

GRADUATE SCHOOL

Doctoral Research Highlights 2021



WELCOME



**PROFESSOR
ADRIAN WILLIAMS**
DEAN OF
POSTGRADUATE
RESEARCH STUDIES
AND RESEARCHER
DEVELOPMENT

Welcome to our 2021 Research Highlights. Inside you will find a snapshot of some of the excellent research and community engagement work by our amazing doctoral researchers. Despite the restrictions imposed by the pandemic, research has continued into important local, regional and global challenges. We have around 1900 doctoral students from over 100 countries working across our academic disciplines, all of which could have been included – but it would have resulted in a very large publication!

Inside you will find examples of how our doctoral researchers help to deliver the four key underlying principles of the University of Reading. As a community they work collectively to create opportunities for others, such as the work with The Brilliant Club. An example of the excellence of their work is their numerous contributions to research on climate change that was recently recognised by a Queen's Anniversary Prize. Sustainability research ranges from flood prevention to understanding extreme weather events, with many doctoral researchers attending and contributing to COP26 in Glasgow. Finally, we engage with local and global communities, from the Oxford Road global village to work on sea snakes in Costa Rica, and seek to impact society through research into the barriers faced by disabled filmmakers or challenging stereotypical representations of characters within video games.

I very much hope that you enjoy reading these highlights.



FRONT COVER:
Canary-coloured sea snake
by Brooke Bessesen

Highlights from the academic year 2020/21



1,880

postgraduate research students from 110 countries*

WE AWARDED

200

DOCTORATES



51%

international students*

THE AGE*
RANGE
OF STUDENTS STUDYING
FOR A DOCTORATE AT
READING WAS

21 to 78

31%

OF ALL DOCTORAL RESEARCHERS
UNDERTOOK THEIR STUDIES
PART TIME*

*Higher Education Statistics Agency (HESA) student returns, 2020/21.

Highlights from the calendar year 2021

MOST DOWNLOADED RESEARCH PAPER¹

PUBLISHED ONLINE IN THE JOURNAL OF MANAGEMENT EDUCATION

JULIA CARDEN'S PAPER
"DEFINING SELF-AWARENESS IN THE
CONTEXT OF ADULT DEVELOPMENT:
A SYSTEMATIC LITERATURE REVIEW"

MOST DOWNLOADED THESIS¹

"EMOTIONAL METHODOLOGIES FOR
CLIMATE CHANGE ENGAGEMENT:
TOWARDS AN UNDERSTANDING OF EMOTION
IN CIVIL SOCIETY ORGANISATION (CSO)-
PUBLIC ENGAGEMENTS IN THE UK"

BY JO HAMILTON

DOWNLOADED 633 TIMES

¹Data taken from CentAUR, the University of Reading's institutional repository

Reducing aircraft emissions by SURFING THE WIND

By 2050, the aviation industry aims to be carbon neutral, requiring huge changes that could take decades to implement. However, with commercial flights responsible for more than 2% of manmade greenhouse gas emissions, efforts to reduce carbon dioxide released during flights must start now.

Although there are many exciting and revolutionary projects in development, including changes to aircraft design and the kind of fuel used, an improvement in operational efficiency is the only way to make immediate cuts to emissions. New satellite coverage of the North Atlantic means that aircraft and Air Traffic Control can now be more aware of the position of all transatlantic traffic. We therefore have the opportunity to plan individual flight paths to minimise emissions.

Constant altitude and airspeed routes were created to use the shortest time possible each day to travel between London and New York, taking into account the daily wind conditions. Flying eastwards, prevailing winds can be used to reduce time of flight by increasing speed relative to the ground, whereas westbound flights must try to avoid headwinds, which reduce ground speed. These trajectories were then compared

with flights simulated to fly each of the Organised Track System (OTS) daily routes through the same winds. In this way, it was possible to show that, by designing routes specifically with the wind field in mind, fuel-use and thus emissions can be reduced significantly.

Our research shows that, by following the OTS, certain wind conditions can cause aircraft to travel a distance of 16% further than needed. Using data about the number of aircraft flying along each track each day, we found that using these tracks leads to 6.7 million kg of unnecessary CO₂ emissions each winter. The research was published in the Environmental Research Letters journal and attracted coverage from news agencies worldwide. It was even cited by National Air Traffic Services in their decision to experiment with the adjustment of the OTS on some days.

The next stage of this work is to minimise fuel use, rather than time, to provide more fuel-efficient, fixed-time flights that would work as part of a seasonal timetable. By varying the heading angle, altitude and airspeed of an aircraft, emissions for each small stage of a flight can be minimised, reducing the flight's total climate impact. By comparing results for different combinations of



“Our research shows that, by following the OTS, certain wind conditions can cause aircraft to travel a distance of 16% further than needed.”

these control variables, the influence of each factor can be assessed. The aim is to produce viable flight routes which will provide substantial and immediate cuts to emissions.

