

# Public engagement in the GEES disciplines



A good practice guide

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CHES



Manchester  
Metropolitan  
University

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# I. Introduction

## I.1 Aim of the guide

This good practice guide explores the challenges, benefits and opportunities associated with higher education institutions (HEIs) engaging the public in the disciplines of geography, earth, and environmental science (GEES). We live in a world with massive global, societal and environmental challenges. Work undertaken in universities in the GEES disciplines contributes greatly to the search for solutions to these challenges. The GEES disciplines are increasingly being made accessible in the public arena and it is essential that this engagement with the public is effective, accurate and constructive.

The guide begins by attempting to address a number of questions: What is public engagement and why should we do it? What are the benefits to HEIs? What types of audience should we be trying to engage? The guide then provides principles and guidelines on how best to go about engaging the public, and outlines a wide range of examples from Manchester Metropolitan University. There then follows a series of case studies from across the breadth of the GEES subject areas and in different stakeholder contexts. These include engaging the general public with educational and research activities, supporting community activism, working with schools and colleges, collaborating with industry professionals, co-operating with non-governmental organisations (NGOs) and charities, getting undergraduate students involved, and working with the media. The final part of the guide looks at strategies for enhancing public engagement activities in HEIs with case studies from Manchester Metropolitan University and the University of Dundee. The guide ends with a collection of useful links and further resources around public engagement.

## I.2 Brief overview of the public engagement workshop

A one-day Higher Education Academy (HEA) funded workshop on public engagement in the GEES disciplines took place on 30 April 2012 at Manchester Metropolitan University. The event sought to debate the validity and value of public engagement, discuss the challenges, benefits and opportunities of public engagement, and to identify and collate good practice in public engagement in the GEES disciplines. The workshop included interactive presentations from speakers from across the GEES disciplines and a plenary that generated constructive dialogue. The event was aimed at both new and experienced practitioners involved in teaching, research and enterprise activities. A number of themes were addressed at the workshop including the use of media tools to convey complex information to the public; exploring strategies for public engagement with research; rewarding excellence in public engagement; engaging schools and colleges in GEES activities; and building relationships between GEES disciplines, community and industry.

The primary source of material contained in this guide is from contributions made in response to an open call via the HEA-GEES announcements mailing list and also from presentations delivered at the 2012 workshop. The guide, therefore, offers a snapshot of public engagement activities across United Kingdom (UK) GEES disciplines. It presents guidelines based on dialogue with those at the April 2012 workshop and the collective wisdom and experience of those who have contributed principles and case studies.

The general guidance, case studies and resources in this guide have been compiled for the GEES practitioner who would like to know more about the benefits of public engagement, how to go about it, and how to tap into the wide and varied experiences of those who have trodden the path before. Appendix A provides a list of the 16 case studies presented herein, and Appendix B enables you to identify case studies at-a-glance, based on their intended engagement audience(s). We hope that you find the guide both helpful and inspiring.

**Dawn Nicholson and Phil Wheeler**

## 2. Background

### 2.1 What is public engagement?

by Phil Wheeler

The National Co-ordinating Centre for Public Engagement (NCCPE) defines public engagement as “the myriad of ways in which the activity and benefits of higher education and research can be shared with the public.” It goes on to state that “engagement is by definition a two-way process, involving interaction and listening, with the goal of generating mutual benefit.” (NCCPE, 2013). Historic (and sometimes current) divides between ‘town and gown’ developed mistrust and misunderstanding, preventing both from identifying synergies that enable wider society to understand the knowledge that they are ultimately funding and for universities to ground their research and teaching in the ‘real world’.

### 2.2 Some drivers and benefits of public engagement

by Rob Duck

The drivers and benefits of public engagement are many but can be grouped under three principal headings: moral, business and academic.

*The moral case* for public engagement is paramount. Universities are not ivory towers but institutions of teaching, learning and research that must remain in constant dialogue with the interests and concerns of the communities that support them. They receive very substantial public funding and the public, therefore, has a right to know how its money is being spent; for instance, in terms of the range of research being undertaken and its potential impact upon society. Thus, public engagement is an essential civic responsibility.

*The business case* for public engagement has several elements. These include the potential to generate additional income for the HEI, to enhance its reputation, and to help to motivate staff and students. Embracing a culture of exciting public engagement such as public lectures, workshops, radio, TV and Internet broadcasting, as well as the publication of ‘popular’ articles across a range of disciplines, can make important contributions to the professional development of staff and students. In turn, this can help advance the quality of teaching and research, and improve the recruitment and retention of staff and students. Public engagement also helps ensure that young people – starting with primary school pupils – are attracted to study at university leading to wider aspirations for research-based and academic careers.

*The over-arching academic case* thus brings together several elements: inspiring learning, empowering individuals, and the potential to influence policy and generate prosperity.

### 2.3 Public engagement in the GEES disciplines

by Phil Wheeler

As universities engage more fully with the public, their position in society will become clearer. Subject disciplines will also benefit by becoming more familiar, more relevant, and appearing less obscure. The enthusiasm provided by staff for their subject can often be infectious and we must not forget that members of the public can be encouraged to contribute to a wide range of different research topics if approached in the right way.

In these days of whole scale changes to public policy associated with university funding and management, in terms of both teaching and research, it is especially important that the public understand how universities contribute to the national and international economy and also to wider society. This is particularly relevant today in the GEES subject areas of geography, earth and environmental sciences. At no time in our recorded history has human society been as globally interactive through international travel, commerce and communication as it is today. Understanding the cultures, histories and political developments of those countries that we trade with and visit is crucial to our ability to properly and effectively engage. In addition, there have never been such major environmental issues leading to real impacts on different groups of people. The changes to climate and the wider environment that may have been caused or exacerbated by human activities are of particular concern to many (especially poorer) peoples. Indeed, even in the west, increased frequency of extreme weather events, urban heat island effects, flooding and coastal erosion provide immediate examples of areas of real concern. Many such issues are highly complex, with often contentious causality, and can be extremely controversial. The work produced in universities can help to shed light on these problems, but conveying complex and extensive academic information for public consumption can lead to misunderstanding and provide a platform for particular vested interests. It is one duty of universities to provide its funders with balanced arguments based on known facts and likely theories, but in a way that is easily digestible and comprehensible.

Thus, there is a need for HEIs to provide high quality public engagement activities that meet the needs of a wide range of potential stakeholders. HEIs, the public, and the disciplines can all gain if such activities are well planned, targeted and delivered in an inspirational and professional way.

## 2.4 The different partnerships of public engagement

by Phil Wheeler

There are many different partners or audiences for engagement – from children in schools and associations with local communities, to work with industry and commerce, and links to policy makers and governments locally, nationally and internationally. Table 1 lists some of the benefits accruing from engagement with different groups and stakeholders. It should be noted that many of the most effective public engagement activities are not achieved on the basis of university staff as the ‘experts’ and members of the public as ‘worthy recipients’ of the knowledge transfer, but rather in situations where partnerships develop and university staff benefit reciprocally.

Table 1: Some benefits from engagement with different types of ‘audience’			
Partners	Benefits for the public	Benefits for HEIs	Further information
Schools and colleges	Can inspire and educate as well as reveal pathways into higher education	Understand pre-university education and assist in subsequent transition to HE	<a href="http://www.publicengagement.ac.uk/how/guides/working-schools">http://www.publicengagement.ac.uk/how/guides/working-schools</a> and <a href="http://www.sci-eng.mmu.ac.uk/he_stem/regional_projects/actions/?show=1">http://www.sci-eng.mmu.ac.uk/he_stem/regional_projects/actions/?show=1</a>
Local communities, the general public, interested amateurs	Education and skills development and understanding of complex issues	Better links between “town and gown”	<a href="http://www.publicengagement.ac.uk/how/guides/working-with-local-communities">http://www.publicengagement.ac.uk/how/guides/working-with-local-communities</a>
Museums, libraries, galleries, exhibitions	Provides the public with access to mainstream work and special exhibitions	Offer access to an informed and interested audience as well as possible archive and other material	<a href="http://www.publicengagement.ac.uk/how/guides/working-museums-libraries-and-archives">http://www.publicengagement.ac.uk/how/guides/working-museums-libraries-and-archives</a>
Media (e.g. press, digital and broadcasting)	Raised awareness of current research topics and outcomes and a greater understanding of publically funded research	Provides wide ranging publicity for the institution and enhances the public understanding of research	<a href="http://www.publicengagement.ac.uk/how/guides/working-news-media">http://www.publicengagement.ac.uk/how/guides/working-news-media</a>
Industry, business and professional practitioners	Knowledge transfer and skills development and provides research and staffing for the future	Understand commercial contexts and enhance student employability	<a href="http://www.publicengagement.ac.uk/how/guides/businesses">http://www.publicengagement.ac.uk/how/guides/businesses</a>
Government agencies (e.g. justice system, police), policy-makers	Application of expert knowledge to solve complex problems, and informs planning and provides evidence base for decisions	Institution at the cutting edge of decision making, opportunities to apply research and make teaching more relevant.	<a href="http://www.publicengagement.ac.uk/how/guides/engaging-policymakers">http://www.publicengagement.ac.uk/how/guides/engaging-policymakers</a>
Voluntary organisations, charities and trusts	Develop knowledge and skills and raise awareness	Networking opportunities and publicity for research	See case studies 5, 6 and 7 in this guide

Adapted from: National Co-ordinating Centre for Public Engagement (NCCPE) (<http://www.publicengagement.ac.uk/>)

## 3. Principles and good practice in public engagement

### 3.1 Some general principles for public engagement events

*by Jo Verran and James Redfern*

Public engagement can take many forms, from individual links (e.g. pupil placements or mentoring of staff in industry) to mass media approaches (e.g. via radio, television and social media). In all cases, the target audience must be considered carefully to ensure that the method of communication is appropriate and that the language (including any necessary jargon) is set at the correct level. The background of the audience (level and range) must be understood to avoid appearing patronising or overly academic. It is also important to acknowledge and remove any barriers to accessibility, be they cultural, cost-based, linguistic or physical. Appropriate publicity and targeting (including social marketing) can help to attract the desired audience, as can working with partners who already have access to such groups. Partners can include public organisations, community groups, non-governmental organisations (NGOs), etc. Sound preparation and total professionalism is the key to a successful engagement. The general guidelines below provide some brief tips for successful public engagement activities arising from our own experiences.

**First, identify your message and your audience.** Do you just want to enthuse people about science? Do you want to collect information from the audience? Do you want to explain the results of your research, or give out a key message? The 'public' comprises an infinite range of potential audiences for whom targeted activities/events are appropriate – families, adults, special interest groups, the elderly, community groups, schools, teachers... indeed, the term 'publics' is becoming more generally used. Public engagement can be used to widen access and enhance social mobility as well as raising the profile of your university as an approachable institution with fantastic facilities, enthusiastic staff and students, and a finger on the pulse of contemporary science.

**Is an appropriate event approaching?** Local science festivals provide an overarching organisational structure that should help you to promote your event. Some local events have attained national impact (e.g. Cheltenham Science Festival). National events such as the Big Bang or the Royal Society Summer Science offer a significant audience. Learned society conferences frequently facilitate participation in such events, or at their own meetings. Or, are there regular local events – Café Scientifique, Bright Club, book clubs, Women's Institute meetings, etc., – that might be appropriate? Finally, there are certain days in the calendar which can provide a hook for specific related activities.

**What about location?** University laboratories are always impressive, but could be intimidating and there may be health and safety issues to consider. Children love to see microscopes and other equipment; we let them dress up as scientists, be photographed (with permission) and receive a 'scientist trainee' certificate. Or would your audience be more comfortable in a pub, shopping centre, community centre or football museum?

**There are many practical responsibilities to consider:** Have you carried out a risk assessment? Is appropriate insurance in place? Are first aiders required? Is the location well maintained? If children are present, have Disclosure and Barring Service (DBS) checks been done? Do you have permission to take photographs?

**In terms of attendance, are you sure you are going to have an audience?** How have you advertised or promoted your event? Does the event have a drop-in format? Is it a time-constrained workshop in a laboratory? A lecture? Did you identify an appropriate advertising route for the intended audience? Should the event be ticketed? If there are space limitations, free admission often ensures a 'sell-out' on paper, but with no commitment to attend, audiences can be significantly reduced, with ticketless individuals being unnecessarily turned away. A small charge helps confirm attendance.

**How are you going to evaluate the success of your event?** As with any lesson plan, identify intended outcomes and build in evaluation strategies. Numbers give some information about reach and participation, but not about evaluation or engagement. Participants may feel like guinea pigs if they are repeatedly asked questions relating to your evaluation needs, so in a large event it is important to co-ordinate the process. Post-it notes allow free text comments on enjoyment or new knowledge, but the latter is only demonstrating short-lived transfer of information (it is very difficult to show learning). Using email addresses for subsequent follow-up is a possibility. More active engagement involves crowd-sourcing, where the audience provides data, information or problems that the scientists can subsequently utilise. With citizen science, the public has entire control of their activities.

