

<p><b>Institution: University of Derby</b></p>
<p><b>Unit of Assessment: Biological Sciences (UoA5)</b></p>
<p><b>Overview</b> This unit of assessment represents the submission of the Biological Sciences Research group (BSRG) which is made up of researchers from across the faculty of Education, Health and Sciences (EHS). Due to the diverse nature of the group, natural “clusters” of academic topics occur within; these can broadly be divided into “Human Health” “Conservation” and “Animal behaviour”. The head of the BSRG (Sowter) convenes regular meetings, highlights internal and external funding opportunities, attends University research committees, facilitates collaboration with internal and external partners and distributes the annual QR money to members of the BSRG on a competitive bidding basis. The group aims to:</p> <ul style="list-style-type: none"> <li>• Promote, sponsor, support and develop high impact biological science research</li> <li>• Provide a community for postgraduate research students involved in biological research</li> <li>• Promote engagement between experienced and early career researchers</li> <li>• Ensure constructive alignment between University, Faculty and Subject Group research policies and practice</li> </ul> <p><b>b. Research strategy</b> University research strategy sets out the expectation that all disciplines engage in research leading to outputs which inform the taught curriculum and bring broader economic or cultural benefits for society. The research undertaken by the BSRG resonates with this strategy and the research group has made major progress since RAE 2008; we now have 16 FT academic staff and 6 (3 self-funded) PGR students compared to 6 and 3 (all self-funded) respectively at 2008 and plans are in place for this momentum to continue. Some research income was awarded to a previous member of the group (Duncan) which helped establish research by other members of the group (Sowter). Since 2008 there have been 1 professorial conferments within the group (Vahed) and 1 readership (Sowter). Additionally, since 2009 the group has been awarded funding for 3 graduate teaching associates (GTAs) every 3 years (2 from BFS and 1 from Sport) which are subject to a competitive bidding process from BSRG members; two more are starting in 2013. Quality research (QR) funding received since September 2009 has been re-invested in the researchers including those who have joined since 2008 (Barnes, Bulling, Huck, Knight, Ramsey, Sweet and Smith, 2 of which are early career researchers). Collaboration was an important part of BSRG strategy and has played a major part in the advance of projects which have had significant impact. Internal and QR funding awarded to the BSRG since 2008 has been efficiently and effectively used to set up a strong research team that is now making an international impact. We have the staff and infrastructure to build on these improvements, increase our level of external funding and provide excellent research training. <b>Research plans</b> The group is increasing in esteem, and on-going research over the next 5 years will continue to strengthen our portfolio of activity. Barnes is supervising a Daphne Jackson fellow (Crooks) in a project that aims to develop novel antibiotics for use in humans (starting July 2013). Knight has secured QR funding (£2500) to investigate oral HPV infection in the student population, and attitudes to the HPV vaccination within Derbyshire Schools. New GTA positions (starting Nov 2013) are “The Role of Habitat Enrichment in Improving Welfare in Captive Primates” led by Bulling, and “Learning lessons from the past: understanding the classification, speciation, distribution and current status of the Natterjack toad in Great Britain” led by Rowe. Ramsey is supervising a self-funded international student for a PhD entitled “The Population ecology of corrugated water frog; genus <i>Lankanectes</i> (Peters, 1963) in Sri Lanka” (starting Oct 2013). Huck plans to continue her collaboration with the University of Pennsylvania and her research on Argentinean owl monkeys. In particular, intense surveying of the predator and competitor community of the study population is planned. She will also have access to the long term demographic and behavioural database of an owl monkey project, and analyse these data with respect to the evolution of monogamy and male care in this primate. Sowter has set up a collaboration with Drs Keni and Aldridge at Royal Derby Hospital to investigate whether inspiratory muscle training can improve symptoms of dyspnoea in advanced cancer patients (starting Feb 2014). Sustainable research has been effectively increased by the introduction of an MRes degree (Sport) in 2012, and a MRes (Science) in Sept 2013. Barnes is collaborating with John Cooper from the University of Cambridge veterinary School and in 2014 will analyse tissue samples taken during the decomposition sequence (in 2013), the aim being to improve post-mortem interval estimation in wildlife and domestic animal crime. BSRG staff offer competitive research internships to UG students, some of which will form the basis of pilot studies for external grant applications. In addition, interns gain research training additional to their degree and a strong impetus to continue research in the Sciences; for example, one intern presented</p>