Cathie Wells is a PhD researcher in the Department of Mathematics.



A Wider Lens on FILMMAKING

By failing to bring disabled filmmakers into frame, the film industry misses out, argues Shweta Ghosh.

In a time when anyone with a digital video device can shoot a film and the internet provides a free platform to showcase a diversity of stories, it should be possible for anyone to make one. Nonetheless, people with disabilities remain almost invisible in India, which is home to one of the world's largest film industries.

My doctoral research project, We Make Film, sought to understand the experiences of filmmakers with disabilities in urban India, and the billion-dollar media and entertainment industry that rarely sees them as audio-visual storytellers. It explored the various ways that disability and filmmaking interact in urban Indian

contexts, focusing on the inaccessibility of film and video technology, barriers to film consumption and education, and how filmmakers continue to negotiate these barriers and articulate their creative vision.

The research showed that, even though people with disabilities work in exciting ways to create films, filmmaking still centres the perspectives and practices of non-disabled people, both on and off the screen. Where disabled stories do feature in films, these are told through a non-disabled gaze and without disabled filmmakers driving the storytelling themselves. Our experiences of films are traditionally restricted to audio and visual senses (sight and hearing), but

a broadening to include other sensory experiences can actually open whole new creative avenues and experiences. For example, blind filmmakers may use tactile means (touch) to learn the visual diversity offered by different camera movements, or understand and communicate the spatial organisation of objects and actors when directing a scene.

When disabled individuals tell their own stories, authentic representations of people with disabilities are more likely to emerge, enriching the film experience for everyone. The industry, in my view, should re-evaluate working practices and aesthetic approaches that are rooted in ableism, and build a broader creative environment.

Shweta Ghosh, recently completed her PhD and is now a Lecturer in the Department of Film, Theatre & Television.

Storytelling from a GLOBAL VILLAGE

Doctoral researchers supporting the High Street Heritage Action Zone programme.



Doctoral researchers Alice Mpfu-Coles and Robyn Woronka have been helping to deliver a major English Heritage regeneration project. The project is a collaboration between Reading Borough Council's Heritage Action Zone team, the University and other partners, through funding that seeks to fuel economic, social and cultural recovery.

Alice and Robyn, both undertaking PhD research in human geography, worked on strands of the project which engage

with communities in the Oxford Road area on the west of Reading. The stories and interviews they collected are part of an online community exhibition hosted by Reading Museum. Their interviews included long-term Oxford Road dwellers, recent migrants from Eastern Europe, a well-known local librarian and Windrush residents.

The exhibition also charts the history of the road, from its development as a suburb of the town, following the arrival of new workers from the countryside coming



to the town's factories, through layers of immigration including Russian Jews fleeing persecution in the late nineteenth century. Immigration from Ireland, Eastern Europe and the Caribbean in the 1950s and the division of larger houses contributed to the area growing into what the online exhibition describes as "amongst the most densely populated and cosmopolitan neighbourhoods in the UK."

Robyn describes the road as one that "celebrates human connection" by bringing so many demographics

"On the Oxford Road, you really are in a global village. There are all nations, languages, food, cultures, shops ... and people that thrive together, making it very vibrant."

together in a tightly populated area, a view which is echoed by Alice: "On the Oxford Road, you really are in a global village. There are all nations, languages, food, cultures, shops ... and people that thrive together, making it very vibrant."

"You could feel people's attachment and passion as they spoke about their relationship with the area, the shops, the residents, their memories and the future." Alice said of the storytelling work. "It was a privilege to listen to people share their stories with us."



LEAKY BARRIERS

for natural flood management

A pioneering natural flood management (NFM) scheme near Reading is helping to slow the flow of the River Pang, aiming to reduce the risk of flooding in the local area. The partnership project, involving the University of Reading, volunteer-led Pang Valley Flood Forum, the Environment Agency and landowners of the Englefield Estate, is designed to reduce the impact of flooding which devastated Pangbourne in the 2007 floods.

NFM is a method of flood risk reduction which uses natural processes, such as the planting of trees, creation of retention ponds and the improvement of soil health, to slow the flow of rainfall water rushing into rivers, thereby reducing the likelihood of flooding. Unlike traditional hard engineering methods of flood management (channel straightening, dredging, concrete levees), the NFM strategy incorporates local knowledge and community action to reduce flooding risk.