Proactively involve your university press office and collect and collate evidence of impact,

### 3.2 Examples of public engagement from MMU

*by Phil Wheeler*

At Manchester Metropolitan University (MMU), a number of public engagement activities have been relevant to GEES subject areas in the past few years. Table 2 lists some of these and shows the type of 'audience' involved in each case.

**Table 2: Examples of GEES related public engagement activities at MMU**

<b>Audience</b>	<b>Topic area</b>	<b>Comments</b>
General public (adults and amateur enthusiasts)	Guided human and physical geography walks	Walks targeted at the human and cultural geography of the area around the university, and geology and physical geography walks for the Cheshire's Regionally Important Geological and Geomorphological Sites (RIGS) Group.
General public (adults)	Urbis research forum	Monthly meetings for people living in, designing, managing and/or studying cities. Includes geographical aspects as part of a wider range of topics (architecture, philosophy, engineering and sociology). Including a presentation on "light and social order".
General public (adults)	Modernist dreams and utopias: the changing landscape of the North-West	Curated and hosted series of eight film screenings with guest speakers at Manchester City Art Gallery delivered in partnership with the Manchester Modernist Society and the North West Film Archive.
General public (adults)	"Himalayan glaciers and water resources"	Talk for Oxfam Manchester on the importance of glaciers as a water resource for circa one billion people in Asia. <a href="http://www.manchester-oxfam.org/node/5102">http://www.manchester-oxfam.org/node/5102</a>
Digital media professionals and general public	Data mapping and walking the city	Social Media Café presentation – The Northern. Manchester. <a href="http://socialmediamanchester.net/">http://socialmediamanchester.net/</a>
National Park Authority	Applied research with Peak District National Park	Long-term monitoring research on the restoration ecology of moorlands has also involved active management experiments in collaboration with NGOs and plant suppliers. [Case study 14]
Industry, NGOs, regulators	Aviation impacts on climate and air quality	Leadership of group within International Civil Aviation Organization (ICAO), engaging international science experts to prepare and present three science 'white papers' to brief an audience of national state members of ICAO's environment committee, and observer organisations (EC, airports, manufacturers, airlines). [Case study 8]
Local residents, airports and policy makers	Airport noise control	Following wide-ranging research and consultation on aircraft noise impact on homes close to airports, the Centre for Aviation, Transport and the Environment (CATE) at MMU has influenced UK noise policy. [Case study 8]
Bird watchers, conservation bodies and policy makers	Bird conservation	Collaboration between MMU researchers and international conservation bodies such as Birdlife International has produced an accessible book targeted at the general public as well as an evidence-based report aimed at policy makers to publicise important messages around bird conservation.
Professional architects and students of architecture	Football stadiums and the city	Video presentation for UK-based student architects MIES, <a href="http://mies.org.uk/2013/05/18/football/">http://mies.org.uk/2013/05/18/football/</a> and the RIBA Hub, Manchester. <a href="http://www.architecture.com/regionsandinternational/uknationsandregions/england/ribanorthwest/ribahub.aspx#.Uc73P9isKkl">http://www.architecture.com/regionsandinternational/uknationsandregions/england/ribanorthwest/ribahub.aspx#.Uc73P9isKkl</a>
General public, local authority stakeholders and decision makers	Property level flood protection technologies	Development of best practice guidance to help the public and decision-makers to install property level flood protection products. Co-authored by Manchester Metropolitan University, University of Manchester, and the Building research Establishment (BRE). The guidance has been endorsed by the Association of British Insurers, Defra, the Environment Agency, the Flood Protection Association, the Local Government Association, and the National Flood Forum.
TV audience – mostly 5-12 year olds	Can building snowmen reduce flood risk?	Short TV interview (CBBC Newsround) in response to Environment Agency advice that building snowmen could reduce flood risk. Video can be watched here: <a href="http://www.bbc.co.uk/newsround/21179342">http://www.bbc.co.uk/newsround/21179342</a>
Primary school children	School grounds management	Work between MMU students and staff and local primary schools has encouraged better school ground management for wildlife and better use for school curriculum delivery.
Primary school children	Primary school visit for National Science week	Visits to a local primary school where children in Year 5 learnt about invertebrate diversity and life-cycles, using pit-fall trapping to sample invertebrates, hunting for tardigrades, using light microscopes and designing invertebrate sampling equipment.

Sixth form students and their parents	“The Glaciologist: an unexpected journey”	A talk and presentation of awards to students. General advice on building a career and taking life’s opportunities.
Secondary school and college staff	Development of skills in statistics	Short courses designed and delivered around the A-level syllabus have improved statistical skills for Geography teachers.
Geography lecturers and teachers	A Hundred years of Blackpool illuminations	Presentation to the Manchester Geographical Society.
Sixth form students	Geohazard processes, impacts and mitigation	Specialist subject presentation that contributed to the A-Level curriculum but also provide school pupils with an insight into university life. [Case study 9]

### 3.3 Public engagement in microbiology: learning by doing

by Jo Verran and James Redfern

Professor Joanna (‘Jo’) Verran is Head of Science Communication and Public Engagement in the Faculty of Science and Engineering at MMU. Her teaching and research specialism is in the field of microbiology and Jo has been awarded a National Teaching Fellowship for her work in microbiology education and outreach. In higher education, we are sometimes guilty of working in isolation from closely allied discipline areas, creating a ‘silo’ mentality. In reality, we can learn a tremendous amount through seeing how things are done in other discipline areas. Here, Jo and James outline a number of examples of public engagement in microbiology at MMU to provide a flavour of the diversity of possible activities:

**Microbiology and literature** – the Bad Bugs Book Club ([www.hsri.mmu.ac.uk/badbugsbookclub](http://www.hsri.mmu.ac.uk/badbugsbookclub)) comprises scientists and non-scientists who read and discuss novels where infectious disease forms part of the plot (Verran, 2013). Over the past four years, we have read almost 30 novels. We often combine meetings (Figure 1) with relevant days in the microbiology calendar. For example, on World Malaria Day, we worked with musicians who composed and performed songs and an afternoon community event; on World AIDS Day, we displayed our MMU community tapestry at the Manchester People’s History Museum (microbiology and textiles).



Figure 1: Members of the public and microbiologists in discussion during a Bad Bugs Book Club gathering

**Microbiology and art** – we hosted an exhibition of undergraduate scientists’ art in a Manchester Northern Quarter art gallery (Figure 2). The accompanying catalogue provided information about the science behind the works on display.



Figure 2: Natasha Khan's silk paintings and collages of 'aspergillus'

**Microbiology and monsters** – the MoMiMa (monsters, microbiology and maths) group comprises microbiologists and computer scientists who have developed SimZombie, an outbreak simulation that enables the principles of epidemic disease to be considered using vampires, zombies and werewolves. A wide range of activities (pub quiz, role-play, workshops, book clubs, Continuing Professional Development (CPD) activities for teachers) have been delivered, for example, at the Manchester Children's Book Festival, Manchester Science Festival, and scientific conferences, with some support from the Society for Applied Microbiology. Two of the microbiology team were also invited to take part in 'Deadinburgh', an immersive theatre event.

**Microbiology in the laboratory** – 'The good, the bad and the algae' began as a hands-on microscopy workshop including identification of an unknown species from a key, coupled with modelling. This was developed into a drop-in activity as part of the Big Bang, with the Society for General Microbiology. 'Plaque attack!' encompassed microscopy, plaque disclosing and cleaning, biofilm modelling and destruction, and has also been utilised at the Big Bang (Redfern *et al.*, 2013).

**Microbiology out of the laboratory** – the 'Manchester Microbe Map' was developed as part of a DIY Bio-citizen science project. After training, members of 'DIYBio' swabbed bus stops around Manchester (with permission), and quantified, depicted and recorded their findings on an interactive map. '...now wash your hands' used fluorescent gel to represent hand contamination, and agar handprints were taken from participants. These were incubated and results posted on Flickr (<http://goo.gl/FLP9z>) – hits indicated the extent of participation and interest. 'A longer look at lichen' included microscopy and hands-on printing; participants were also provided with a lichen-hunter's kit (small magnifying glass, information and contact details) so that they could record and report colony sizes centrally after the activity. 'The very small world of viruses' attempted to demonstrate the relative size of viruses, their importance and uniqueness and key messages regarding immunisation and treatment alongside informative videos of virus models, making a virus (to hang on a Christmas tree – it was 1 December, World AIDS Day), and cheek swabbing (to show relative size of virus to cell, coupled to a giant cell carpet). Again, numbers of models made helped inform regarding participation.

The examples above describe some of our experiences of public engagement, and hopefully passes on some of what has been learnt. We need to improve our evaluation, advertising, and use of web sites and social media. There are now very many sources of information, tips and tools, conferences, journals and books about science communication and public engagement, some of which are noted in the resources section at the end of the guide. Evaluation, crowd sourcing and citizen science are becoming important research activities alongside the importance of talking to people about our work. The most important point we can make is that the activities are two-way, and should be enjoyable, informative and positive experiences for all concerned. Share the work and ideas with like-minded individuals and teams in other disciplines, and enjoy yourself!

## KEY RESOURCES

Verran, J. (2013) Return of the zombies. *Microbiologist* 14 (2): 26-27, publication of the Society For Applied Microbiology ([www.sfam.org.uk](http://www.sfam.org.uk))

Verran J. (2010) The microbiology of vampires. *Microbiology Today* 37 (4): 248-49, publication of the Society for General Microbiology ([www.sgm.ac.uk](http://www.sgm.ac.uk))

## 3.4 Engaging with the general public

Case study 1 demonstrates one of the ways in which universities can engage with the general public and promote interaction with academics through debating topical science issues at a pub-based café society.

### CASE STUDY 1: A Café Scientifique in Cheltenham by James Derounian

The University of Gloucestershire established a café society (CS) in Cheltenham. Our CS is a local version of a Café Scientifique, that is, "a place where... anyone can come to explore the latest ideas in science and technology. Meetings take place in cafes, bars, restaurants and even theatres, but always outside a traditional academic context." (<http://www.cafescientifique.org/>).

Our café society events were hosted by a Cheltenham pub, on a weekday evening, on a quarterly basis. The reason that we embarked on this venture was to take the academy out to the people. Each session, lasting about two hours, started with a free drink - courtesy of the university. The promise of free refreshment was, at least initially, a lure to attract participants. café society attracted between 30 and 50 people to discuss a topical issue, which was briefly introduced by an academic specialist.

Topics very broadly reflected on ‘science and technology’ and ‘geography and environmental sciences’. For example, ‘climate change – fact or fiction?’, ‘the question of evil’, and ‘fatboyslim – childhood obesity’.

After a short 10-15 minute introduction, people fell into discussion at their tables (in groups of around five members). When the hubbub began to die down, usually after about 45 minutes, a facilitated discussion then took place. The regular ‘MC’ was a lecturer skilled in community engagement and facilitation who was able to encourage any and all participants to contribute with observations, questions and points for discussion. These might be directed at other audience members, at the speaker, or both. There was no attempt to summarise these often wide-ranging and well-informed debates. An event ended with details of the next session.

Benefits of the activity:

- simplicity – a pub venue, and an academic colleague to introduce a topical subject
- Informality;
- one-off impact on individuals introducing a provocative theme;
- facilitating members of the public to interact with academic staff at a neutral and public venue;
- free entry and initial refreshment;
- anonymity – no one knows your background (i.e. non-university or academic);
- regular publicity for the university, staff, teaching and research;
- a shop window for the university and its courses;
- attendees are added to an electronic database and kept informed of future CS events;
- the regular Monday evening slot and start time encourages (casual) visitors to attend;
- potential to scale up and link to Cheltenham Festivals or establish a festival of ideas;
- requires very modest funding;
- the publican was delighted with the extra trade on a quiet weekday.

Because of its simplicity and the very modest call on staff time, a café society can be highly sustainable. As long as there are staff willing to arrange and front the event, people wanting to attend, a venue keen to host, and topical matters to discuss, then the CS has a real chance of continuing over time. To get a café society going in your own HEI it is suggested that a ‘war party of the keen’ is established, comprising say 5-10 staff members, who can link to colleagues and subjects across the establishment.

## KEY RESOURCE

Café Scientifique - <http://www.cafescientifique.org/>

**RELATED CASE STUDIES:** 2, 3, 4, 6

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## 3.5 Engaging with museums, galleries exhibitions and libraries

The next three case studies focus our attention on approaches to universities engaging with public events and venues such as art galleries and exhibitions. In case study 2, we see how a university is enriching the experience of visitors to a campus-based attraction, and highlighting the inter-weaving of aesthetic, cultural and historic heritage, with current and future concerns for biodiversity and environmental sustainability. In case study 3, academics tackle the challenge of communicating complex information to a non-specialist audience. A sediment core display at an established science centre is used to explain ideas about climate and environmental change, both to the general public and to the media. A university art gallery provides the focus for case study 4, which outlines two exhibitions set up to explore links between science and art, in a very public setting.

### CASE STUDY 2:

#### A biodiversity visitor attraction at Canterbury Christ Church

by Peter Vujakovic

The Department of Geographical and Life Sciences, Canterbury Christ Church University (CCCU), has been instrumental in developing an innovative campus-based biodiversity initiative (Figure 3) based within the Canterbury UNESCO World Heritage Site (WHS). The WHS is the major attraction for visitors to Canterbury and provides an excellent opportunity for

the university to engage with the public. The university has a memorandum of understanding with Canterbury Cathedral to steward this common resource, and is engaging with other important stakeholders in the WHS.