## Environment template (REF5)

results of his project at the National Cancer Research Institute Conference in Nov 2012. **Promoting research and interdisciplinary collaboration** We publicise our research news via the BSRG website, and make our publications available through the University of Derby Online Research Archive (UDORA) the green open-access platform launched in Dec 2011. Interdisciplinary research with other departments within the School of Science is promoted via specific events (for example, School of Science Away day in 2010 funded by BSRG and Psychology QR money). Staff presenting research at national and international conferences have been funded by the UoD and QR money.

**c. People, including: Staffing strategy and staff development**

**Commitment to increasing sustainable external funding** In 2012 the EHS central faculty business manager ran the following activities to help improve both chances of funding success and increase impact of research: 1) Seminar on 'Changing UK & EU Funding Landscape' – delivered in-house with support from Loughborough University. This seminar provided an overview of the changing UK environment in terms of access to funding to support following the 2010 and 2011 Comprehensive Spending Review which resulted in significant reduction in funding for knowledge transfer activities and changes to weightings for QR monies. 2) Proposal writing workshop held in collaboration with UKRO – this seminar covered mainly the EU funding landscape and the adoption of practices to help improve chances of success such as consortia building, funding eligibility, contractual and financial considerations. Additionally, the BSRG organised a workshop with the NIHR research development team in 2012, which has sparked plans to apply for a large Research for Patient Benefit grant (see future research plans). Our associate member (Mr Bali) is an NHS-employed researcher who has co-supervised one of our GTA students (Archer); Archer has now been employed by Mr Bali as a post-doctoral scientist at the Royal Derby Hospital, and both will continue to be active researchers in the BSRG. A Peer Review Scheme for external grant submissions introduced in March 2012 requires that all applications are peer reviewed by an appropriately experienced colleague to ensure high quality of submission to external organisations.

**Development of research staff and staffing strategy** During their annual performance review BSRG staff are required to indicate research outputs and objectives. The University is committed to providing professional development to early career researchers and also to longer serving members of academic staff, and has provided a series of professional development workshops since 2005 focused particularly on the needs of early career researchers. In 2010 the University established a cross University team representing all the faculties which created an assessed credit based programme in Academic Practice in Research. The core part of this programme comprises two class room based modules Research Colloquium and Research Supervision. The first is about the practice of the researcher and the second is a mandatory module for all staff who are supervising PGR students for the first time. First time supervisors must take a short three day course provided by their faculty before they can start as a supervisor before taking the Research Supervision module. In the BSRG staff development is also supported by other mechanisms, such as PhD supervisory mentorship, and early career staff are included in supervisory teams to gain experience. Staff development funding revolves around three main sources **1)** funding secured through RAE2008, some of which is made available to newly appointed members of the group **2)** funding from the University in the form of either a) Research, Learning and Teaching Funds which encourages links between pedagogic and discipline-based research (£38,000 to the BSRG since 2008) or b) the Promising Researcher Fund, which focuses on discipline-based research and **3)** Faculty staff development budgets that support professional development and conference attendance. Since 2006 the University has organised an annual research conference to showcase University research, provide group discussions of important research matters and above all to enable staff to network. BSRG members have been very active participants in all these events. **Research students** are fully integrated into the research centres on enrolment and supported to develop confidence in presentation by giving a research seminar to staff and UGs at least once during the course of their programme. The University has a very strong commitment to provide the very best possible postgraduate research experience. This includes the formal development of PGR skills and research methods which would satisfy the requirements of the research council training requirements. In September 2008, the University introduced a programme of credit bearing assessed level 7 modules. These modules are taken as the first stage of a two stage four-year New Route PhD. This New Route PhD with the interim award of the Master of Research Degree operates alongside the existing three year FT Traditional Route PhD and provides research training for students without a Masters qualification. Both routes are also available part time. This programme is considered to be major step forward and the student responses have been favourable. The module materials are also made available to the Traditional Route students. The PGR students are represented on the framework committee and their directors of studies are invited to attend as well so