38 woody leaky barriers have been built, using natural materials, on upstream tributaries to the River Pang to create a network of barriers to slow the flow of water. Much like a beaver dam, these allow the passage of water during normal river levels, but come into effect when the river level rises as a result of rainfall by slowing the flow of water and pushing water onto the floodplain, therefore increasing the river's capacity, encouraging absorption into the floodplain and reducing the risk of flooding downstream.

The University's role in the project is to monitor the level of water flow through these leaky barriers. Data has been gathered via the use of time-lapse cameras to provide visual updates, level sensors to measure water depth and water flow monitoring equipment at eight locations. Preliminary analysis has shown that leaky barriers can contribute

to slowing the flow of water by increasing the lag time between rainfall hitting the ground and it reaching the River Pang from its tributaries, thereby reducing the risk of flooding.

These initial results are promising, yet more investigation and analysis is needed into the effectiveness of leaky barriers for river catchments with different characteristics across different sized rainfall events.

You can watch a video outlining the project at <https://youtu.be/9lvNjYtsx7Y>

Gabrielle Powell is studying for a PhD funded by the University of Reading, Forest Research and Thames Water, and is associated with NERC Landwise and ESPRC Twenty65. This NFM project is funded by the Department for Environment Food & Rural Affairs (DEFRA).



SEEING YOURSELF?

Representation and diversity in gaming

Doctoral researcher Rachel Gauthier unpicks the limitations of representation in a study of discourses about identification in video games.

How the video gaming industry portrays characters of different social categories—for example, race, gender, and sexuality—is regularly criticized as an issue of poor representation. While some individual games are praised for their depictions of marginalized identities and narratives, many players still consider the characters and stories of mainstream gaming to be narrow. Characters that are exceptions to these trends are often analysed by players in terms of being positive or realistic representation. My doctoral research on the discourses of gaming focuses in large part on the nature of such analyses.

Calls for gaming to do better frequently operate on axes of present versus absent and/or accurate versus inaccurate. These calls may be framed as a need for

identification, a common argument being that all players should be able to see themselves within games.

Perhaps the most well-known example would be Lara Croft, who still provokes debate as to whether she can be read as a sexist stereotype, strong female representation, or a combination of both. Another, more recent example would be when *The Sims 4*'s depiction of Black skin tones was criticised for being inaccurate and largely absent; in response, the game's skin tone range was updated in 2020.

My research is not a critical response to players' desires for diversity in gaming—I am very much in favour of moving away from non-inclusive gaming conventions. Instead, I work to interrogate the limits of these

debates about representation and identification. One limitation that I particularly focus on is how they often assume that ideas like identity, character, real, and virtual are stable. I am interested in reading how these ideas are framed differently within different games rather than being fixed and easy to define, and in considering the tensions that can emerge from these different perspectives. Rather than asking whether a character is good or bad representation, which may take a great deal for granted, we can ask what it means to claim that a player can ever really be represented by a character in the first place.

Rachel Gauthier, doctoral researcher in English Literature

DINNER AFTER DARK

In the small Central American country of Costa Rica, there's a rare tropical fjord called Golfo Dulce where canary-coloured sea snakes live, which are found nowhere else on Earth. Currently considered a subspecies, the scientific name *Hydrophis platurus xanthos* means "yellow flat-tailed water serpent". An apt description, as these air-breathing reptiles spend their entire life cycle in the sea and can absorb oxygen through their skin. For my doctoral research, I've been studying the ecology of the population with the suspicion that Xanthos, as the snakes have come to be called, are unique enough to be considered a new species.

Xanthos are closely related to the black-backed *Hydrophis platurus*—the only sea snake ever to venture across the Pacific Ocean and arrive in the Western

hemisphere. Some of these black-backed seafarers entered the deep inner basin of Golfo Dulce and became separated from the wider population by a shallow shelf. Unable to escape, this isolated group was forced to adapt to this warmer environment. Dark solar-absorbing skin gave way to all-yellow colouring, and the snakes' body size shortened from over 28 inches to about 19 inches. This lighter skin and greater surface area to volume ratio helped Xanthos avoid overheating at the water surface where they feed. In addition to these physical changes, I suspected that behavioural strategies may also have evolved to aid their survival in this new environment.

Open ocean sea snakes are most active and feed during the day; in the Pacific they commonly float in smooth water drift lines,

created by converging currents, until juvenile fish approach close enough to be snatched with a sideways strike of the head. Black, melanin-rich skin protects their organs from sun damage and preserves the potency of their venom so they can safely dine for hours under the full sun. Inside Golfo Dulce, however, daytime sea surface temperatures can exceed 32°C, more than four degrees higher than in the Pacific, and while yellow skin may keep Xanthos cooler (because lighter colours absorb less heat), it also makes the snakes sensitive to solar radiation. Could Xanthos be avoiding sunburn by primarily feeding at night?