‘Christ Church Bioversity’ (correct spelling) was created and developed by Professor Peter Vujakovic, lecturer in biogeography and environmental management. This biodiversity initiative focuses on the creation of a unique identity and sense of place based on the university’s location in the Canterbury WHS. The university’s site, located within the former precincts of St Augustine’s Abbey, is a recognized centre of learning with a fourteen hundred year history and this is reflected in the Bioversity Project. The wider WHS includes Canterbury Cathedral and St Martin’s Church (the oldest Church in the English speaking world that is still used for worship). Heritage forms a key element of CCCU’s approach to biodiversity and environmental stewardship of the site.



**Figure 3: Part of the ‘green link’ to the wider campus-based Bioversity initiative**

The ‘Bioversity’ initiative focuses on the enrichment of the experience of the local community, visitors to Canterbury, and members of the university through contact with nature. The site is being transformed into an urban biodiversity hub which reflects its rich cultural and environmental heritage, but which also focuses on the future through concern for social and environmental responsibility.

The initiative acknowledges CCCU’s responsibility for the environment in which it operates and the communities that it serves. The project involves developing the wildlife and biodiversity potential of the site by innovative restoration and management of its green spaces. The project focuses on cultural biodiversity, for example, the recent planting of an orchard and a medicinal and culinary herb garden. This provides continuity with past communities and knowledge systems of the abbey and cathedral (e.g. the 11th century

Canterbury Herbal, now held in the Bodleian). The project includes planting of rare and local varieties that represent the monastic tradition, but also reflect the wider Kentish agricultural and environmental heritage, and reference current developments in areas such as plant science and climate change. Each of these developments has dedicated external information panels aimed at visitors to the WHS. The site has also been incorporated into the ‘Britain in Bloom’ campaign, to show locals and visitors that gardens are not just about aesthetics, but can also play an important part in environmental improvement.

The university is also seeking to develop ‘green links’ to the rest of the WHS, and the wider city, working in partnership with a range of local stakeholders. A phase 1 habitat survey (JNCC, 2010) of the whole WHS within its wider city setting is taking place in 2013 to map the ‘green infrastructure’ involved. The initiative aims to create connections with the wider community, and generate innovations in teaching, learning and research across the arts, sciences, health and wellbeing, and education studies. It is also a major motivational focus for CCCU’s approach to social and environmental responsibility. The focus on stewardship through biodiversity provides a launch-pad for a wider discussion and engagement with the sustainability agenda, and links the local and the global.

## KEY RESOURCES

Canterbury Christ Church University. (2013) *Sustainability – Working Hard To Make A Difference* [online]. Available from: <http://www.canterbury.ac.uk/AboutUs/Sustainability/Home.aspx> [date accessed]

UNESCO. (2013) *Canterbury World Heritage Site* [online]. Available from: <http://whc.unesco.org/en/list/496> [date accessed]

## RELATED CASE STUDIES: 3, 4

## CASE STUDY 3:

### An interactive sediment core exhibit

by Wendy Woodland

The Department of Geography and Environmental Management at the University of Western England (UWE) in Bristol assisted @Bristol (one of the UK's largest interactive science centres) to design an interactive sediment core exhibit. This was in support of their new exhibition 'Our World – no more waste', a ten-year exhibition focussing on aspects of the Earth system such as nutrient cycling, weather systems, tectonic systems and climate change.

The sediment core exhibit helped visitors to understand how a record of climate and environmental change is recorded in fossil sediments spanning 15,000 years of Earth's history. It consisted of a 1:1 scale sediment core (displayed vertically to emphasise the length of the archive beneath our feet), supported by an interactive film explaining how the core was collected and the evidence it contains for climate and environmental change.



**Figure 4: A UWE geography academic being interviewed by the BBC, explaining how the sediment core was collected and what it reveals about climate change**

Academic and technical staff from the Department collected the sediment core and filmed the activity. We involved @Bristol staff in the fieldwork and they recorded the activity on their live Twitter feed. A local BBC TV news crew also filmed the coring process and interviewed UWE academics and @Bristol about the collaboration (Figure 4). Department staff then prepared samples of fossil pollen and sediments, and text and video commentary for the display, and advised @Bristol on science language and content.

Academic staff benefitted from the challenge of communicating complex science and non-familiar subjects to a non-academic visitor audience. Technical staff benefitted from involvement in a departmental outreach activity, witnessing how laboratory procedures can be communicated to a non-specialist audience and helping academic staff to prepare the final video footage for the display. @Bristol staff benefitted from involvement in core collection and sample preparation, which gave them an opportunity to place the soil core exhibit into a broader context. An unexpected benefit from the activity is that we are now using a duplicate of the sediment core display in our teaching – it allows us to teach about sediment coring and sediment types in a classroom environment without getting our hands dirty!

The profile of the department was enhanced locally and regionally and we are seen as a supportive, and accessible team, keen to be involved in local enterprises. We have since been invited to follow-up events linked to the sediment core exhibit. Given that this is a ten-year exhibition, we hope to further enhance our partnership with @Bristol.

#### KEY RESOURCES

@Bristol exhibition 'Our World' <http://www.at-bristol.org.uk/ourworld.html>

**RELATED CASE STUDIES:** 2, 4, 14

## CASE STUDY 4:

### Art meets environmental science... and gives birth to a 'fictional hybrid'

by Peter Vujakovic

The Ecology Research Group (ERG) at Canterbury Christ Church University (CCCU) comprises a group of academics who contribute to teaching in Environmental Science, Ecology and Conservation, and Geography. The team has become actively involved, in partnership with the university's Sidney Cooper Gallery, in public engagement with the environmental sciences

through the arts. The Sidney Cooper Gallery has a high-street presence in the centre of the historic city of Canterbury, a major tourist destination with a large public footfall. Members of the ERG were involved in the development of two major exhibitions in 2011 and plans are in place for further events, as well as outreach to other areas in the south-east. The exhibitions gave an opportunity for staff to engage with the wider public, and to show how scientists can work with artists to benefit a wider understanding of the environment.

The first exhibition, 'Red List' (September to November, 2011), explored issues of concern to contemporary nature conservation such as extinction; threat to species and habitats; the impact of invasive species; and 'ownership' of nature. Employing a diverse range of media, process and materials, the artists involved sought to question our associations with the natural world. The artists in this exhibition included Neeta Madahar, Paul Hazelton, Stephen Melton, Ben Rowley and Richard Barnes. The ERG was involved from the beginning in planning the exhibition and advising on themes. Members of the ERG in a series of information panels that formed a part of the exhibition, explained their active engagement in several areas of environmental research, including disturbance ecology, human-predator relations in conservation (Figure 5), and sustainable pest control using ladybirds. The exhibition provided an excellent opportunity to explain to the general public the environmental research work undertaken by their local university.



Figure 5: Part of the Red List exhibition

The second exhibition, 'Fictional Hybrids' (November to December, 2011), was a joint initiative with the nationally renowned Stour Valley Arts. The exhibition consisted of artwork and photography by Vera Möller, artist in residence in King's Wood, Kent, in 2009. Her training in botanical science informs her artistic practice. Her subjects were imaginary species (often fungal in form) constructed as minute sculptures and then photographed in nature as "mutant protrusions on the forest floor that are close enough to reality to seem plausible". Möller notes "[the] themes I pursue in my practice [can be] characterised as a sustained examination of the fluid boundaries between 'naturalia' and 'artificialia', biotech and nature, the real and the imagined. Particular subjects I continue to explore are notions of hybridity in biology

and ideas relating to hypothetical or imaginary specimens." Peter Vujakovic (ERG) contributed to the exhibition catalogue (Vujakovic, 2011), with a section

exploring the links between hybridization in life and in art, and was 'in conversation' with the artist at a public open evening at the gallery, discussing issues related to science, nature, biotechnology, culture and communication. The exhibition was also used as a 'field-trip' location for an innovative exercise as part of an undergraduate module in biogeography at CCCU.

## KEY RESOURCES

Ecology Research Group (ERG), Canterbury Christ Church University [online]. Available from: <http://www.canterbury.ac.uk/social-applied-sciences/geographical-and-life-sciences/Ecology-Research-Group/Home.aspx> [date accessed]

Sidney Cooper Gallery (Canterbury Christ Church University) exhibitions 2001 [online]. Available from: <http://www.canterbury.ac.uk/sidney-cooper/past-navigation/2011.asp> [date accessed]

## RELATED CASE STUDIES: 2, 3

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## 3.6 Engaging with voluntary organisations, charities and trusts

This section explores ways in which GEES academics can interact with a variety of small, local organisations such as charitable trusts, voluntary groups and individuals. In case study 5, a 'flipped academic' shows how working with small local trusts can inform constructive dialogue with local planning authorities and underpin community activism around long term issues in food security. Case studies 6 and 7 demonstrate how student-centred activities can work particularly effectively with local organisations such as these. Such collaborations can deliver a wide range of associated interactions, for example, with the general public, interested amateurs, and professional practitioners. They also offer excellent opportunities for embedding innovative approaches to learning (e.g. field-based, problem-based, and research-based learning).

## CASE STUDY 5:

### Tales of a ‘flipped academic!’ engaging with medieval barns, community groups and new foodscapes

by Richard Spalding

I had not realised that what I had been doing for a good decade now was being a “flipped academic”. I had always believed that a major role in my academic life was to work with real projects on the ground and to learn from them. Alex Bruton at Mount Royal University in Canada sees a flipped academic as one who informs first and publishes later, seeking usefulness as well as truth in their research, and striving only to publish after having had an impact on students and society (Bruton, 2012). I don’t know if I have done that, but the work has produced knowledge and this has been passed on to undergraduates through teaching and engagement with real projects as powerful links beyond the academy. This is not easy work; in fact it continues to be deeply challenging. It is participatory and requires a deep commitment to the idea of learning through doing. It has also allowed me to develop a tough old hide to deflect flack from colleagues and community activists alike as well as having some fun along the way.

It has been possible to engage with academics, royalty, celebrities, politicians, students and many local ‘fiery spirits’ along the way. Two strands of activity have emerged from my desire to set my learning into a context of public engagement:

- working with Winterbourne Medieval Barn Trust to help secure the future of a semi-derelict and nationally important agric-cultural (the hyphen is deliberate) building on the north Bristol fringe:
- working to create the Blue Finger Alliance, Bristol, which campaigns to bring back into contemporary agricultural and horticultural use some of the finest and most productive soils in the UK.

These two strands are held together through a geography of food and place – historic farm buildings and their heritage-led regeneration coming together with new initiatives to help feed the city. Using old landscapes as assets in the creation of new foodscapes in this era of deep concern about long-term food security and resilience lies at the heart of the endeavour. Doing all of this in a particular place – on and around a finger of land sticking out of the highly contested ground that is urban fringe.

The nature of my public engagement has been to try to mobilise community initiatives through the creation of charitable trusts, negotiation with planning authorities, countless evenings away from home and seeking opportunities to develop the rich seam of ideas held within local communities as to how their places and spaces might be developed for the future. The benefits of all of this activity have been knowledge transfer between community, local authority, and university. The longer term sustainability impacts have been to open up a debate on place-making which has resonated across the land. It sounds grand, but the flipped academic in me is quietly proud of the deeper learning from practice which these off-campus activities have achieved. I did revert to traditional academic for respite, but it didn’t have the energy and joy of being flipped. I think I will stay flipped as much as I can. This is a personal account of my own public engagement close to my university. I am not claiming anything unique here, but simply noting that the sense of working to ‘shape place’ lies at the heart of many of our GEES endeavours, certainly within human geography.

#### KEY RESOURCES

Bruton, A. (2012) The Flipped Academic. The Innographer.com (blog). Available from: <http://theinnographer.com/flipped-academic/> [date accessed]

Spalding, R. (2013) Daring to Volunteer: some reflections on geographers, geography students and evolving institutional support for community engagement in higher education. *Journal of Geography in Higher Education*. 37 (1), 59-64

The Blue Finger Alliance. [www.bluefingeralliance.org.uk](http://www.bluefingeralliance.org.uk)

Winterbourne Medieval Barn Trust [www.winterbournebarn.org.uk](http://www.winterbournebarn.org.uk)



**Figure 6:** Top left – Bristol students working at Winterbourne Medieval Barn; top right – gloves awaiting volunteers; bottom left – Michael Eavis CBE (founder of the Glastonbury Festival) recounts his own experiences of regenerating the medieval barn at Pilton.

**RELATED CASE STUDIES:** 6, 7

## CASE STUDY 6:

### Introducing students to the real world of international development

by Alan Dixon

One of the key challenges often facing teaching and learning in the field of development geography is providing relevant experiential and immersive learning activities for students in the absence of overseas fieldwork opportunities. This case study outlines a recent innovation within the Geography programme at the University of Worcester that has addressed this challenge by providing student learning opportunities via links with civil society and NGOs involved in international development and development education. This has taken the form of collaboration between the university and a local charity in organising a public conference.

