to inform farmers of current and future parasite disease risk to aid sustainable anthelmintic-based parasite control strategies.

## ***Project Title 6:***

### **Debris-cover evolution on European Alpine glaciers**

#### **Main Supervisor:**

Dr Tom Holt, [toh08@aber.ac.uk](mailto:toh08@aber.ac.uk), Faculty of Earth and Life Sciences

#### **Project Description:**

Glaciers in the European Alps are melting at an unprecedented rate. Their surfaces are becoming increasingly debris-covered, which is further exacerbating ice-mass loss. However, little is known about the complex processes linking century-scale climate change to the evolution of glacier-surface debris, how such changes might affect glacier longevity, or the wider socio-economic implications of future climate change on water supply, tourism and sustainability.

This project aims to quantify debris-cover evolution on glaciers in the European Alps by satisfying three core objectives:

1. To measure glacier-surface debris from a suite of maps, aerial images and satellite data.
2. To investigate contemporary debris-cover thickness on key study sites using a combination of field-based and remote-sensing approaches.
3. To identify historic, present and future debris sources to project future glacier scenarios in a changing climate.

A combination of remote sensing and field-based measurements are proposed. The spatial extent of debris cover could be mapped at multi-decadal timescales using a range of freely available remote sensing data. Debris thickness could be measured in the field, and approximated over large areas using thermal data acquired by satellites. Debris source areas could be investigated through detailed structural, geomorphological and geological interpretations across a glacier's catchment.

The ideal candidate will have a good understanding of glacial geomorphology and sedimentology, knowledge of remote sensing and GIS approaches, and field experience in remote and/or mountainous environments.

***Project Title 7:***

**Virtual Measuring Tapes**

**Main Supervisor:**

Dr Helen Miles, [hem23@aber.ac.uk](mailto:hem23@aber.ac.uk), Faculty of Business and Physical Sciences

**Project Description:**

Virtual Reality (VR) platforms and environments have become a popular way to visualise and present spatial data, placing the user within a 3D space with tools to control and manipulate their surroundings. Despite the rapid uptake of VR technology, the ability of users to accurately perceive or interpret this information is not fully understood. A user's ability to accurately estimate distances - a task most people can perform quickly and efficiently in the real world - is key when analysing a spatial data set. This project will investigate novel tools and visualisation techniques to support the user in the fundamental task of measuring virtual objects in VR.

***Project Title 8:***

**Narratives of displacement in French and francophone culture**

**Main Supervisor:**

Dr Marieke Mueller, [mam139@aber.ac.uk](mailto:mam139@aber.ac.uk), Faculty of Arts and Social Sciences

**Project Description:**

This project aims to investigate the theme of displacement in French and francophone culture. It will examine different understandings of the phenomenon of 'displacement', in particular social mobility as a form of displacement, but also migration within and across countries, and displacement as experienced by post-migratory communities. The researcher may choose to work with a range of cultural products such as novels, film, or television. The material will be approached through the specific angle of narrative, studying the way in which textual structures frame and influence the representation of displacement on an individual, collective and inter-generational level.

Interdisciplinary in nature, the project relates to a number of important areas of research, such as new approaches to social mobility (Jacquet, 2014; Eribon 2010), or recent scholarship on post-migratory cultures (Kleppinger and Reeck, 2018). Its originality lies firstly in the bringing-together of different understandings of 'displacement', allowing them to shed light on one another and thus contributing to a more general understanding of discourses around 'displacement' in French and francophone culture. Secondly, through its angle of narrativisation and a concern for the ways in which cultures tell stories about displacement, the project has implications for non-academic practitioners in education, journalism and the wider cultural sector.

We would also welcome proposals adopting a comparative approach, considering French-language texts alongside works in German or Spanish.