A field study was conducted in 2021 to answer this question. We surveyed five different transect lines across an area of water over five weekends. Travelling

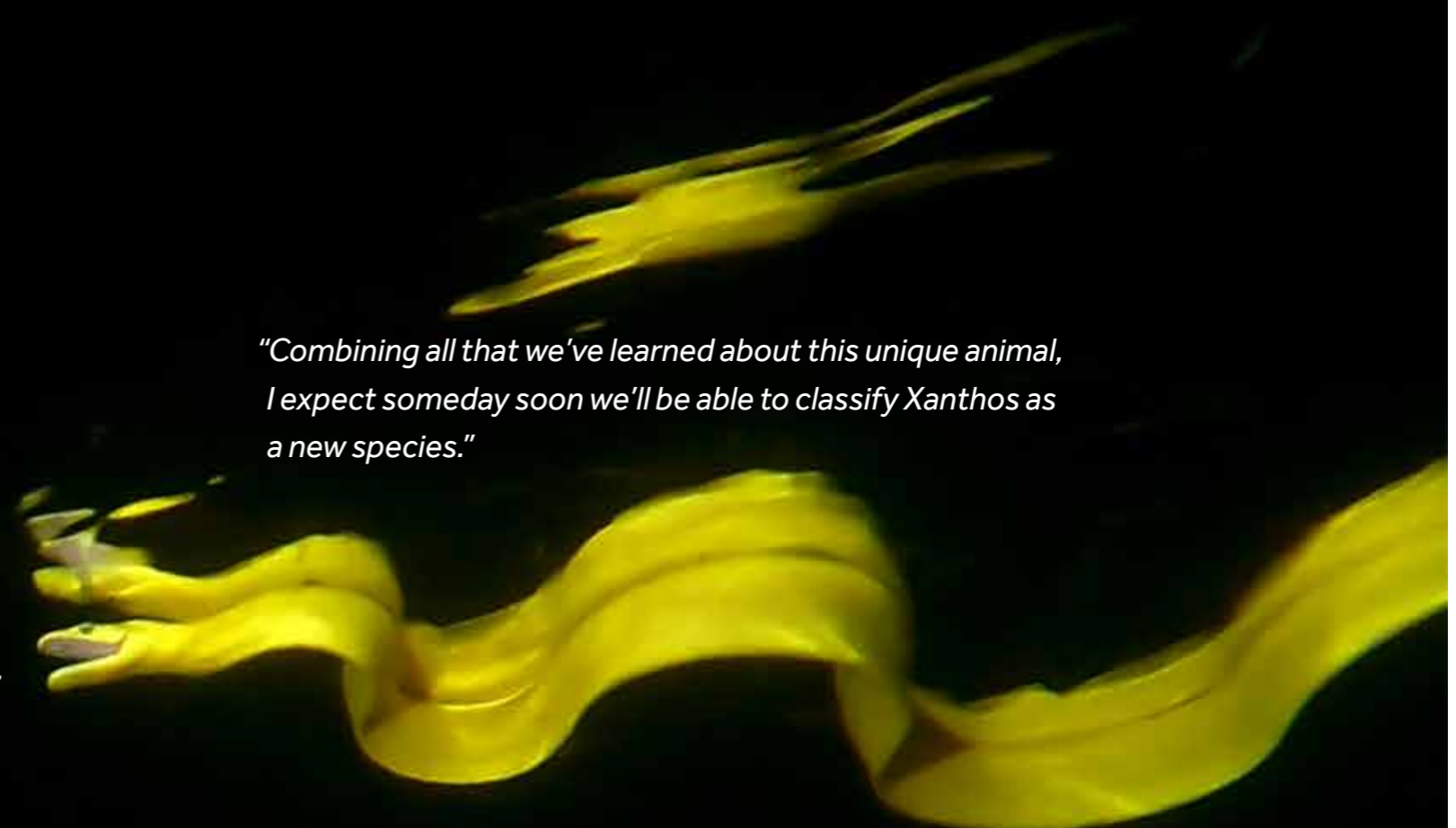
"Combining all that we've learned about this unique animal, I expect someday soon we'll be able to classify Xanthos as a new species."

back and forth along each short line for 24 hours, I recorded every Xanthos sighted and its behaviour. Hungry snakes were easily recognized as they had adapted to the choppy waters common to the Golfo Dulce with a peculiar feeding position, whereby the snake contracts into a tight accordion shape to gain stability. Around-the-clock observations through sun-piercing days, sleepless nights, and an occasional drenching of rain, proved a feat of endurance. Yet I managed to record more than 350 Xanthos sightings, always scribing the exact time onto waterproof paper.