Beacons Development Education Centre is a small charity based in Great Malvern, whose aim is to raise awareness of international development issues among young people and schools in the Worcestershire and Hereford areas. Since 2005 it has held an annual conference on a development theme (e.g. water, conflict, sustainable development). Although the conference attracted a wide range of participants from various backgrounds ranging from interested members of the public, teachers and civil servants, to academics and development practitioners from NGOs, it has struggled to attract young people in any great numbers. However, as a result of closer ties between Beacons and a member of the Worcester Geography team, the 2011 annual conference was held for the first time within the university itself (Figure 7), re-branded as a 'student conference', and critically, explicitly linked to learning in a second year module 'Geographies of Development'.



**Figure 7: Conference participants (left)**

Rather than simply suggesting to students that they attend the conference because it was 'good for them', learning activities within the module were modified so that they became more aligned with the conference experience. Within the module, students were required to produce a poster for the conference on a development theme of their choice, but with the caveat that they at least attempt to highlight the synergies between their development topic and the conference theme. Prior to the conference, posters were presented during a class 'gallery' session for peer review and discussion. The best six were subsequently enlarged for display at the conference itself, where all participants voted for a winner and runner up who each received a small prize. Although the poster

competition was a means of incentivising student participation at the conference, it was also developed as a means for students to gain formative feedback on their treatment of the development topic (Figure 8), in preparation for a summatively assessed policy briefing paper to be submitted later in the module.

**Figure 8: Students participate in a workshop discussing international aid priorities (right)**

The first conference, entitled 'The Politics of Aid', included speakers from Hereford-based NGO Concern Universal, and international ethical investment movement Shared Interest, as well as the local member of parliament (MP) and academics from the Universities of Worcester and Exeter.

While evaluations revealed that students found the academic content of the conference interesting, it was the networking opportunities that were valued most highly – in particular the experience of being able to interact with a range of professional practitioners in the field of development, and being able to meet informally with participants from varied backgrounds. Many (although not all) enjoyed the poster competition, since it helped them focus their ideas for their summative assessment, and gave them the opportunity to utilise different skills. In addition, most students enjoyed the pre-conference 'gallery' session that allowed them to view and assess the work of their peers.



Meanwhile, Beacons volunteers have been overwhelmingly supportive and positive of student involvement, suggesting that it has reinvigorated the annual conference. Many have been impressed by the extent of student participation in discussion, and the poster competition is valued as a focal point of the day. Beacons have been keen to use the student posters in their promotional material. The Beacons conference has been cited as case study of best practice at the University of Worcester, and continues to be funded as a learning and teaching activity. One welcome outcome of the initiative has been students joining the organising committee of the following year's conference. Several have also expressed an interest in becoming more closely involved in Beacons voluntary work.

## KEY RESOURCES

Beacons Development Education Centre: <http://beaconsdec.org.uk/>

Institute of Science and the Environment at the University of Worcester: <http://www.worcester.ac.uk/discover/institute-of-science-and-the-environment.html>

## RELATED CASE STUDIES: 5, 7

## CASE STUDY 7:

### Students at the heart of networked outreach communities

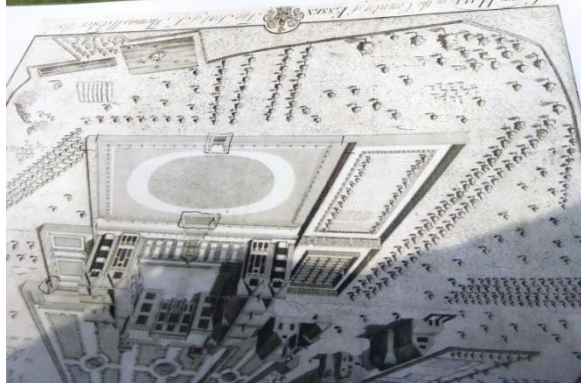
by Vincent Tong and John Shepherd

Public engagement is often understood as a form of outreach activity led by academics. However, university students can also play a central role in these activities and can enhance their own learning at the same time. This case study outlines how Geology undergraduates on a geophysics field course at Birkbeck, University of London, have been engaging with the Copped Hall Trust Archaeology Project as part of their problem-based learning (PBL). Copped Hall is located in Epping Forest on the north-eastern outskirts of London and is the site of a 16th to 17th-century mansion and formal gardens (Figure 9).



Figure 9: Geology students' work is centred on finding out about the site of the (buried) former gardens at Copped Hall. They apply geophysical imaging with the help of a drawing of the original gardens, which is shown in the photo.

During a five-day field course, Geology students work in groups to investigate a series of hypothesis-based problems linked to the Archaeology Project at Copped Hall, by using field geophysics. Students share and discuss their scientific work during the field course via social media. Specifically, they are asked to explain how they approach, and eventually solve, the archaeology problems by posting photographs and video clips on a Facebook page dedicated to the project on a daily basis. A number of outreach communities are connected through this activity, including fellow Birkbeck students, as well as participants on the education programmes and professional archaeologists at Copped Hall and local schools. They are all encouraged to follow the progress of the geophysics fieldwork by commenting on students' status updates on the Facebook page. At the end of the field course, the Geology students attend a guest lecture at Birkbeck given by an archaeologist from Copped Hall. After the lecture, they summarise the findings of their investigations and explain how they have used the commentaries on the Facebook page in shaping their inter-disciplinary investigation. Other participants in the project are also invited to attend the wrap-up session.



The rationale here is to create synergies between different forms of outreach to benefit a wide range of participants from both the host university and partner institutions. Student learning, in a PBL context, is supplemented by inputs from external participants not enrolled on the field course, including professional archaeologists and other students at Birkbeck. Thus, these connected outreach communities created on social media are important in enriching the enquiry-based approach used in this student work. These communities also help integrate the students' fieldwork with research undertaken as part of the Copped Hall Trust Archaeology Project. The programme therefore represents research-enhanced teaching (see Healey and Jenkins, 2009) and, because it adopts an online platform for information exchange and dissemination, also represents technology-enhanced learning. Together, these exemplify technology- and research-enhanced education (TREE) (Tong, 2014).

There are a number of benefits for the Geology students:

- first-hand experience of collaborating in inter-disciplinary research work, central to the promotion of scientific research in teaching at undergraduate levels (Tong, 2010);
- collecting real data to solve real problems, in the knowledge that their data will have long term scientific impact;
- development of communication skills by sharing and explaining complex technical information to a variety of specialist, professional and non-specialist audiences;
- access to a significantly wider range of learning resources and expertise;
- reinforcement of the importance of discussing and disseminating outcomes of research to colleagues and to the public.

Others also benefit from this outreach programme. For instance, data collected by students has long term scientific impact as it is archived and used in ongoing work by the Archaeology Project. For example, the data are used to define new features that warrant examination by excavation with help from members of the community. Thus the repository of scientific data collected by the Geology students ensures sustainability of the joint research. There are reciprocal benefits to other participants in the connected outreach communities. For instance, other students at Birkbeck, students from the participating schools, and archaeologists at Copped Hall become more aware of each other's work. These interactions effectively result in

'networked public engagement', creating synergy both to the student-led outreach at Birkbeck and the community-centred education programmes at Copped Hall.

There are two primary innovations in this collaborative project. The first is combining PBL and field investigation (see Perkins *et al.*, 2001) with student-centred public engagement. The second is in creating online networked communities for enhancing students' learning experience as well as interaction between students and other outreach participants.

## KEY RESOURCES

Copped Hall Trust <http://www.coppedhalltrust.org.uk/>

**RELATED CASE STUDIES:** 5, 6, 14

## 3.7 Engaging with communities and local activism

In case study 8, a powerful argument is made for the role of universities acting as mediators between local communities and industry to build trust, mutual understanding and positive attitudes. This is achieved here, in the context of a major global environmental issue, that of sustainability in the aviation industry. University academics may sometimes find themselves in a very influential position, as apolitical experts with valuable research findings, and can provide effective mediation in complex and challenging circumstances.

### CASE STUDY 8:

#### Airport community communications, a key to sustainable growth

by Callum Thomas and Paul Hooper

Airports play a major role in social and economic development by providing global accessibility. Forecasts indicate that regardless of any short-term fluctuations, air transport demand will continue to grow for at least the next 20-30 years. Meeting that demand will bring significant benefits to millions of people. However, it will not be achieved without cost; in particular, a detrimental effect upon the lives of residents of communities surrounding airports and beneath their flight paths.

This unequal distribution of costs and benefits, set against the anticipated growth of the industry over the coming years, will pose particular challenges for airport management, because rising community opposition can constrain airport growth and, therefore, their ability to support sustainable development. The disturbance caused by aircraft noise is the most important local environmental impact associated with air transport and leads to significant operational constraints, refusal of planning approval, and even airport closures (Thomas *et al.*, 2010).

For this reason, airport operators need to engage with their neighbours and facilitate their participation in decision-making. Stakeholder participation increases the likelihood of sustainable airport development and is more acceptable to local communities because:

- the prospect of appropriate and acceptable development is maximised;
- people feel part of the development process;
- future growth is seen as more transparent, responsive and accountable;
- it demonstrates commitment from airports to minimise their environmental and social impacts.

However, community residents can represent one of the most significant and complex stakeholder groups to co-operate with. In part, this is because aircraft noise impacts upon people in different ways depending on their lifestyle (e.g. it disturbs sleep, and affects relaxation, watching television, conversations and reading etc.), but it is also because perceived nuisance is partly physical (i.e. a function of aircraft movement frequency and noisiness) and partly influenced by socio-economic, cultural and lifestyle factors (Thomas *et al.*, 2010). So although individuals may complain about aircraft 'noise', other factors, such as fear of air accidents, airport development, or disturbance from associated activities (e.g. increased road traffic) may be underlying causes of annoyance (Thomas *et al.*, 2010). Furthermore, noise metrics (decibels and outputs from noise modelling programmes) are

complex and difficult for the general public to understand, and this thereby generates a climate of misunderstanding, misinterpretation and mistrust



**Figure 10: Aircraft noise may be measured in decibels, but disturbance is a matter of perception and dependent upon non-acoustic factors such as lifestyle, affluence or fear of air accidents.**

(indeed this may explain why levels of community annoyance in response to aircraft noise exposure has increased in recent years during a time when metrics have consistently demonstrated a reduction in noise levels around most European airports (see UK Department for Transport (DfT), 2007).

The contrast between noise metrics and the human response has encouraged research into the ‘non-acoustical co-determinants’ of aircraft noise annoyance (e.g. Schreckenberg *et al.*, 2010) to improve understanding of factors contributing to annoyance (Figure 10). Findings suggest that public attitudes are critical determinants of noise annoyance, potentially more influential in determining responses to noise exposure than the sound itself (Guski, 1999). Therefore, stress reactions to noise can be exacerbated by a perceived lack of fairness in procedural and political discourses on aircraft noise annoyance (Schreckenberg *et al.*, 2010).

Building positive public attitudes towards airports and aviation factors is therefore paramount in increasing tolerance, and reducing noise annoyance. This principle is reflected in the ‘Noise Road-Map’ published by Sustainable Aviation, which emphasises the importance of “noise communication and community engagement” (2013:19) in their list of noise mitigation priorities. It is also reflected in the ‘Balanced Approach to Aircraft Noise Management’ (ICAO, 2007) which includes “people issues”, encompassing communication strategies and enhanced information for public access.

Solutions to these challenges demand an integrated and multi-disciplinary approach to the underpinning science and management, and this has characterised the Centre for Aviation, Transport and the Environment’s (CATE’s) 22-year track record of research and knowledge transfer in this field. CATE ([www.cate.mmu.ac.uk](http://www.cate.mmu.ac.uk)) has focussed on identifying and finding sustainable solutions to the environmental challenges of aviation to enhance its ability to contribute to social and economic progress.

Noise researchers in CATE work closely with airport operators in the UK (e.g. at Heathrow, Manchester, East Midlands) and internationally (e.g. in Australia, China, Germany); local community groups (such as HACAN [www.hacan.org.uk](http://www.hacan.org.uk)); Government departments (e.g. the Civil Aviation Administration of China, the UK Department for Transport, the Department for Regional Development Northern Ireland); and international bodies such as Eurocontrol ([www.Eurocontrol.int](http://www.Eurocontrol.int)) and the European Union. Work has ranged from social surveys (Hume and Thomas, 1993) and participation in public meetings around airport development proposals, to analysis of noise complaints. CATE has developed new ‘community friendly’ noise indicators that are now being trialled at airports (Hooper *et al.*, 2009, 2011) to improve airport-community dialogue. This has led to the development of good practice guidance for use at airports across the UK and Northern Ireland (Thomas *et al.*, 2003).

## KEY RESOURCES

CATE (Centre for Aviation, Transport and the Environment) [www.cate.mmu.ac.uk](http://www.cate.mmu.ac.uk)

Hooper, P. D., Maughan, J. A. and Flindell, I. (2009). Indices to Enhance Understanding and Management of Community Responses to Aircraft Noise Exposure [online]. Manchester: Manchester Metropolitan University. Available from: [www.omega.cate.mmu.ac.uk](http://www.omega.cate.mmu.ac.uk) [date accessed].