## Environment template (REF5)

that improvements can continue. Progress of PGR students is monitored via the Faculty Research and Research Degrees Committee (meeting 4-5 times per year) and through annual progress reports written by both supervisors and students. Since 2008, PGR Network events are organised once each term to help PGR students mix across the different disciplines and in 2010 the Annual New Horizons PGR Conference was introduced. This is sponsored by the University but entirely organised by the students (with a little guidance from the Head of Research). About 80 to 90 students have participated and about 16 have presented their research each year. Also introduced in 2010 are eight awards of up to £250 each year to help finance student presentations at external conferences. These improvements to the PG environment were reflected in our PGR student satisfaction score; in 2011 85% rated their experience as excellent or good, rising steadily from 75% in 2006. Externally, Sowter has co-supervised two NHS senior registrars who successfully completed MD projects at the University of Nottingham Medical School between 2009-2013. Ramsey is co-supervising 4 PhD's based at University of Cumbria – registered at University of Lancaster, funded by UKERC (3) and Freshwater Biological Association (1) and Lynch is supervising a PhD student at Universiti Puta Malaysia.

**d. Income, infrastructure and facilities** The UoD and EHS Faculty have committed to continually improving the research infrastructure, and the BSRG has substantially benefitted from this policy since 2008. In-house facilities for PGR students and specialist research equipment provision are two areas of major improvement. Since 2008 two large PGR offices have been re-equipped to accommodate about 40 FT students and also provide hot-desk facilities for PT PGR students. Library facilities include the provision of a wide range of electronic journals relevant to the biological sciences, free interlibrary loans for staff and PGR students. PGR students and research staff in the BSRG also have access to specialised research laboratories; these include PCR suites (with a quantitative PCR machine purchased in 2012), cryopreservation technology, plant culture and human cell culture facilities (the latter was established in 2009; a laminar flow hood was purchased for Sowter by the Translational Research laboratory at UCL in gratitude for collaborative work undertaken that year). Departmental funding has allowed the refurbishment of our insectary facility in 2012, which is used both by PGR students (Gee), and research staff (Barnes, Bulling and Vahed). Additionally, since 2008 the Faculty has invested in a specialised physiology laboratory (used by Smith and Sowter), and Derby is one of the few universities to own an iDEXa machine to monitor body composition (this will be used in future research projects). Between 2008 and 2010 the BSRG was awarded £208k as part of a Derby and Derbyshire Enterprise Partnership (DDEP) grant to update HPLC facilities (used in the Herceptin project; see case study 2) and for equipment essential to Mehra's research (microwave digester, furnace for atomic absorption spectrophotometer). Since 2008 we have secured £38,000 of internal research money from the UoD (teaching informed research fund) that has helped to set up research for early career scientists (eg Sowter's TMA project in 2009). In 2012 the UoD became a sponsor of a Daphne Jackson Foundation awardee, Crooks, who joined the BSRG under the supervision of Barnes and Sowter in 2013. Her 0.5 salary (up to £40,000 for the 2 year period of her employment) will be paid by the EHS central faculty. Additionally, a commitment to the funding of 3 GTA positions (@ £20,000 per year for salary and consumables) has been met by the BFS and Sport departments since 2009.

**e. Collaboration and contribution to the discipline or research base** BSRG members have gained reputation in their respective research communities which can be evidenced by invitations to deliver seminars, to act as peer reviewers for journals and funding bodies and to sit on scientific committees that inform direction and change within their subject areas. Specific details are outlined below.

**Journal editorship Lynch:** Associate editor for Journal of Horticultural Science and Biotechnology, and invited co-editor of special edition of Acta Horticulturae associated with the first International Symposium on the Cryopreservation of Horticultural Plant Species, Katholieke University of Leuven, Belgium Mar 09. Co-editor of Cryopreservation of crop species in Europe Proceedings of the final meeting of CryoPlanet, COST 871 (2011). **Mehra:** Invited Assistant Editor of the international refereed journal 'Chemical Speciation and Bioavailability'. Invited member of the Editorial Board of the international refereed journal 'Environmental Geochemistry and Health', 2003- present. **Vahed:** Associate editor for the *Journal of Orthoptera Research* (on-going). **Sowter:** Oncology Editor for Scientifica Journal, on the editorial Board of Journal of Cancer Research, Associate Editor for Oncology News. **Invited research seminars and publications Carey:** The International Karst Waters Institute meeting on Anchihaline cave Lagoons Nov 2009, Mallorca, Spain. **Mehra:** 'Environmental iodine and goitre – A case study of endemic goitre in the UK-Peak District', at the Diabetes and Endocrine Department, Derbyshire Royal Infirmary, Nov 2009. Invited

## Environment template (REF5)

author of a book chapter (Mehra, A., Lynch, P., Saikat, S., Chan, L. 2012. 'Trace elements in tea (*Camellia sinensis*) and their bioavailability', In: 'Tea in Health and Disease Prevention', Elsevier.