When the data was analysed, we found that more snakes were recorded at the water surface and in their feeding position at night. This confirmed that the subspecies was generally nocturnal, the exact opposite of its pelagic relative, but we also found curious, statistically significant spikes of activity after sunset and before sunrise. This pattern of activity at dawn and dusk is called crepuscularity, and this behaviour had not previously been reported in any of the about 50 sea snakes within the genus *Hydrophis*.

Separated from its pelagic relatives, Golfo Dulce's endemic sea snake has developed distinctive physical and behavioural characteristics and unique ecological patterns, like crepuscular activity. Combining all that we've learned about this unique animal, I expect someday soon we'll be able to classify Xanthos as a new species - *Hydrophis xanthos*? It does have a nice ring.

Brooke Bessesen is a doctoral researcher in the School of Biological Sciences.



COP26

HOPE FOR OUR FUTURE?

In November 2021 world leaders met to discuss measures desperately needed to tackle climate change. We asked three PhD researchers to share their thoughts on the experience of attending COP26 in Glasgow.

HOW WERE YOU INVOLVED WITH COP26?

Gwyneth Matthews: As part of the Walker Institute's COP Climate Action Studio (COPCAS) scheme, I was lucky enough to attend the Blue Zone in Glasgow for week two of the conference. My role was to organise interviews between COP26 attendees and students working from the Walker Institute in Reading.

James Hill: I was offered a place to attend by the NERC SCENARIO Doctoral Training Partnership (DTP). I attended the Green Zone, which included lectures, seminars and debates by big names in industry, academia, nature media and the art world. The whole city of Glasgow was permeated with a sense that this was a historic moment in time.

Kerry Smith: I attended the Blue Zone as a non-governmental organization (NGO) observer for the Walker Institute. I interviewed a range of experts linking with COPCAS students back in Reading, writing blog posts about what I had learned and soaking up the experience.

WHAT WERE YOUR HIGHLIGHTS OF COP26?

Gwyneth Matthews: I attended one of the last stocktaking events which allowed all delegates to voice their support of, or their objection to, the progress in the negotiations so far. This event showed the importance of having a platform where less developed countries have an equal opportunity to speak about an issue that is currently impacting them the most.

James Hill: Being in Glasgow at this historic moment in time – seeing people march, feeling the excitement and frustration in the air. Discussions with other PhDs, as to the philosophies and practicalities of making environmental change actually happen. The opportunity to see and discuss how environmental science has leaked out into the wider world, and the implications of that leaking (both good and bad), was truly invigorating.

Kerry Smith: Walking into the venue and being met with a gigantic Earth hanging from a thread. Seeing some international accountability gave me hope. Witnessing real politics at work. Hearing a children's choir singing about their future was so hopeful and uplifting that it stopped me in my tracks and gave a heartfelt reminder of what this is all for.

DID ANYTHING ABOUT COP26 CHANGE YOUR ATTITUDE TO, OR UNDERSTANDING OF, CLIMATE CHANGE, AND/OR ITS POLITICS?

Gwyneth Matthews: One of the most eye-opening talks for me was a discussion on the loss of words and language that some communities are exposed to as climate change impacts their traditions and practices. I don't think I had fully understood the depth of the loss we face if we don't start acting more quickly on climate change.

James Hill: On this occasion I only had access to the Green Zone, so I wasn't able to witness the real substance of the conference. I would have liked to have been able to access the Blue Zone negotiations; I imagine it would have been extremely informative in regard to the actual detailed politics of the situations.

Kerry Smith: With such diverse topics at play, it's not surprising that a scientist with limited understanding of law, politics, industry, and economics, can gauge little about what was going on. The scale and crosscutting complexity of the challenge we face is something that we can never quite comprehend, but COP26 gave a feel for it.

AFTER COP26 ENDED, HOW WERE YOU LEFT FEELING?

Gwyneth Matthews: Disillusioned and inspired. Leaders made pledges that were not substantial enough. Some parts of the final Glasgow Climate Pact were good, but overall the agreement was underwhelming. But I also learned about adaptation plans being enacted at a local level around the world that are making a big difference to people's lives.

James Hill: Ambivalent, uncertain, contradictory, pessimistic. Climate change is one of the biggest threats to civilisation. Response requires a global effort with the myriad ethical and practical implications of such a task. Grateful that I am secure and happy compared to some unfortunate people who are likely to suffer a lot from climate change. Grateful that I am funded to work on issues relating to human-environment relationships.

Kerry Smith: Small. There were thousands of people at COP. The only measure of progress is what we achieve as a collective, and that will determine whether we can prevent catastrophic and irreversible changes to our planet's stability. This is a feat of international cooperation unlike any seen before. So, I feel worried yet hopeful, and excited by the opportunities in global cooperation that climate change provides.