Thomas, C. S., Maughan, J. A., Hooper, P. D. Hume, K. I. (2010) Aircraft noise and community impacts. In: R. Blockley and W. Shyy (eds.). *Encyclopedia of Aerospace Engineering*. Chichester: John Wiley and Sons Ltd, 3599-3606.

## RELATED CASE STUDIES: 5, 12

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## 3.8 Engaging with schools and colleges

by Steve Millington and Dawn Nicholson

### 3.8.1 Why engage with schools and colleges?

There are numerous benefits to HEIs in engaging with schools and colleges. Not least are the potential benefits from promoting the activities of the university at a local and regional level, improving public relations, and increasing admissions from the local catchment. This can have knock-on benefits in encouraging applications from a wider diversity of backgrounds, and in the GEES disciplines which may mean more female applicants and interest from minority groups. This can assist universities in achieving Office for Fair Access (OFFA) targets. Research Councils UK (RCUK) make it clear that research funding proposals that demonstrate impact (see Pathways to Impact <http://rcuk.ac.uk/kei/impacts/Pages/home.aspx>) are more likely to succeed than those that do not. Public engagement with research projects is one way of achieving appropriate dissemination and demonstrating the benefits of the work and this can be achieved by research teams working closely with schools and colleges. Skills and knowledge passed onto school and college pupils and teachers may support career development, assisting industry and commerce in producing appropriately skills employees of the future.

The popularity of GEES disciplines ebbs and flows in response to societal demands, media coverage and government policy. Discipline prosperity (and perhaps survival) can be enhanced with positive publicity, awareness-raising and direct experience. Benefits also accrue for those individuals who partake in engagement with schools and colleges, providing opportunities for development of communication skills, confidence, understanding impact, and applying creativity. Importantly, engaging with members of the prospective student body can also be great fun!

### 3.8.2 Building outreach capacity and sustainability

**Motivation, perceptions and preparation of staff:** key to working with schools and colleges is to consider the skills, perceptions, experience and motivations of the academic staff that will be involved. Key considerations include:

*Are staff motivated to work with schools and colleges?* Motivation comes from a clear understanding of the benefits and drivers of such activity.

*Do staff possess the communication skills required to work with younger people?* For example, would they be able to control a classroom environment? Preparing staff for working with younger people may need an investment in the form of tailored staff development training.

*Are staff adequately rewarded and recognised for public engagement work with schools and colleges?* This could be through promotion criteria, for instance. Reward and recognition schemes are increasingly being modified to reflect the changing activities and motivations in the HE landscape, but this will require senior and strategic input.

*Is the time input required reflected in workload allocation?* Public engagement activity takes time and, to be undertaken effectively, needs careful consideration of the implications for workload, both for individuals and for achieving balance across teams.

*Are staff best positioned to engage with widening participation target groups?* If widening participation is a key objective of public engagement activity, then staff need to have a good awareness of inclusive practice in the target group. This may require diversity awareness training.

Some of these aspects are considered further elsewhere in the Guide (section 4).

**Perceptions of GEES disciplines:** a further consideration is the nature of the outreach offer, and in particular, how it aligns with the perceptions of GEES disciplines by teachers, parents and school and college pupils. There is a regional geography legacy ('capex and bays') that influences the perceptions of many parents (e.g. those who were taught geography in that style), and an associated reluctance to recognise GEES disciplines as critical sciences. The way that GEES disciplines are taught in schools and colleges varies markedly, depending on both the exam board and the type of institution involved (e.g. school, sixth form college, grammar school, specialist academy). There is frequently a disconnect between the National Curriculum and contemporary GEES disciplines that are taught in HEIs. The focus of geography, earth and environmental science curricula in HEIs is also incredibly varied. Thus it is important that some research is undertaken to ensure that the outreach offer is compatible for both parties.

**Widening participation (WP):** it is important that any outreach offer is compatible with institutional and national priorities for widening participation in GEES disciplines. OFFA formalises institutional targets and HEIs are required to provide clear evidence of their attempts to attract a more diverse student body. It is worth considering the more fundamental question – are schools and colleges even the best conduits through which to reach WP groups? Third sector and voluntary networks might provide better access to particular target groups in some cases.

**Involving students:** current undergraduate and postgraduate students can be particularly effective if involved in outreach activities with schools and colleges – not least because they are likely to be closer to the age of the target audience and may be perceived by them as role models. This involvement can be facilitated by establishing and using student ambassador schemes (e.g. the Royal Geographical Society Student Ambassadors Scheme), awarding credits (or 'practice credits') for engaging in extra-curricular activity, or embedding outreach activity into the curriculum.

### 3.8.3 Contacting schools

There are a number of considerations for making that first contact with local schools and colleges. It is helpful to identify from student records the key local feeders to the university and to have a good understanding of both your student population and that of the local community. Don't re-invent the wheel – there may be good links already with local schools and colleges in other parts of your own institution. At the same time, you want to avoid making repeated contacts to the same school from different parts of the institution – this won't give the impression of good organisation! You may also have central services teams who can do some of the legwork for you – widening participation and access teams, the recruitment team, as well as more generic services such as the student support services. Some student unions are also very knowledgeable about the widening participation picture in the region.

### 3.8.4 Planning the activity or event

Once you have decided upon which schools and colleges to make contact with, you need to come up with an approach that will be mutually beneficial. What's in it for them, and what's in it for your university and you? When planning activities or events, it is important to understand the constraints of the school year. Teachers probably only have two or three opportunities in a year to engage with HEIs and thus long lead-in times are essential – perhaps up to a year in advance.

There are other practical considerations:

- does the school have the space and resources for you to deliver the planned activity?
- off-site activities (e.g. at your institution) are increasingly difficult for health and safety reasons, transport, CRB checks, etc.
- how much investment of time is needed by the academic staff involved (and are there other alternatives such as making use of technical staff, undergraduates and postgraduates)?
- what resources will be needed (e.g. laboratory space, rooms, equipment, consumables, transport)?
- how much will the event or activity cost – and should any costs be passed onto the participants? Is there any grant support available (e.g. through RCUK, Researchers in Residence, Bringing Cutting Edge Research into the Classroom, CREST Awards, Nuffield Bursaries, [www.Schoolscience.co.uk](http://www.Schoolscience.co.uk)). Is there a valid economic case for HEIs supporting outreach?
- what are the legal implications (e.g. risk assessment, ethics, CRB checks - legally required if left alone with people under 18, public liability insurance, Intellectual Property rights)?

**What type of activity might be appropriate?** The answer to this will depend upon the purpose of the activity or event. The activities planned for discipline awareness raising, promotion of the university, and curriculum enhancement, for example, might be quite different from those intended for widening participation, aspiration raising, transition training and early careers development. Important intervention points occur in Key Stages two (higher education awareness raising), three (discipline promotion), and five (recruitment).

Examples of potential activities include:

- university visits – going beyond the open day and providing summer schools and revision conferences;
- providing teaching secondments in HEIs – teachers are often better placed to assist in developing materials in partnership with HEIs. This type of activity can be good for negotiating access to schools;
- careers talks – particularly good if these can be followed up by providing young people with short term work placements in HEIs;
- participation in regional events – examples from the Manchester region include the Manchester Science Festival, Manchester Histories Week, Manchester Architecture Week, and National Science and Engineering week;
- working with museums and galleries – this can provide good opportunities to make links with schools and colleges but also with the general public, voluntary organisations and local special interest groups. Examples from Manchester include Museum of Science and Industry (MOSI), Manchester Museum, Whitworth Gallery, URBIS, CUBE, and Cornerhouse;
- targeting teachers – CPD provision and specialist teacher conferences and journals.

### 3.8.5 After the event

Consider building in opportunities at an early stage for evaluating the impact and benefits of the event (for all concerned). How successful was the event itself and what is the longer term impact and sustainability likely to be?

### 3.8.6 Conclusions

Some top tips for delivery in schools are:

- always remember – who your audience is;
- keep presentations short and focused;
- use a variety of resources when presenting;
- ensure your audience can contextualise the activity you present – make it real and relevant;
- use hands-on activities if possible – but those that present a clear challenge and clear targets;
- carefully manage the expectations of those involved (establish clear aims and targets);
- plan ahead (think about school and college timetables, understand the school year, prepare for DBS checks, risk assessments etc., and allow for lead-in times of several months);
- build in opportunities for evaluation and feedback;
- identify and disseminate good practice.

## KEY RESOURCES

National Higher Education STEM Programme. (2010). *Outreach to Schools: A Good Practice Guide*. Birmingham: University of Birmingham.

Office For Fair Access <http://www.offa.org.uk/>

Research Councils UK [www.rcuk/per/schoolsandyoungpeople](http://www.rcuk/per/schoolsandyoungpeople)

Royal geographical Society <http://www.rgs.org/OurWork/Schools/Teaching+resources/Teaching+resources.htm>

Case study 9 below presents a simple (and probably very common) example of the mutual benefits of engaging with local schools and sixth form colleges.

## CASE STUDY 9:

### Contributing to curriculum delivery in a sixth form college

by Dawn Nicholson

A significant challenge for academic staff in UK HEIs is their common lack of familiarity with the pre-university education curriculum. Curricula, learning activities and assessment types appear to be in a constant state of flux and many academic staff have lost touch with what and how GEES disciplines are taught in schools and sixth form colleges. This case study outlines a simple, and probably very common approach, to improving understanding.

Xaverian College, Manchester, is a Catholic sixth form college with Beacon status and an outstanding reputation for student success and academic achievement. It is located just south of the city centre and on the periphery of the urban academic corridor comprising Manchester Metropolitan University and the University of Manchester. The college has a philosophy of enriching students' educational experience through a wide range of activities and events. This includes inviting academic staff from local HEIs to contribute to the delivery of specialist elements within the A-Level curriculum and to paint a picture of university life and the opportunities that it presents.

The Edexcel A-Level Geography curriculum, which operates at Xaverian, includes the module 'World At Risk', encompassing global natural hazards and climate change. Two members of academic staff from the Division of Geography and Environmental Management at MMU, both physical geographers, were invited to deliver a two-hour class to a group of about 50 geography students on the topic of geohazards. The academic staff both have a breadth of teaching and research experience in geophysical hazards including earthquakes, tsunamis and volcanic activity (Figure 11). The Geography Curriculum Leader at Xaverian was keen for the content to complement the set A-Level curriculum but at the same time to broaden students' horizons beyond the set topic, and also to provide a glimpse into university life.

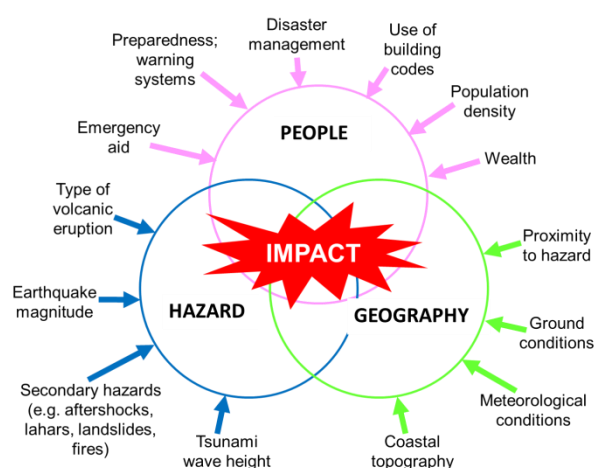


Figure 11: Summary of geohazard processes, influencing factors, response and management

The class presentation followed the broad requirements of the curriculum, and considered hazard processes, impacts and approaches to mitigation and management. The presentation was interactive and students were encouraged to respond to open-ended questions and to ask questions. The opportunity was taken to draw on the teaching and research activities of the academic staff and to make links with other modules delivered as part of Geography and Physical Geography courses delivered at MMU. Case studies used to illustrate geohazards were drawn from a mix of recent, widely known examples, and classic events from which valuable lessons in hazard response have been learnt.

Informal feedback after the event indicated that students really enjoyed the experience and opportunity to engage with academic staff from a local university. In particular, they valued the opportunity for a taste of university teaching as well as links made to research activities, which made the content seem more authentic. The whole exercise has helped to strengthen links between the university and college and provided an opportunity for pupils to ask questions about university life, making the transition, and the courses available. The experience also provided an opportunity to publicise the university and its courses, but crucially, also to learn more about the A-Level Geography curriculum. The college has maintained links with staff at MMU and there may be opportunities to repeat this activity in the future. Other academic staff are increasing their links with local schools and colleges with a view to engaging in mutually beneficial ways. Organisations such as the Geographical Association and Earth Science Teachers Association may be able to assist with making links with local schools and colleges. The presentation has since been used as the basis for talks on

geohazards to groups of geology enthusiasts participating in University of the Third Age (U3A – <http://www.u3a.org.uk/>) courses.