*Project Title 9:*

**A transformational physical activity intervention to improve health outcomes and quality of life for children with Autism Spectrum Disorder in Wales (“ASDactive”)**

**Main supervisor:**

Dr Simon Payne, [smp14@aber.ac.uk](mailto:smp14@aber.ac.uk), Faculty of Earth and Life Sciences

**Project Description:**

The overarching goal of ASDactive is to develop a fun, motivational, evidence-based physical activity programme, for children aged 4-11 with Autism Spectrum Disorder in Wales. This is a rapidly growing population, so early intervention is vital; the benefits of physical activity for symptoms of ASD and associated comorbidities is substantial. The research aims to learn *how* to design the programme so that it (1) **encourages** participants to expend enough energy to benefit physiologically and neurologically, and (2) **sustains** prolonged adherence and hopefully, a lifetime of physical activity. To do this, ASDactive will require the researcher to synthesise the pertinent psychological and physiological literature (systematic reviews), gain insight from stakeholders in the sector (qualitative research), design, execute, and evaluate a 6-month physical activity intervention (randomised control trial), and create a training manual for dissemination to stakeholders. Thus, applications are encouraged from individuals with a passion for the topic, a background in psychology or sport and exercise science, confidence to lead physical activity sessions with the target population, and demonstrable potential to undertake the mixed methods design.

**Project Title 10:**

**Modelling of hydraulic fracturing in the presence of pre-existing interfaces**

**Main Supervisor:**

Dr Adam Vellender, [asv2@aber.ac.uk](mailto:asv2@aber.ac.uk), Faculty of Business and Physical Sciences

**Project Description:**

Hydraulic fracturing (HF) is a widely used method for stimulation of hydrocarbon reservoirs. The essence of this technological process is pumping fluid into the wellbore at a pressure greater than the fracturing pressure of the rock formation. As a result the bed is penetrated by propagating cracks, which increases the surface for hydrocarbon extraction. Mathematical modelling will result in increased yields industrially, which has implications for energy security, while minimalizing the potential for environmental damage.

This brings many mathematical challenges, including strong nonlinearity arising from solid/fluid coupling, a non-local relationship between fracture opening and net fluid pressure, degeneration of the governing PDE at the fracture front, and uncertainties in the data. Any efficient computation algorithm to deal with HF should carefully address each of these.

One important feature remains unaccounted for in existing HF models. The usual assumption of the uniform properties of rock formations excludes from consideration a very important case when the fracture propagates along the contact surface of two neighbouring geological strata. Such a situation is encountered in many types of reservoirs (e.g. shale beds) where the HF process results in the opening of a pre-existing crack. The overall aim of this project is to derive new HF models that include such imperfect interfaces via an integral formulation [2] and to provide efficient numerical tools using the resulting modified algorithms.

**Project Title 11:**

**Reading processes in Welsh/English bilinguals: Insights from eye-tracking and EEG**

**Main Supervisor:**

Dr Victoria Wright, [viw8@aber.ac.uk](mailto:viw8@aber.ac.uk), Faculty of Earth and Life Sciences

**Project Description:**

How do bilinguals read in each of their languages? Within Wales, increasing numbers of people are bilingual speakers of Welsh and English, and the Welsh Government currently has in place a strategy to increase the number of Welsh speakers to one million by 2050. Thus, in the future, Wales will see increasingly larger numbers of bilingual citizens and there is a need to develop understanding of some key psycholinguistic processes, such as reading, in the context of the Welsh language. Recent work (e.g. Goswami & Ziegler, 2005) has suggested that a key linguistic property – the regularity with which sounds map to letters - may influence the way in which readers decode text. If this is the case, where a bilingual speaks two languages that differ in terms of the regularity of their sound-spelling mappings – such as Welsh and English - a key question is to what extent is the bilingual able to apply language-specific reading processes. To address this question, this project aims to explore differences in reading strategies between adult bilingual Welsh-English speakers and monolingual English speakers at the word, sentence and extended text level using a range of research methods (behavioural experiments, eye-tracking and EEG). The outcomes of this project will extend understanding of the neurocognitive basis of reading in Welsh, and have, in the longer term, the potential to inform development of teaching strategies and learning materials to support children learning to read bilingually. This project would particularly suit a Welsh speaker with interests in psychology/psycholinguistics/bilingualism.