CAN YOU TELL US HOW YOUR PHD RESEARCH RELATES TO CLIMATE CHANGE?

Gwyneth Matthews: My PhD in the Department of Meteorology focuses on developing error-correction methods for flood forecasts. Studies suggest that climate change will lead to an increase in the most extreme floods. I'm working on improving accuracy and decreasing uncertainty in flood forecasts to make them more useful for decision-makers.

James Hill: My PhD research in the Department of Geography and Environmental Science focuses on how tropical rainforest and dry forest boundaries (or "ecotones") have responded to climate change over the last 7,000 years in the Bolivian Amazon. The extent to which forest boundaries remained resilient to past droughts and fires can help inform predictions of how Amazonian forests will respond to increasing droughts and fires over the course of the 21st century.

Kerry Smith: My PhD research in the School of Biological Sciences is about functional biodiversity loss, which means understanding how the shape and size of mammals and birds is changing in response to human threats, including climate change. This might tell us how resilient mammal and bird populations are to human-induced change, to what extent ecosystem functioning will be affected by a warming world, and how important feedback loops are in understanding biodiversity loss.

ONE BRAIN, TWO TONGUES: Why Bilingualism Matters

Dr Toms Voits, who presented the 2021 Fairbrother Lecture via film from Norway, explains why speaking more than one language quite literally changes the brain.



Being able to speak more than one language has known benefits – it boosts career prospects, makes it easier to communicate abroad, and provides deeper insight to other cultures. In recent decades, researchers have studied the neurocognitive effects of bilingualism and found that bilingual experience also seems to (quite literally) change the structure and function of your brain.

Why bilingualism changes the brain

The brain is an incredibly plastic organ that above all strives to be efficient. When learning a new skill the brain adapts, optimising neural architecture to carry out the task using as little resource and energy as possible. Even with efficiency, the neural networks that are needed for a particular task can be strengthened and reinforced with increased engagement in the task. For example, in the brains of London taxi drivers brain structures that are important

for spatial navigation show a larger volume, while brain regions involved in auditory or motor function show changes among musicians and jugglers.

As with the examples above, bilingualism is also a skill that places demands on a cognitive resource, specifically that involved in cognitive control. Cognitive control is something we use every day. It is required to work, learn, focus, manage daily life and govern our emotions. When someone has two languages available to them, both languages are always active and competing in the brain. The brain must constantly control both and choose the language that is appropriate for different communication contexts by inhibiting and suppressing the language not in active use. This increased mental exercise leads to adaptations in the neural systems that support bilingual language control and cognitive control more generally.

Implications for later life

Increased demand for cognitive control in bilinguals has implications for the later years of life. Healthy older bilinguals have been reported to have built up a “neurobiological capital” of sorts that can be thought of as a structural reinforcement of the brain. This suggests that naturally occurring neural degeneration in healthy ageing individuals may take longer in bilinguals where there is a build-up of structural brain reserve.

These benefits extend to those diagnosed with Alzheimer’s Disease (AD) who appear to develop a cognitive reserve. Researchers find that they are performing better than would be expected for the extent of brain damage they have sustained, potentially explaining why bilinguals are on average diagnosed with AD four to five years later than monolinguals – although the brain is declining, they exhibit no symptoms initially because the brain is able to compensate for tissue loss.

The mechanisms behind cognitive or brain reserves are not yet fully understood. As AD is primarily known as a memory disease, my research examined the hippocampus, a structure essential to memory formation, sensitive to ageing and AD, and previously shown to change in response to bilingualism in younger individuals. We found that in both healthy older individuals and those with a diagnosis of Mild Cognitive Impairment (MCI) the hippocampus was greater in volume for bilinguals. Among those with MCI the onset of symptoms was later for those who actively used both their languages on an everyday basis, suggesting that it may not be just bilingualism per se, but the regular active engagement and use of both languages that could be the important factor in this context.

In the absence of a pharmacological cure or treatment for neurodegenerative diseases like AD and MCI, it is important to explore whether lifestyle factors, such as bilingualism, can contribute to delaying the onset of symptoms and prolonging healthy life expectancy. Understanding the exact neurocognitive impacts of bilingualism might inform policymakers, help promote bilingualism where it

already exists, and put greater emphasis on learning and using more than one language across the lifespan.

The Fairbrother Lecture is a University public lecture named after Jack Fairbrother who in 1929 became the first student to be awarded a PhD from the University. The lecture is an annual event at which a Reading doctoral researcher presents their research to a wider audience. The 2021 Fairbrother Lecture can be viewed at https://www.youtube.com/watch?v=Wm_IpwRuiwU.