## KEY RESOURCES

Examples from the north-west of HE STEM engagement with schools and colleges: National HE STEM programme (2012). Regional Projects: HE engagement with schools and colleges. Available from: [http://www.sci-eng.mmu.ac.uk/he\\_stem/regional\\_projects/actions/?show=1](http://www.sci-eng.mmu.ac.uk/he_stem/regional_projects/actions/?show=1)

Geographical Association: <http://www.geography.org.uk/>

## RELATED CASE STUDY: 10

### 3.9 Engaging with industry, business and professional practitioners

In this section, two case studies consider the benefits of engaging with industrial partners, be they individual professional practitioners, small enterprises, or large consultancies. Case study 10 outlines a training programme provided by academic staff for teachers of earth science. Case study 11 demonstrates the wide-ranging benefits of engaging industry partners and government agencies with academic research.

#### CASE STUDY 10:

#### Earth science training for key stage one and two teachers

by Fiona Gill

Aspects of Earth Science are present in the current primary National Curriculum, and proposed changes to the curriculum include an increased content at key stage two. Primary age children often have a natural interest in, and enthusiasm for, volcanoes, dinosaurs and other geological phenomena that can be used to illustrate principles from other areas of science. However, when I read a Royal Society report on primary science and mathematics education (Royal Society, 2010), I was shocked to learn that only 3% of primary school teachers have a science background, and realised that the number with specialist knowledge in Earth Science must be even smaller. Anecdotally, many teachers are keen to teach Earth Science, but a lack of knowledge of basic principles and the absence of suitable resources and specimens make this task difficult. To address these issues I designed and delivered a short training session on Earth Science for key stage one and two teachers, held at the School of Earth and Environment (SEE), University of Leeds in 2012 and 2013. University of Leeds Access and Community Engagement funded this activity, so this continuing professional development (CPD) opportunity was offered to teachers free of charge. The funding represents the university's commitment to widening participation (WP). In that sense it is not designed to have a direct benefit for the university but is more altruistic.



**Figure 12: A box of fossil casts – part of the resource pack supplied to participants**

Each twilight session lasted three hours and included an introduction to Earth Science (covering the structure of the Earth and the nature of geological time), a section on rocks and minerals, and a section on fossils and Earth history. A key focus was to supply teachers with suitable resources to use in their own classrooms, and so each participant received a bespoke box of rocks and minerals, a box of fossil casts (Figure 12), a geological map of the UK and a copy of the slides from the session. The sessions were practical and interactive and designed to familiarise participants with the specimens provided. During the break between sessions, attendees were challenged to put their new knowledge into action by identifying a selection of rocks, minerals and fossils displayed in the School of Earth and Environment.

Feedback from the teacher participants demonstrates the value of these sessions on multiple levels. Not only did the training relate directly to the curriculum they are expected to deliver, but it inspired them to introduce different activities in the classroom and gave them more confidence to teach the subject. Feedback comments included:

*“It will fit with the KS2 curriculum on rocks and minerals but where it doesn’t fit directly it will fire the enthusiasm and inspire young enquiring minds.”*

*“All really interesting, and inspiration for ideas to use in school.”*

*“Great resources provided.”*

*“Children can learn from hands on experience rather than looking on computer.”*

An added benefit of targeting teachers is that it is an efficient way to reach a large audience, since each teacher can potentially use the knowledge and resources for multiple generations of pupils. This means that the university plays a role in raising awareness of Earth Science as a stand-alone discipline and making it accessible to as many people as possible. A longer term aspiration is to encourage some of the pupils being taught by the teachers who participated in this CPD activity to consider studying Earth Science in the future.

## KEY RESOURCES

Earth Science Teachers Association: <http://www.esta-uk.net/>

**RELATED CASE STUDIES:** 6, 7, 8, and 11

## CASE STUDY 11:

### Engaging industry and government agencies with applied research: ecological enhancement of hard coastal structures

by Larissa Naylor and Martin Coombes

This case study stems from a collaborative, south-west England based research project that was jointly funded by the Environment Agency (EA) and Great Western Research (GWR), and undertaken by academics at the University of Exeter and in close collaboration with Professor Richard Thompson at the University of Plymouth. The research examined the two-way interplay between organisms and geomorphology in hard coastal engineering. An integrated ('bio-geomorphological') approach was used to improve understanding of how animals and plants use artificial coastal structures (such as seawalls) as habitats, and how they might be better designed for environmental gains. This highly inter-disciplinary work involved close collaboration between experts in ecology, geomorphology, geology and environmental policy and management. The project had strong experimental and theoretical components (developing novel field and laboratory procedures in the south-west, and new conceptual frameworks for scientific understanding), while emphasis was placed on engagement with end users throughout. Translating the research findings into practical outcomes was a key motivation for the project.

The foundational research was an EA-GWR doctoral studentship (October 2007 to May 2011). The original project partnership comprised the EA, the Universities of Exeter and Plymouth, the Marine Biological Association of the UK, Falmouth Harbour Commissioners and the National Maritime Museum (Falmouth), with specialist input from HR Wallingford. Critically, the project was developed in close collaboration with the industry partner (the Environment Agency) in recognition that there was virtually no existing research to inform and support implementation of the European Water Framework Directive (WFD) in hard coastal defence and flood risk management. This ensured that the questions tested, methods used, and research outputs were operationally feasible and relevant to practice.

The project was one of the first, on a global level, to test how materials commonly used in coastal engineering, and their physical properties, affected colonisation. The research produced quantitative evidence of how the choice of materials used in coastal engineering, and more importantly, the fine-scale texture of those materials, can influence 'ecological potential' (a WFD measure). Furthermore, manipulative experiments were used to demonstrate how artificially texturing materials like concrete can significantly increase habitat value where used to build coastal structures. The project also demonstrated how organisms alter the physical properties and behaviours of the materials they grow on, which has implications for weathering science and engineering.

Continuous engagement with practitioners in the south-west during the project, and active dissemination of the results via a project website, YouTube videos, information flyers and updates, and public displays and presentations ([www.exeter.ac.uk/coastaldefencesbiodiversity](http://www.exeter.ac.uk/coastaldefencesbiodiversity)) greatly expanded the initial project partnership from six to more than 25 organisations. This included Cornwall Council, port and harbour authorities in Cornwall, Devon and Dorset, Government agencies, local businesses, NGOs, and engineering consultancies, all of whom actively supported, and were intellectually involved in the research.

To date, five academic papers have been published from this research. Regionally, several highly successful spin-off projects have also been undertaken. Research outputs from the project fed directly into enhancement designs for the £8.3 million

DEFRA funded Shaldon and Ringmore Tidal Flood Defence Scheme in Devon. This was the first operational ecological enhancement trial for new coastal defences in the UK. The work, to date, has been showcased as an Environment Agency (EA) best practice note and won an EA project award in 2012. This project will feature as a case study in the forthcoming revised EA mitigation measures manual to support Water Framework Directive implementation – it will be the first hard coast example of ecological enhancement as a form of mitigation. We also collaborated with Portland Harbour Authority and a regional business (Treweek Environmental Consultants) via a European Regional Development Fund (ERDF)/ South West of England Regional Development Agency (SWRDA) Knowledge Escalator Fellowship to undertake a rapid appraisal of the Port's existing structures, and produced guidance on ecological enhancements for the wider port and harbour community. Significant national impact has also been achieved. The project influenced a newly revised manual on the use of concrete in maritime engineering, produced for practitioners by the Construction Industry Research and Information Association (CIRIA). The research findings were translated into new national guidance. This guidance, produced by the Universities of Exeter and Plymouth in partnership with Treweek is the first of its kind globally, and provides a synthesis of existing research/operational trials alongside practical suggestions for embedding ecological enhancement in planning and design of coastal structures

#### **Indicative publications:**

- Coombes, M. A., Naylor, L. A., Roast, S. D., Thompson, R. C. (2009) Coastal defences and biodiversity: the influence of material choice and small-scale surface texture on biological outcomes. In: W. Allsop (ed.). *Coasts, Marine Structures and Breakwaters: Volume II*. London: Thomas Telford, 474-485.
- Coombes, M. A., Naylor, L. A., Thompson, R. C., Roast, S. D., Gómez-Pujol, L., Fairhurst, R. (2011) Colonization and weathering of coastal construction materials by microorganisms. *Earth Surface Processes and Landforms* 36 (5), 582-593.
- Naylor, L. A., Coombes, M. A., Venn, O., Roast, S. D., Thompson, R. C. (2012) Facilitating ecological enhancement of coastal infrastructure: the role of policy, people and planning. *Environmental Science and Policy*. 22, 36-46.
- Naylor, L. A., Venn, O., Coombes, M. A., Jackson, J., Thompson, R. C. (2011) Including Ecological Enhancements in the Planning, Design and Construction of Hard Coastal Structures: A Process Guide. Report for the Environment Agency, 66 Exeter: University of Exeter.

#### **KEY RESOURCES**

University of Exeter. (2010) *Coastal Defences and Biodiversity* [online]. Available from: [www.exeter.ac.uk/coastaldefencesbiodiversity](http://www.exeter.ac.uk/coastaldefencesbiodiversity) [date accessed].

University of Exeter (2012) *Bioprotection* [online]. Available from: [www.exeter.ac.uk/bioprotection](http://www.exeter.ac.uk/bioprotection) [date accessed].

**RELATED CASE STUDIES:** 6, 7, 8, and 10

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### **3.10 Engaging with government agencies**

Working with government agencies may provide a valuable mechanism for academic staff, and for universities more generally, to influence policy. However, public bodies such as the police and the wider justice system, also sometimes have a need for very specialist expertise to solve unusual, sensitive and/or very complex problems. In case study 12, we discover some extraordinary applications of hydrological science and fluvial geomorphology.

#### **CASE STUDY 12:** **Working with the police and the justice system** by Carolyn Roberts

The results of investigations drawing on the traditions of enquiry in physical geography and broader environmental sciences have sometimes been utilised in forensic investigations, for example, through tracking the movements of objects by virtue of the characteristics of pollen, algae or soil that these objects attract and retain (Figure 13). However, I believe I may be unique in having undertaken more than a dozen investigations for various UK police forces, in exploring and modelling the movement of human cadavers through river or canal systems.



**Figure 13: A typical investigation site – weirs on a river in the north-east of England**

The potential for undertaking this work was revealed following a chance approach during a public inquiry, when I was acting as an expert witness for a local authority presenting hydrological evidence for a planning appeal. An off-duty detective sought me out during a recess to ask if I had ever looked at human bodies floating down rivers. Having previously taught groups of students about flow patterns in the meandering River Severn by floating small groups of them short distances downstream in wetsuits, I offered to see whether I could assist his enquiry. As a result, I was subsequently included on the expert witness database used by other forces, and a series of other commissions followed.

The work has been undertaken in situations varying from the urgency associated with a presumed drowning and the rapid search for a person in a water body, through to establishing potential sites where a corpse could have entered a flooding river, given the location and timing of its subsequent discovery in sediments or on the floodplain downstream. Timescales for these investigations vary from a few hours, for example, when a child fell into the River Wear near Durham in 2012, to a historic case undertaken on behalf of the Royal Military Police thirty years after the loss of a toddler from Schloss Neuhaus military base at Paderborn, in Germany. Each investigation is different, and requires a creative approach drawing on hydrological or fluvial geomorphological principles.

Sometimes experimentation with part-floating dummies has been involved. One case in the tidal Bure upstream of Great Yarmouth in Norfolk, I had to await autumn water levels that most closely matched the conditions of the early spring high tide when a young asylum seeker was killed and her body dumped in the river. With a known point of deposition for the body, modelling of water levels driven by tides and freshwater discharge established the time of its grounding high on the river bank. ‘Search-and-rescue’ dummies were then released and tracked during equivalent tidal cycles in the autumn, to establish the likely pathway of flow, and the timing and likely point of entry into the water. Other investigations involving slower waters such as the Grand Union Canal near Camden Lock in London have used dye tracing, or careful monitoring of exceptionally slow and intermittent flows driven by lock gates or sluices opening for river traffic. One notable attempt to locate the missing part from a murder victim whose dismembered body had been thrown into a canal in Wolverhampton, involved experimentation with models of human heads. The ensuing drainage of one of the adjacent locks produced further revelations in the form of a second body and a handgun. In another investigation, the victim’s body was assumed to have been locked into a suitcase, thrown into the fast-flowing River Dee near Chester, and lost. In all of these cases, invaluable evidence was produced that enabled either some possibilities to be eliminated, or (in the case of the Norfolk investigation) a time and place for the dumping of the corpse that was subsequently verified by closed-circuit television (CCTV), and the successful prosecution of the victim’s partner for murder.

Each case is obviously a human tragedy for a family and a community, but each is also a unique and fascinating scientific problem with huge potential for deploying expert knowledge about river flow, fluid dynamics, modelling and forecasting, use of remotely sensed imagery, and the exploration of scientific errors. I like to think of these investigations as a type of Sudoku – intriguing puzzles with fragmentary pieces of evidence that can either be found or modelled, but that need to be logically assembled into a coherent whole using all available methods of problem-solving. The fieldwork can be exciting too. Because of the uncertainty of the timing of investigations, reliance usually has to be placed on data generated locally, from previous police work at the scene of the crime, or from freely-available data sets such as may be obtained from the Environment Agency, the Coastguard Service, or the Meteorological Office. And it is frequently necessary to work in the public gaze; murder investigations attract considerable interest from local residents and the media.

