Institution: University of Worcester

Unit of Assessment: 5 - Biological Sciences

a. Context

Impact has arisen from 4 of the 6 research groups identified in the submission (*Atmospheric Science*, *Fungal Diagnostics*, *Health & Clinical Sciences*, *Plant Science*) primarily but not limited to activity undertaken by the National Pollen and Aerobiology Research Unit (NPARU).

Research in *Atmospheric Science* has developed techniques for sampling airborne material and identifying and quantifying specific pollen types in air samples, as well as establishing predictive models which feed into an accurate national pollen forecast. This research has public health benefits, enabling individuals suffering from asthma, hay fever and other allergies to manage their medication more effectively based on the forecast; it also improves the service that clinical practitioners can offer to allergy sufferers; it informs allergy testing on products such as air filtering equipment, vacuum cleaners and washing machines, bringing potential commercial benefits to the manufacturers but also health benefits to those using the products; it has been utilised in forensic work - pollen evidence can be used to link a person or objects to a location – and has therefore impacted on criminal cases; it has informed health policy relating to allergy.

Research in *Fungal Diagnostics* has led to the development of easy-to-use devices to predict the presence of fungal pathogens in soil and air and fungal spore forecasts, which benefit agricultural and horticultural growers by enabling them to make more informed and more effective decisions about pesticide use. This leads to increased yields alongside reduced pesticide costs. There are additional environmental and health benefits that arise from this research through reduced pesticide use.

Research in *Health & Clinical Sciences* examining the effects of airborne material on eyes has improved the services offered by clinical practitioners; while clinical trials of allergy medications have had both commercial and health benefits.

Research in *Plant Science* focused on pathogen-originated elicitors and effectors which inhibit or trigger plant immune systems also has applications for growers such as marker assisted breeding and for agri-businesses in development of seeds and seed protection.

The main users/beneficiaries of research in the submitting unit are thus the general population (particularly allergy sufferers), clinical practitioners, policy makers, vegetable growers and businesses producing allergy products and agri-products.

b. Approach to impact

The University's Strategic Plan for the period 2007-12, under the broad heading *Generating Knowledge and Promoting Enterprise*, identified the following key objective: "to support the development and expand the reach of our areas of research excellence...with social and/or community identified impacts". The submitting unit reflects the success of this objective: it has produced excellent research which has had wide-ranging impacts on health, environment, public policy and services, commerce, economy and society.

Staff in the unit have enabled impact from their research by:

- **Interacting directly with user groups/beneficiaries**, e.g.:
  - The unit works with local hospitals (e.g. Worcester Royal Infirmary) and individual clinicians at Worcester Acute Hospitals NHS Trust (Ian Winson, Consultant Orthopaedic Surgeon; Richard Lewis, Consultant Physician in Respiratory Medicine; Steve O'Hickey, Consultant Physician in General Internal and Respiratory Medicine).
  - It provides training which is informed by its research to e.g. clinical practitioners, the data collection team for the National Pollen Monitoring Network.
  - NPARU is a member of the Worcestershire Health Research Collaboration, a network of regional Clinical Commissioning Group and Acute Trusts, focused on developing and disseminating collaborative research with public health benefits.

- **Developing relationships/partnerships with key stakeholders**, e.g.:
  - NPARU has a close working relationship with Allergy UK, a leading national charity dedicated to supporting the estimated 21 million allergy sufferers in the UK; it undertakes product testing under the agency of Allergy UK, which provides accreditation of the products through a Seal of Approval
  - NPARU has undertaken commissioned research for The Horticultural Development Company (AHDB) since 2010.
- **Establishing long term relationships/partnerships with businesses,** e.g.:
  - NPARU has undertaken a range of commissioned research for Syngenta since 2011 and is in the process of establishing a longer term collaboration to enhance the marketing of its hand-held lateral flow devices.
  - NPARU also works with Kettle Produce Ltd, a major vegetable producer in Scotland, providing them with data on fungal pathogens to disseminate to their growers.
- **Disseminating research to non-academic users/beneficiaries,** e.g.:
  - Staff in the unit have produced reports aimed at the general public, e.g. Emberlin's Hay Fever Health Report (2010) commissioned by Kleenex was widely reported in the media and was part of a campaign recently estimated as having reached 75 million people (http://www.utalkmarketing.com/Pages/Article.aspx?ArticleID=16831).
  - NPARU provides crop disease forecasting through its website; it also utilises Twitter in conjunction with a team from the allergy clinics at Worcestershire Acute Hospitals NHS Trust to keep allergy sufferers up-to-date with pollen and fungal spore forecasts.
  - Kennedy's research features regularly in the trade magazine, *The Vegetable Farmer*.
- **Engaging non-academic audiences with the unit's research,** e.g.:
  - Staff in the unit regularly provide broadcast interviews for radio and TV relating to topical events (e.g. the volcanic dust cloud, interviews about honey bees, and forensic expertise), as well as featuring in local and national newspapers (e.g. Beverley Adams Groom, Pollen: everything you need to know, The Guardian, 12/4/2012).
  - Staff (Susanne Prankel, Lorraine Weaver, Wheeler) collaborated with colleagues in the Drama department to develop short plays on stem cells, IVF, etc. that were delivered to school children in the region.
  - In 2012, Alison Tor-Woods, a postdoctoral researcher in NPARU, was the scientist on a Royal Society Partnership Grant with Alcester Academy on a project looking at Molecular Detection of Allergenic Pollen.
- **Through participation in strategic policy and planning committees/groups,** e.g.:
  - Kennedy sits on West Midlands South Comprehensive Local Research Network Board
  - Newbury chairs the Biochemical Society Education Committee which seeks to engage the next generation of bioscientists, through events, resources and career support.