This article is adapted from a Connecting Research blog published on 2 June 2021.

Toms Voits is a postdoctoral research fellow affiliated with the AcqVA Aurora Centre and the Psycholinguistics of Language Representation (PoLaR) lab at UiT the Arctic University of Norway. He was awarded a PhD in Psycholinguistics from the University of Reading in December 2020 and presented the 2021 Fairbrother Lecture.





IMPACT OF FLOODING on soil pollution

Floods are projected to increase in the UK as a result of more frequent and intense rainfall. Floodplains are areas of land that are used to help reduce the magnitude of floods downstream by storing excess flood water, making them useful for flood management. Human settlements have traditionally been situated next to rivers and so floodplains are often polluted by contaminants deposited from waste discharged by settlements located upstream. Arsenic, copper, lead, cadmium, chromium are potentially toxic elements that cannot be degraded. The frequency and duration of floods are predicted to increase due to climate change; therefore, it is important to understand the impact that increased flooding may have on contaminant mobility and legacy pollution.

My research addressed this uncertainty by collecting soil samples before, during and after a flooding event of the River Loddon from an area of the Loddon floodplain in Berkshire. Results showed that flooding did not influence the environmental fate of all potentially toxic elements in the same

“The frequency and duration of floods are predicted to increase due to climate change; therefore, it is important to understand the impact that increased flooding may have on contaminant mobility and legacy pollution.”

way; different soil contaminants behaved differently during and after the flood.

Overall, I found no evidence to support the previously held idea from laboratory studies that floodplains become a source of potentially toxic elements due to flooding events. Flooding generally decreased the contaminant concentrations in soil pore water; the concentrations of cadmium, copper and chromium were found to be lower

in soil after the flooding compared to levels before the flooding. Analysis of the sample area showed that the level of soil contamination across the floodplain depended on whether the sample was recovered from a low-lying area of the field or from an area at a higher elevation and therefore less susceptible to flooding. I also identified a mechanism that may explain the changes to contaminant mobility on specific floodplains; this mechanism is associated with the binding of potentially toxic contaminants to organic carbon or sulphides found in floodplain soils.

These results highlight the importance of understanding the processes that drive the mobility of potential contaminants on floodplains, so that site-specific predictions can be made on the impact of future floods on legacy pollution.

Dr Jessica Ponting graduated in December 2021 with a PhD. She was lead author on a **Science of the Total Environment** paper

Parliamentary PLACEMENT

In the summer of 2021, Katie Powell undertook a three-month placement with the Parliamentary Office of Science and Technology (POST). We spoke to Katie to find out more.

What did a typical day involve?

Firstly, I conducted a literature review to understand the policy around the subject I was tasked to write about for my policy placement. I then interviewed 30 different stakeholders, including NGOs, industry, academics, and government departments and agencies over a period of a few weeks to get a deeper understanding of the policy area. Then I produced a four-page briefing “POSTnote”. I started with more than one hundred pages of material from my research, but the brutal editing process helped me to hone my writing skills!

Were you based in Westminster?

Usually, POST fellows work in Westminster for three months. Unfortunately, COVID-19 restrictions meant I was sitting at my dining room table for the duration! However, I was working from a parliamentary laptop, which was something.

Were you working on your own or with others?

The briefing paper is a combined effort between the POST fellow and advisor, but I mostly worked independently. I enjoyed working with my advisor; it was

similar to working with a PhD supervisor. Interviewing the stakeholders made it feel more like a collaborative project, although getting comments back from so many people was quite overwhelming.

What was the significance of the policy paper you wrote?

It summarises the approach of a new area of biodiversity policy called Local Nature Recovery Strategies (LNRS). LNRS will map future opportunities for habitat restoration, in a way that connects species’ populations and delivers environmental benefits, such as carbon storage and water quality regulation. My POSTnote captured opinion about approaches that authorities could take to produce LNRS, along with the potential challenges for implementation.

What were the highlights of your placement?

My favourite part was interviewing such a broad range of people to understand the subject matter as deeply as I could. I feel like I have really broadened my horizons for the future through making these connections, as well as

expanding and deepening my knowledge in an area I hope to go into when I finish my PhD. I had the opportunity to see science and research from a new angle, from inside parliament, and understand how scientists can make a difference to policy-making. It was also a chance to develop my writing and communication skills. The placement has deepened my interest in the science-policy interface, and given me the confidence to get involved with establishing a new “English Policy Group” in the British Ecological Society.

Would you recommend a POST placement to others?

Absolutely! This is not just a useful experience for someone who wants to go into a career in policy, but for anyone who wants to know how to make an impact with their research.

