Institution: University of Gloucestershire

Unit of Assessment: C-17 Geography, Environmental Studies and Archaeology

a. Context

The principal non-academic user groups and beneficiaries of the UOA's research consist of 'green' business, such as Ecotricity (a national green-energy company); Wildlife Trusts; Gloucestershire NHS Trust; Chambers of Commerce; Transport organisations and user-groups; British Trust for Ornithology; Royal Society for the Protection of Birds; English Heritage; Natural England; Natural Resources Wales; Society of Biology; the Police and Criminal Justice system; BBC TV and BBC Radio Science (Radio 4 and World Service); and the International Union for Conservation of Nature. The UOA's adoption of 'Citizen Science' approaches to research questions benefits a large and diverse section of the general public through their active participation with the UOA's research, which also increases public understanding of science. This is recognised by RCUK which has selected **Hart**'s work on the application of Citizen Science in studying flying ants as one of a small number of case studies to be included in a publication celebrating the "*Concordat for Engaging the Public with Research*".

Impacts of significance to these users include the engagement of, in some cases, millions of listeners/viewers; increasing public awareness and engagement with science; changing conservation and management practice; and assisting in 'greening' business.

b. Approach to impact

The UOA achieved impact at local, regional, national and international levels through a concerted and networked approach towards end-user engagement. To maximise impact, the UOA sought to develop networks of beneficiaries (including private companies and public bodies as well as the general public) and in many cases members of those networks became partners and co-researchers, thereby developing a mutually beneficial relationship. Impact was, and continues to be, supported through a collegiate approach that took full advantage of the contacts, connections and expertise of staff. For example, connections made by **Hart** with Ecotricity through his public engagement work have led to colleagues working with ecologists in this company on bat surveying.

Academic staff taken on during the REF period [**Wood**] and an institutionally supported Research Fellow [**Patrick**] allowed the UOA to develop impact through significant links with managers of Skomer Island and with the Portland Bird Observatory (PBO). New staff appointments have been considered in the light of the importance of impact and in some cases have been specifically appointed to develop research partnerships and networks to achieve impact (e.g. **Patrick**). Research (not submitted here) by **Wood** on monitoring international bird migration, for example, has changed the way that Skomer and other reserves count sea birds. This work will likely form the basis of an Impact Case Study for the next REF. The UOA also has sole access to more than 50 years of data accumulated by the ringing activities of the PBO, which will become a major beneficiary when these data are analysed by UOA staff.

The relatively small size of the UOA and the modest level of funding available to its members mean that staff have adopted a strategic networked approach to their activities that greatly enhanced the impact of the UOA's research. For example, the PBO research was more than just "contracted research" between the PBO and the UOA. Undergraduate students were trained to undertake the data handling, the research has become the topic for talks to interest groups across the country and the PBO has hosted field visits from interested parties. The research becomes the centre of a complex and mutually advantageous relationship between staff, the beneficiary, students and the wider public. This approach is typical of the UOA's pathways to impact and guides the UOA in supporting staff in developing and maintaining the impact of their research.

A similar networked approach to enhancing impact is shown by the *Centre for Environmental Change and Quaternary Research*'s work on climate mitigation/adaptation responses. For example, an innovative 'green' public transport project (**Chambers),** promoted in collaboration with Cheltenham Chamber of Commerce (CCoC), was runner-up in the HEFCE Low Carbon and

Innovation Awards 2010 as voted by an audience of more than 100 industry peers. Further work on the project involved collaborative discussion and knowledge exchange with rail-vehicle manufacturer Severn-Lamb and resulted in a presentation by **Chambers** at the Scottish National Gallery, Edinburgh winning the £25,000 prize for first runner-up in the international Green Transport Awards 2013. This encouraged a subsequent spin-off, under the auspices of CCoC, of a Limited Company to promote knowledge transfer into the public and commercial domains. Beneficiaries and end-users included Climate SouthWest, whose updated climate adaptation summary for policymakers '*Warming to the Idea*' (revised 2012) was co-edited by **Chambers** who also provided a presentation for Public Transport groups and users at TravelWatch SouthWest's (TWSW) March 2013 public meeting. As a consequence of this work TWSW then demanded, of government and industry, greater resilience of public transport to weather events.

Networking with a wide range of clients has led to impact from research applications of the UOA's Luminescence Dating facility. Beneficiaries include industry, large consortia of HEIs and museums. Working with Birmingham Archaeo-Environmental and Wessex Archaeology, **Toms** contributed to Regional Environmental Characterisation projects to influence the preservation of historic finds and support aggregate extraction, wind farm placement and fishing in the Humber and East Coast regions. Connections made through this work led to **Toms** contributing to land-based projects funded by the Aggregate Levy Sustainability Fund and Historic Environment Enabling Programmes through English Heritage to reduce environmental impacts of extraction of aggregates, including major mitigation projects at Chard Junction and in the Severn-Wye catchment.