The court cases where expert testimony is presented are also challenging. The production of clear and precise reports suitable for use by non-specialists is critical, even when the information is incomplete and inferences have to be drawn in the light of considerable uncertainty. The language used must be comprehensible by members of the judiciary and the jury, and the testimony must also be robust in the face of challenge. When giving verbal evidence, it is necessary to ensure that the uncertainties are represented fairly, even when there is pressure (for example from barristers) to make claims lacking the appropriate error margins. While exploration of these human tragedies is not routinely considered as part of the drive for a sustainable future, developing our understanding of the movement of semi-submersed objects in river systems is an area where environmental scientists have something distinctive to offer to forensic science.

## **RELATED CASE STUDY: ||**

### 3.1.1 Getting students involved in public engagement

Student involvement in public engagement activities is not always appropriate (see case study 12, for example), or necessary. However, where public engagement work can be planned, designed and developed to embrace student input, valuable benefits can be accrued for all involved (see case studies 6 and 7, for example). Case study 13 presents a simple approach to getting students to consider the wider, and public, implications of academic work, alongside developing their own communication and presentation skills at the same time.

#### CASE STUDY 13:

#### Using student posters to communicate technical investigations to the public

by W. Brian Whalley

In the GEES disciplines, we often ask students to undertake quite complicated analyses and investigations, in the laboratory, the field, or frequently, a combination of both. Ideally, such investigations should be realistic and problem-based so that field or laboratory research can help to answer questions posed by a contractor, for example, rather than being merely an academic



Figure 14: One of the student posters generated from field and laboratory work and prepared for public display

exercise (i.e. the 'because it is good for you' approach). Commonly, this work is written up by the students in the form of a report, presenting methods, results and findings. Such reports will tend to be somewhat technical. However, there is a need to communicate the findings and results of research project to a wider audience to demonstrate, among other things, that money has been well spent. The communication of complex ideas and concepts, which by their very nature, are not commonly known, is good practice, a valuable learning experience for students, and an opportunity to develop real-world skills. It also presents an opportunity to get the message across to students that geography (or other GEES disciplines) has applications to real problems, and this can help students make important connections between their academic work and future career aspirations.

One approach is to ask students to produce both a technical report and a report for the public. This will emphasise the different styles required in each and encourage students to think carefully about terminology, explanation and language. The public report could include an executive summary or have an alternative form (e.g. non-written). At Queen's University Belfast, students were asked to prepare a written technical report and also a poster intended for public consumption presenting the findings of a combined field and laboratory analysis of beach geomorphology. Students undertook a beach profile survey extending from the sea, over the top of a dune line with marram grass to a lower lying area behind. The investigation involved surveying a profile using a professional grade differential global positioning system (GPS) and presenting the outputs on a map or using Google Earth. In addition, some field sampling of sand was undertaken for subsequent laboratory size and shape analysis.

Done well, posters are an effective means to present complex information graphically and concisely. There are also close synergies with other forms of public display such as interpretive boards and visitor displays. Preparing a good poster requires considerable skill. The one illustrated (Figure 14) is a little verbose and not that easily readable. However, poster displays offer an excellent opportunity to teach students the art of critique, concise writing, and to engage them in giving and receiving feedback to and from their peers.

#### RELATED CASE STUDIES: 6, 7

### 3.12 Working with the media

by Wendy Woodland and Simon Caporn

Case study 14, below, presents a personal commentary on one academic's journey through media training, momentary fame, and the application of wisdom. But first, here are some general tips and advice for GEES academics working with the media:

Who is the audience?

- ask the journalist/interviewer what level of knowledge should be assumed for that audience;
- keep complex scientific terminology to a minimum to avoid misinterpretations. The media will often take quotes from your interview and contextualise them in their own words or use them for attention-grabbing headlines. Provide clear explanations for terminology where necessary;
- try to show how the work contributes to ordinary life – how is it relevant? Use every day examples to convey this message if appropriate;
- do not make sweeping or unsubstantiated claims about the significance of the scientific evidence that you are using. This is especially important for a contentious area such as climate change.

Presenting complex technical information to the general public:

- keep the information clear and, where possible, relate it to 'real world' experiences;
- do not be afraid to invite an audience to use their imagination; for example, to imagine how a previous landscape may have looked;
- use a mixture of media; for example, filming unusual field methods, or if you have a live audience, providing samples of materials that visitors can touch and interact with.

Getting academic/technical/other staff on board (rewards/incentives?):

- encourage colleagues to see the 'bigger picture' in terms of the benefits that public engagement can bring to personal job satisfaction as well as to departmental profile;
- encourage colleagues to seek opportunities for knowledge exchange, swapping best practice, or novel approaches to problem solving.

Top tips for press and radio media:

- stick only to the subject you know about;
- if you want to get known, work with your press office and put out press releases;
- write your press release with the message at the start, not at the end;
- plan your interview to get your key message across early;
- radio is about entertainment – be interesting and enthusiastic, even wacky;
- get some media training, particularly for radio interviews;

#### CASE STUDY 14:

#### Famous for three minutes – my time with the media

by Simon Caporn

While academics have a continuing appetite for publicity and a particularly strong desire at the present time for making an 'impact' in the public arena, the media are also hungry for news stories. So, getting your story in the newspapers and on the airwaves might sound like an ideal marriage. But you must be well prepared and take care not to get your fingers burnt in the process through unintentional misrepresentation, misunderstanding or worse. My first serious encounter with science journalism came after an invite to a research council media training course in Swindon. Our first task was to hear our pre-prepared press statements pulled apart by the Independent's science editor Steve Connor. My own carefully crafted 'news story' on the effects of air pollution on plant ecology was, he said, written back to front. He meant that the typical organisation of a scientific article that I had followed (i.e. background → evidence → discussion → conclusion) should have been written in reverse order with the conclusive 'punchline' at the beginning, and not held back until the end as is the convention in academic science writing. Journalists understand that typical newspaper readers scan news headlines and many will not get further than the opening paragraph of a story. This is where the important information (the 'punch line'), therefore, needs to be. The details and background can appear further down the page where only the deeply interested will venture. The training course in Swindon also trained us in the spoken word – how to get your message across in local radio interviews. A few years later the media training paid dividends.



**Figure 15: Early experimental trials by undergraduate and MSc students, adding Sphagnum beads**

Within a day or two I had given local radio interviews on BBC Stoke and BBC Manchester and quickly found that my media training had, after all, been useful. Local radio seemed eager to interview an enthusiastic specialist who could tell them something novel, interesting, and fill the three-minute gap before the weather forecast. For BBC Stoke, and with one day to prepare, I made a list of the key points about moorland conservation and our scientific research that I wanted to convey, plus all of the people I needed to mention. The latter was important as I realised that this was not just my story but it belonged to all of the colleagues in the hills making moorland restoration happen. As the interview kicked off I took a deep breath and let my amateur dramatics experience take over. I think the radio presenter enjoyed me gushing forth with excitement on a topic about greening the hills up behind the Potteries. The following day I had a date on BBC Radio Manchester with the infamous presenter Alan Beswick – a bit like John Humphreys with the gloves off and knuckle-dusters on. I was wary but need not have been. My news story was such a good one that Alan was chuckling all the way through about how he could imagine us throwing moss beads out the back of a helicopter. But it was more than just a laugh as he was clever, interested, and had clearly read the press release. He had introduced the item with much of the background painted for listeners before I got a word in. It was fun to be peddling such a good science feature and it was probably difficult to go wrong, but I cannot help wonder how much more difficult it might have been if my news story had been about explaining the science behind more controversial issues such as the badger cull, the banning of pesticides, genetically modified (GM) crops, moor burning and so on.



Since Media City lit up Salford, scientists from the local Manchester universities have seen increased media interest. Once you have been exposed as the eccentric media-friendly scientist, it is likely that your name will be in the phone book of the journalist who wants a comment on a range of science topics. But be wary of sounding off on subjects that you don't really know about. This nearly happened to me a few weeks after the Sphagnum bombing story. I received a phone call out of the blue one Sunday morning and was asked to comment on Ash tree dieback for a short item that was to appear in the hugely popular BBC Countryfile programme that same evening. Although a plant ecologist, I knew only a little more about trees than 'ash before oak – you're in for a soak!' However, the candid media producer told me that he just needed someone with a PhD to be filmed, walking through Derbyshire woodland, saying how important Ash trees were and how awful it would be to lose them. While the allure of poetic wandering through woods with presenter Julia Bradbury on prime-time TV had a certain draw... I decided against it. I knew that Ash dieback was a serious and difficult topic and that I would soon be – academically speaking – out of my depth.

**Figure 16: Helicopter spreading beads on to degraded moorlands in the Peak District**

Whatever the reason, my decision not to do the TV interview on Ash dieback was a wise one and it proved very successful for my good friend and university colleague Robin Sen, a microbiologist to whom I passed the baton. He knew a lot about this subject and had some genuinely useful things to say. Ironically, on the same Sunday morning when I called him, Robin had just sent off a letter to the Times newspaper on... Ash dieback! He lives in the Peak District and jumped at the offer of an interview in the woods (even without Julia Bradbury). The Ash dieback story was building and Robin was there at exactly the right time and place. Within days he was on the sofa of prime-time BBC Breakfast TV and on local BBC Radio. Within weeks Robin was invited to give advice on Ash dieback to the parliamentary and scientific emergency meeting at Westminster. My point is that if I had run with the Ash story it would have quickly faltered and I may have ended up looking stupid. By passing it to a colleague in the right subject area it turned out better for all concerned.

**Acknowledgements:** The Sphagnum bombing story arises from collaborative work on moorland restoration with Moors for the Future and Micropropagation Services Ltd.

## **KEY RESOURCES**

Moors for the Future Partnership. (2012) <http://www.moorsforthefuture.org.uk/restoration>

**RELATED CASE STUDIES:** 3, 7

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## 4. Strategies to enhance public engagement in HE

### 4.1 Promoting public engagement in universities

by Phil Wheeler

Encouraging university staff to engage with the public can be problematic when other drivers (such as teaching, research and income generation) fill the workloads. Supporting training in this area so that it is not too daunting as well as mentoring staff who are beginning a public engagement journey can help to reduce anxiety. Publicising and celebrating successful events will raise the profile, as will including public engagement in annual personal and professional development reviews. Institutions that include (and publicise) public engagement in promotional opportunities are likely to embed such activities more quickly. Below, are case study 15 from Manchester Metropolitan University (MMU) and case study 16 from the University of Dundee that shed some light on how these institutions have achieved successes in public engagement, and in particular, strategies to encourage wider participation of academic staff in such activities.

#### CASE STUDY 15:

#### Kick-starting public engagement at MMU through the Manchester Beacon

by Joanna Verran and James Redfern

Over the past five years or so, universities have become increasingly aware of the importance of informing the outside world ('the public') about their work and achievements, even more recently as part of the REF 'impact agenda'. This is especially important for science: Sir Paul Nurse, President of the Royal Society (2010 to 2015) has used his position to emphasise how rapidly poor – or even dangerous – science stories are taken up by the public (for example the controversies around the measles, mumps and rubella (MMR) vaccine, GM crops, and climate change), leaving scientists to defend positions rather than to disseminate their findings. However, science communication should not be a one-way movement of information. Scientists need to engage with their audiences and exchange ideas and information. This engagement should focus on dialogue, or two-way interaction. Reinforcing this notion, patronising terminology (e.g. 'public understanding of science') is being replaced by more constructive and collaborative phrases (e.g. 'science and society').

Colleagues may see public engagement as somewhat peripheral to the business of a university academic. However, many funding bodies now offer grants for public engagement activities, and also demand plans for the dissemination of project findings to the wider public in grant applications. Professional organisations and societies offer smaller awards to support public engagement events. There is also an increasing body of peer-reviewed literature emerging around public engagement. Thus, measurable outcomes such as publications, income and esteem can derive from public engagement work for the enthusiast... it can be fun too! Undergraduate and postgraduate students benefit enormously from participating in such activities – science communication and skills acquisition, obtaining STEM Ambassador status, accumulating credits for university employability schemes, project work, and so on.

At Manchester Metropolitan University (MMU), RCUK (Research Councils UK) funding for the Manchester Beacon for Public Engagement (2008-12) initiative provided a seed from which our activities grew. The existence of this concrete focus gave credibility to the subject, enabled links to be made, events to be developed, delivered, evaluated and refined – indeed just having people to talk to was a huge benefit. When the Beacon funding had come to an end, the legacy continued through the adoption of tools, methods and approaches (e.g. an evaluation toolkit, the website) and through the networks that had developed. On a national scale the National Co-ordinating Centre for Public Engagement (NCCPE) has positioned itself as advisor for the impact agenda. At MMU, the Faculty of Science and Engineering created a senior post designated Head of Science Communication and Public Engagement, introduced an annual award for 'public engagement champions', included public engagement in the graduate school programme, increasingly utilised undergraduate and postgraduate STEM ambassadors and other volunteers, and supported the establishment of a team of interested staff (academic, technical and administrative) and students. A graduate intern was appointed, with the task of co-ordinating activities, and with the intention of demonstrating the need for a permanent post. Our profile is being raised by social networking (@MMUEngage) and an emerging and up to date faculty website ([www.sci-eng.mmu.ac.uk/engage](http://www.sci-eng.mmu.ac.uk/engage)) which promotes our activities and provides ideas and tips for others wishing to 'engage'. We are also heavily involved in local events such as the Manchester Science Festival, and the National Science and Engineering Week, as well as with smaller events in the science calendar.