These approaches have been enabled in a number of ways:

- NPARU in particular has a strong focus on business development. It employs a Commercial Research and Business Development Manager (Wakeham, an active researcher returned here) who promotes NPARU in the commercial sector, identifies and develops areas of commercial research, and seeks out opportunities for product testing.
- The unit's approach to dissemination is supported by the University's Communications and Participation Department (Comms). This department facilitates and seeks out interactions with the media, produces a general public-focused research magazine (*Inspire*) which regularly features staff from the unit, organises media-focused events.
- The Hive, the UK's first joint university and public library, provides spaces for public

engagement – meeting rooms, lecture theatre, exhibition space – which have been utilised by university researchers to deliver information, presentations, posters, etc. to the general public.

Evidence of impact is tracked in a number of ways. NPARU, for example, keeps a detailed record of public engagement activities – TV and radio appearances, newspaper articles, public lectures, etc., which is reported to its steering group. A more general record of the unit's engagement activities is kept by Comms. The close working relationships described above enable direct liaison with research users to ascertain the impact of the unit's research. In the case of training workshops, evaluation is undertaken to measure the impact of the event.

c. Strategy and plans

The approaches described above have been successful in generating impact from the unit's research, although, for the most part, they reflect approaches adopted in NPARU. They have created a model for development for other research groups in the unit to adopt. There are researchers, for example, in *Biomedical Sciences* seeking to understand cancer progression at a cellular level (Cherry, Coles) and in *Animal Biology* examining the adhesive qualities of tree frogs (J Smith) whose work has significant potential impact and the unit will look to fulfil this potential in the next 5 years.

The broad impact strategy of the unit going forward is thus: to maintain and develop relationships with organisations that can facilitate impact; to work with business, both through contract research but also through the establishment of more long term collaborations; to continue to engage directly with research users through networks, training, one-to-one relationships; to ensure the widest possible dissemination of its research to non-academic users through print, visual and social media; to track and measure the impact of its research.

The unit will be supported in its ambitions by the enhancement of the University's business development services. In particular, greater expertise relating to Intellectual Property (IP) will allow more effective capture and exploitation of IP rights, increasing the economic impact of the unit's research.

There are more detailed plans in place for enhancing impact in NPARU. A number of developing strands of research in NPARU have a clear focus on benefitting the end-user:

- developing mobile phone apps to provide faster and more convenient delivery of information about pollen and spore levels;
- providing growers with risk predictions for a wider range of fungal diseases;
- providing more detailed information to hay fever sufferers (at the level of pollen species and their allergens);
- developing multiplexed hand-held kits that allow the assay of more than one fungal spore type at a time.

NPARU also has plans to complete IEC 17025 Accreditation Validation for its facilities and protocols for testing for Volatile Organic Compounds thus providing stronger support and services to industry.

d. Relationship to case studies

The two case studies, both arising from research within NPARU, strongly reflect the unit's approach to impact and have informed the strategy moving forward. Both case studies reveal how established relationships with key stakeholders and businesses - the Met Office, Allergy UK, Kettle Produce Ltd, Syngenta - have enabled the impact of the research. They also are illustrative of the approach to dissemination in the unit, demonstrating the many different channels the unit has used to engage users with its work: print media, TV and radio, lay reports, websites, social media. The case studies also show the range of benefits emerging from the unit's research: on public health, on the environment, on businesses, on clinicians and clinical services.