Networking has led to surprising extra-disciplinary impacts. Research Associate and Honorary D.Sc. **Wiltshire** (Cat. C, RAE 2008) has developed and introduced applied aspects of ecology and palynology to forensic science. The methods have been so successful in cases of murder, rape, abduction and other serious crime that, through the National Police Improvement Agency, they now form part of police protocol in Wales, England, Northern Ireland and Scotland. With **Hawksworth**, she has developed mycological techniques that are also proving successful in aiding criminal investigation. Through his chairing of the highly networked IUBS/IUMS International Committee on Bionomenclature, **Hawksworth** has worked to simplify and streamline the naming systems of organisms of all kinds, and led proposals to make changes in the naming systems for fungi, which were adopted in the 'International Code of Nomenclature for algae fungi, and plants'. These included the requirement to register all new names in a recognised public database available to everyone. This represents a significant and long-lasting international impact of the UOA.

Public engagement

Public engagement activities have been supported within the UOA in part by the activities of a science communication and public engagement specialist (**Hart**). A culture of public engagement has developed during the past six years, and most staff have been involved with activities (e.g. a long-running series run by the UOA in collaboration with the Royal Society of Chemistry) that allow them to engage a wider audience with their research. A number of seminars and training sessions (both formal and informal) have been run throughout the REF period to support and train staff in enhancing impact through engagement. The development of a Masters in Science Communication (to start in 2014) will link directly to these existing activities and will help further in developing routes to impact.

Supported by the institution's Press and Marketing Department, **Hart** has written (since 2010) a monthly Research Focus column that highlights and explains published research undertaken by the UOA. A number of outputs submitted by the UOA have been featured [including outputs by **Chambers**, **Goodenough**, **Grenfell**, **Hart**, **Toms**, **Webb** and **Wood**]. This route has supported staff within the UOA in producing directed press releases for the national press, resulting in research by the UOA (not submitted as outputs here) on flying ant emergences (also selected as an RCUK case study for their publication on the anniversary of the Concordat to highlight the impact and benefit of public engagement), house spider phenology, bird nest box positioning and others being featured in national media including BBC Radio 2's *Breakfast Show* (8 million listeners), BBC Radio 4 (including *Today* and *Material World*), *The Sun* and *The Independent*.

Hart is also a regular national broadcaster on BBC Radio 4 and internationally on BBC World Service, writing and presenting documentaries. He was co-presenter of a major BBC TV documentary that was broadcast worldwide and presented a version that engaged children and involved them with science (Impact Case Study 1).

Members of the UOA have been regular participants at the renowned Cheltenham Science Festival throughout the REF assessment period with contributions that include lectures on recent research, panel events (including events on climate change and conservation) and family-friendly activity events based on research carried out by the UOA. These have included an interactive "smell-o-vision" session on pheromones, GIS mapping and bacterial hygiene demonstrations.

c. Strategy and plans

In 2012, the University committed to five years of funding directed at increasing research investment in 'Environmental Dynamics and Governance' (EDG) which spans the UOA and also includes research in the internationally renowned Countryside and Community Research Institute (CCRI; submitted RAE2008 to UOA 31). The EDG initiative underpins the UOA's research strategy for the next five years and is also providing the platform for maximising the impact of that research.

Impact Goals:

1) To develop closer links with businesses nationally through a directed and centrally supported Business Link programme to form research partnerships for applied research;
2) To expand Public Engagement and enhance the impact and reach of research outputs through directed press releases, social media and participation in international events.

The UOA's strategy for impact will involve two 'hub-based' programmes within EDG: (i) from 2014: to develop impact-focussed applied research through work with business, supported institutionally by a central business development unit as well as an Enterprise Hub for "hothouse" start-ups; and (ii) from 2015: to develop a Public Engagement Hub that allows for the considerable development of and institutional-level support for the engagement activities of the UOA. Citizen Science projects (with which members of the UOA already have experience and success) will be a particular focus, and this will be supported by existing expertise and new appointments linked to the developing Masters provision in this area. Citizen science projects allow the UOA to promote engagement and develop impact-focused research data with relatively modest investment.

d. Relationship to case studies

Impact Case Study 1, *Ants: Life inside in the Colony*, developed as a direct consequence of the strong public engagement strand that runs through the UOA's pathways to impact, and the institutional level support for staff undertaking public engagement activities. **Hart's** broadcasting work arose from his profile as a science communicator that itself arose from the support provided by the UOA and the institution. The networked approach outlined above is exemplified by this case study. The initial programme built on **Hart's** research, but this output led to further secondary impacts that included novel Citizen Science research projects. These projects have engaged the public directly in his continuing research. Thus, research outputs become impacts, which themselves lead to further research outputs.

The UOA has a long track record of contract research in climate science, applied conservation and management through the work conducted by the *Centre for Environmental Change and Quaternary Research*. To maximise the impact of this work, the UOA has always sought to engage multiple end-users with research outputs whenever possible, in line with the networked approach to impact outlined above. Case Study 2, *Applied ecology: from science to conservation policy and practice* (**Chambers, Goodenough**) exemplifies this approach. Contract research for national statutory conservation agencies, together with peer-reviewed publications, have led to briefings for conservation agency senior staff, subsequent engagement of conservation managers at reserve level, and to changes in policy and practice that are directly related to the UOA's research.