Katie’s research within the School of Biological Sciences seeks to understand how the long-term decline of insect abundance impacts the wider functioning of ecosystems, such as pollination services and provision of prey species for predators. Her PhD is funded by the NERC SCENARIO Doctoral Training Partnership, but she is largely based at UK Centre for Ecology and Hydrology in Wallingford.

Read Katie’s POSTnote on DEFRA’s Local Nature Recovery Strategies <https://post.parliament.uk/research-briefings/post-pn-0652/>





THE BRILLIANT CLUB

An opportunity to help break down barriers to higher education.
PhD researcher Caitlin Lewis shares her experience.

What is The Brilliant Club?

The Brilliant Club is a UK-based charity that aims to increase the number of pupils from underrepresented backgrounds applying to university. To do this, the organisation recruits and places PhD students in primary and secondary schools to deliver a series of extra-curricular tutorials. The Scholars Programme requires a PhD student to design and deliver a course based on their own research. I developed a course focused on forest management and ecology.

How did you design your course?

Once accepted as a tutor through the interview process, I attended the tutor training programme which provided guidance on designing tutorials to support pupils' progress. I then developed a course plan, which was reviewed by The Brilliant Club before creating the course handbook. Whilst tutors have the freedom to decide on the course content, courses designed for The Scholars Programme are created within the structure set by The Brilliant Club.

How did you deliver your course?

I was offered a four-month placement at a local school starting in January 2021, teaching A level pupils with an interest in studying environmental-related subjects at university. Typically, pupils have a one-hour tutorial per week and a tutor is asked to teach two classes of 6-8 pupils for seven weeks. Initially we had planned for my course to be delivered face-to-face, but when schools in England resorted to virtual learning once again, following Christmas 2020, the material had to be adapted to be delivered online. Due to this, a number of pupils hoping to attend the course were no longer able to, due to issues with accessing technology during the designated timeslots. This in itself highlighted an issue which may be a barrier to higher education in the coming years.

What did you enjoy about teaching?

My research focuses on the impacts of forest management on water quality, which provided opportunity to include broader discussions on biodiversity and climate change. It was inspiring to hear how passionate the pupils were about current environmental issues and how creative their solutions could be. It was also insightful to learn about their opinions and prior knowledge on the importance of forest ecosystems, and how they related the course content to what we see every day in the media.

What was most rewarding about the experience?

The effort and commitment these pupils put into their education was inspiring and it was humbling to support that process. At the end of the course, the pupils shared that they felt they had developed confidence in their academic abilities and felt more open to applying to university. It was encouraging to have made a positive impact.

Would you recommend The Brilliant Club to other PhD students?

Definitely! Not only did the experience equip me with skills in course design, providing feedback, and oral communication, it also helped me to see my research from a new perspective, and gave me some much-needed motivation at the time. Many of us in the academic community are aware of the many barriers that limit the progression of students from underrepresented backgrounds to higher education – this is an opportunity to be part of the solution.

Caitlin Lewis is a PhD researcher in the School of Agriculture, Policy and Development, funded by the Natural Environmental Research Council. Her research is a collaboration with Forest Research and the British Geological Survey, and focuses on the impacts of forest management on groundwater quality.



GAMING the system

Tamisan Latherow, a doctoral researcher studying women's historical impact on British farming, collaborated on a project to integrate precision farming technologies into the computer game Farming Simulator. This highly successful simulation video game, with millions of players worldwide, has the primary aim of developing farmer skills; players can breed livestock, grow crops and sell assets created from farming. Tamisan helped test and present the new precision farming additions to a University of Reading focus group, and their responses helped fix bugs and streamline the information in the final module release.

Precision farming observes and measures real-time data to respond to field conditions, such as water and

fertiliser usage to maximise plant growth. Many of these precision farming technologies are not widely used by farmers. Therefore, the introduction of a selection of these technologies into the Farming Simulator gaming platform allows farmers, agricultural students and other stakeholders to understand and experience the benefits of precision farming to transform food production. It is hoped that this will in turn encourage the adoption of these precision farming techniques as part of working farming models.

Since its launch in December 2020, the new module has been downloaded more than a million times by players all over the world. The next round of technologies, including variable rate fertilisers, growth

changes based on weather and planting constraints, herbicide and pesticide usage and rotation practices will be available in the 2022 version of the game.

In October 2021, this European Union co-founded EIT Food project was awarded the EIT Food's Environmental Impact award for the novel and innovative way it communicated the benefits of precision farming to a wide audience, making a real difference and transforming our food system.

The project was led by John Deere in collaboration with the University of Reading, University of Hohenheim, Grupo AN, PAS Institute of Animal Reproduction and Food Research and GIANTS software



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