In our experience, the most exciting and effective public engagement activities have utilised cross-disciplinary links to ensure delivery of a key message via an exciting and novel event. For example, research in human movement was presented via dance (Think, Feel, Move); we used a bouncy castle to measure respiratory and heart rate; we are linking the opening of the new Manchester School of Art building with Manchester Science Festival, including light-based research by scientists as creative exhibits alongside 'illuminating discussions' between scientists and artists. Our postgraduates 'pop-up' across the city with large and artistic photographs of their research, as a focus for interaction with audiences. Further examples of our public engagement work are included in section three.

## KEY RESOURCES

Manchester Beacon Network: <http://www.manchesterbeacon.org/>

MMU's Faculty of Science and Engineering 'Engage' website: [www.sci-eng.mmu.ac.uk/engage](http://www.sci-eng.mmu.ac.uk/engage)

**RELATED CASE STUDIES:** 13, 16

## CASE STUDY 16:

### Reward and recognition of public engagement activity at the University of Dundee

by Rob Duck

Nobel Prize winning poet and honorary graduate, Seamus Heaney described the University of Dundee as “having its head in the clouds and its feet firmly on the ground.” The University’s so-called ‘transformation vision’ is to “transform lives locally and globally through the creation, sharing and application of knowledge.” Thus, by recognising the importance of its relationship with the public, the University of Dundee embraces and supports a culture of public engagement. Indeed it has a long history of doing so that dates back to its origins in 1881 as University College Dundee. Public lectures, for example, have been central to the institution’s strong bond with the local community and the ‘Saturday Evening Lecture Series’, which celebrated its 89th anniversary in 2013, is the longest continuous public lecture series in Scotland. Other high profile events include the Dundee Literary Festival, Women in Science Festival and the Duncan of Jordanstone Degree Show, along with the Café Arts, Café Science and Dundee Science Festival programmes. These cover a wide range of artistic, educational and cultural interests.

As a means of further embedding the culture of public engagement amongst staff at all levels but especially recognising its importance and value, the university has introduced a series of awards that reward excellence. Each of the institution’s four colleges makes an annual award (<http://www.dundee.ac.uk/revealingresearch/newsandevents/peawards/>). The ‘Brian Cox Award’ in the College of Life Sciences is named after the Dundee-born Hollywood actor who is currently in his second term of office as the university’s Rector. This incorporates two categories of award – one for early career researchers and one for research leaders. The ‘Ian Stevenson Award’ in the College of Medicine Dentistry and Nursing honours a distinguished former Professor and Vice-Principal, while the ‘D’Arcy Thompson Award’ in the College of Life Sciences is named after the celebrated Sir D’Arcy Wentworth Thompson, the first Professor of Biology at Dundee, and specifically recognises the work of outstanding communicators. The College of Arts and Social Sciences ‘Award for Excellence in Public Engagement with Research’ completes the quartet. In 2013, this was won by Professor Rob Duck for his recent book, *This Shrinking Land: Climate Change and Britain’s Coasts*.

In 2012, a pan-university award, the ‘Stephen Fry Award for Excellence in Public Engagement with Research’, was inaugurated. This is named after the well-known broadcaster who was Rector of the university from 1992 to 1998. This annual award, a trophy and prize of £1,500, recognises the work of the university’s outstanding communicators in improving understanding of the research and practice of the university to a wider audience. The first winner of this award was Professor Sue Black, the world renowned forensic anthropologist, and her team in the Centre for Anatomy and Human Identification. The work of Professor Black and her colleagues is known to millions of people through the BBC series *History Cold Case* and they are also extremely active in public engagement with schools and community groups.

Collectively, these awards are a measure of how strongly public outreach is valued both at university and college level in the University of Dundee. However, public engagement cannot simply ‘happen’ without institutional support. To that end, the university has established a public engagement office, known as ‘Revealing Research’ (<http://www.dundee.ac.uk/revealingresearch/>). This provides a range of services that support all staff and students: inter alia delivering or sourcing communication training; co-ordinating and promoting events; supporting public engagement funding bids; and advising on impact statements in research grant applications. ‘Revealing Research’ has not only raised the profile of public engagement, it has facilitated engagement with a wide spectrum of staff and students than might otherwise not have been involved in such activities. It is, therefore, suggested that this could be a model of good practice for other HEIs to emulate.

## KEY RESOURCES

Revealing Research at University of Dundee: <http://www.dundee.ac.uk/revealingresearch/>

**RELATED CASE STUDIES:** 13, 15

## 4.2 Beyond project evaluation: outreach activities as educational research

by Vincent Tong

Public engagement with science serves a variety of purposes, addresses a diverse range of topics, and is aimed at a wide variety of audiences. Given the complexity of outreach programmes, project evaluation is often conducted for assessing their quality and impact. This short contribution is written for those who wish to go beyond conventional project evaluation by incorporating research in their public engagement. The aim is to outline the case for conducting educational research to raise the profile of public engagement as a pedagogical activity. Educational research may provide important evidence for project evaluation, but there are also some notable differences between them:

- for educational research, the purpose is not to 'sell' a particular outreach project by highlighting the positive outcomes. Instead, it is important to evaluate critically with regard to some clearly defined educational issues that are likely to be of wide interest. Outreach activities provide the contexts for these investigations;
- project evaluation is often conducted towards or after the completion of outreach activities. In contrast, early and structured planning for research may be necessary so that key data can be collected during the course of an outreach programme;
- dissemination of findings to the wider academic community is of high priority in research, while project evaluation is mainly for internal review.

Educational research can, therefore, be used as a tool for shaping the design of an outreach programme. It may help academics focus on the pedagogical nature of outreach as opposed to concentrating exclusively on the scientific content. Educational research may also act as a catalyst for delivering outreach activities in more innovative ways by scrutinising the pros and cons of current practices. By taking relevant theoretical foundations into account during the design of outreach programmes, pedagogical research can help forge closer integration between theory and practice. The sharing of research outcomes creates a public, peer-reviewed platform that helps improve the quality of outreach activities. It can also raise the academic profile of outreach work and is a way of recognising pedagogical innovations through published articles in educational journals, conference presentations and workshops. However, given their different objectives, educational research is not a substitute for project evaluation. It may be best viewed as a component that is complementary to project evaluation within an outreach programme. There are many themes in education inquiry that may be pursued in the context of an outreach project. The choice of theme may depend on the nature, resources and time frame of the public engagement activities. However, it is possible to identify some current issues in disciplinary research, science communication, technology-enhanced and research-enhanced education that are highly relevant to pedagogical research involving science outreach. Here are some themes of inquiry that are particularly relevant to public engagement in geography, earth and environmental sciences:

- understanding the inter-disciplinarity in geography and earth system science;
- understanding model uncertainties and validity of research evidence in science, such as climate change science;
- science outreach for participants with special learning needs or from disadvantaged backgrounds;
- public engagement as a student-centred platform for learning and teaching (see contribution by Tong in this volume);
- use of mobile devices, social media and online delivery of synchronous outreach events;
- public engagement through virtual fieldwork or experiments;
- interface between informal (e.g. outreach) and formal education (e.g. science in the National Curriculum).

Differences between positivist methodologies and those used in education inquiries may present challenges to physical geographers and geoscientists who do not have backgrounds or training in social research. However, linking educational research and scientific research also presents opportunities for cross-disciplinary collaborative work between geoscience/geography academics and educationalists. Participating in cross-disciplinary work is likely to encourage scientists to examine the approaches used in their teaching and outreach activities. This experience is highly relevant to those who seek research funding, given that there are increasing demands for innovative, parallel outreach programmes in publicly funded science projects.

### KEY RESOURCES

Cohen, L., Manion, L., Morrison, K. (2011) *Research Methods in Education*. Oxford: Routledge.

Slater, S. J., Slater, T. F., Bailey, J. M. (2011) *Discipline-Based Science Education Research: A Scientist's Guide*. New York: W. H. Freeman and Company.

Tong, V. C. H. (ed.) (2014) *Geoscience Research and Outreach: Schools and Public Engagement* Dordrecht: Springer.

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### 5.2 Useful resources

#### Published articles, books, reports and guides

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### Links to useful web sites

- British Science Communication Conference: <http://www.britishtscienceassociation.org/sci-comm-conference>
- British Society for Geomorphology: <http://www.geomorphology.org.uk/>
- Cafe Scientifique: <http://www.cafescientifique.org/>
- Earth Science Teachers Association: <http://www.esta-uk.net/>
- Geographical Association: <http://www.geography.org.uk/>
- Geological Society: <http://www.geolsoc.org.uk/>
- Manchester Beacon Network: <http://www.manchesterbeacon.org/>
- National Co-ordinating Centre for Public Engagement: <http://www.publicengagement.ac.uk/>
- National HE STEM programme (2012). Regional Projects: HE Engagement With Schools and Colleges: [http://www.sci-eng.mmu.ac.uk/he\\_stem/regional\\_projects/actions/?show=1](http://www.sci-eng.mmu.ac.uk/he_stem/regional_projects/actions/?show=1)
- Research Councils UK – public engagement: <http://www.rcuk.ac.uk/per>
- Royal Geographical Society: <http://www.rgs.org/HomePage.htm>
- The Wellcome Trust: <http://www.wellcome.ac.uk/Funding/Public-engagement/>
- University of the Third Age: <http://www.u3a.org.uk/>
- Vitae – realising the potential of researchers: <http://www.vitae.ac.uk/researchers/374241/Public-engagement.html>

## 5.3 Relevant journals for your public engagement publication

- *Bioscience Education* (HEA journal)
- *International Journal of Science and Mathematics Education*
- *Journal of Biological Education*
- *Journal of Further and Higher Education*
- *Journal of Geography in Higher Education*
- *Journal of Geoscience Education*
- *Journal of Higher Education Outreach and Engagement*
- *Journal of the Learning Sciences*
- *Journal of Science Communication*
- *Planet* (HEA journal)
- *Public Understanding of Science*
- *Science and Education*
- *Science Communication*
- *School Science Review*

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Dawn Nicholson is a Senior Learning and Teaching Fellow in the School of Science and Environment (Division of Geography and Environmental Management) at Manchester Metropolitan University. Her research has been funded by the LTSN GEES Subject Centre, the Higher Education Academy, the INLT (International Network for Learning and Teaching in Geography), Nuffield Foundation and Manchester Geographical Society. Core research themes are technology-enhanced teaching, engaging undergraduate students in research, and rock weathering and landform evolution in cold environments. In addition to work with local schools and colleges, Dawn has worked closely with local authorities, environmental and engineering consultancies, and also with regional societies and groups of enthusiasts. She is a member of the Committee of Heads of Geology Departments (CHUGD), and co-editor of the GEES journal *Planet*.

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## Appendix A: List of case studies

Case study No.	Title	Author(s)
1	A Café Scientifique in Cheltenham	James Derounian
2	A biodiversity visitor attraction at Canterbury Christ Church	Peter Vujakovic
3	An interactive sediment core exhibit	Wendy Woodland
4	Art meets environmental science... and gives birth to a 'fictional hybrid'	Peter Vujakovic
5	Tales of a 'flipped academic!' engaging with medieval barns, community groups and new foodscapes	Richard Spalding
6	Introducing students to the real world of international development	Alan Dixon
7	Students at the heart of networked outreach communities	Vincent Tong and John Shepherd
8	Airport community communications, a key to sustainable growth	Callum Thomas and Paul Hooper
9	Contributing to curriculum delivery in a sixth form college	Dawn Nicholson
10	Earth science training for Key Stage one and two teachers	Fiona Gill
11	Engaging industry and government agencies with applied research: ecological enhancement of hard coastal structures	Larissa Naylor and Martin Coombes
12	Working with the police and the justice system	Carolyn Roberts
13	Using student posters to communicate technical investigations to the public	W. Brian Whalley
14	Famous for three minutes – my time with the media	Simon Caporn
15	Kick-starting public engagement at MMU through the Manchester Beacon	Joanna Verran and James Redfern
16	Reward and recognition of public engagement activity at the University of Dundee	Rob Duck

## Appendix B: At-a-glance quick reference guide to case studies

CASE STUDY NO.	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
General public	✓✓	✓	✓	✓		✓										
Museums, galleries		✓✓	✓✓	✓✓												
Voluntary, charities, trusts					✓✓	✓✓	✓✓									
Community, residents					✓			✓✓				✓				
Schools and colleges									✓✓	✓						
Industry, professionals						✓	✓	✓		✓✓	✓✓					
Government agencies											✓	✓✓				
Engaging students						✓	✓						✓✓			
Working with the media			✓				✓							✓✓		
Research dissemination								✓			✓			✓		
Strategic development in HE													✓		✓✓	✓✓

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