**Vahed:** "Beware of males Bearing Gifts? Sexual conflict and nuptial feeding in bushcrickets" (University of St Andrews, May 2009 and Aberystwyth University, Mar2010, University of Newcastle, June 2010); "Testes and titillators: the evolution of genitalia in bushcrickets" (Uppsala Agricultural University, Sweden, Feb 2011, University of Plymouth, Feb 2011; University of Tours & Centre National de la Recherche Scientifique (CNRS), France, Mar 2012); "Sexual conflict in crickets" (public lecture) (Natural History Museum, London, May 2011). Organiser of a symposium on sexual selection as part of the 10<sup>th</sup> International Congress of Orthopterology (Turkey June 2009) and a symposium on "Nuptial gifts in insects" as part of "Ento '13", The Royal Entomological Society's annual conference (University of St Andrews, September 2013).

**Sowter:** "The Science of Cancer" (Thames Valley Cancer Network Leukaemia Update Group, Oxford University, Aug 2009) and "Using tissue microarrays as predictive models of ovarian cancer" (University of Northumbria Nov 2011).

**Huck:** "Till Death Us Do Part? Monogamy and male care in owl monkeys (and other mammals)" (Department of Anthropology of the University of Durham April 2013).

Participation in Peer review processes 2008-2013

**Lynch:** Invited to be a reviewer for the European Science Foundation, for the Estonian Research Council (2012) and Austrian Science Fund (2013); this included giving advice and support to potential applicants and reviewing and grading submitted applications in the area of plant biotechnology.

**Vahed:** Member of the Orthopterist's Society's Grants Committee (on-going). Has reviewed and have made funding decisions on approximately 60 grant applications for the Orthopterist's society's small research project grants since 2008. Grant reviewer for the National Science Foundation (USA) in 2009 and 2010 and the Association for the Study of Animal Behaviour (2010). Article peer reviewer for: Proceedings of the Royal Society B, Behavioural Ecology & Sociobiology, Biology Letters (Royal Society), Evolution, Journal of Evolutionary Biology, Animal Behaviour, Behavioural Ecology, PloS one, Ethology, Canadian Journal of Zoology, Behaviour, Naturwissenschaften, Journal of Insect Physiology, Journal of Insect Behavior, Journal of Ethology, Journal of Zoology, Ecological Entomology, Entomologia Experimentalis et Applicata, Physiological Entomology, Journal of Orthoptera Research, Biological Journal of the Linnean Society, Journal of Insect Science, European Journal of Entomology, Heredity, Forensic Science International, Journal of Experimental Zoology, Frontiers in Zoology, BMC Evolutionary Biology and Evolutionary Ecology.

**Mehra:** Invited to review book 'Landon, M. 2010. Environment, Health and Sustainable Development. Open University Press, McGraw-Hill Education, England' in December, 2010. Appointed by the Kuwait Foundation for the Advancement of Sciences (KFAS) to review their report entitled: 'Apportionment of trace metals of pollution in outdoor and indoor PM-10, PM-2.5 and in selected flora of Kuwait arid ecosystem'. Project Code: 2006-1401-02; review of new proposal for KFAS, Sep 2013 on 'Multi-dimensional assessment of trace metals and criteria pollutants using air and water quality indices in the Kuwait environments. Project Code: 2013-1401-02.

**Bulling:** Article reviewer for International Society for Microbial Ecology Journal, Environmental Modelling, Oikos, Functional Ecology and PLoS ONE

**Sowter:** Article reviewer for American Journal of Pathology, Carcinogenesis, Journal of Ovarian Research and Human Molecular Genetics; Grant reviewer for the MRC (twice), Wellbeing of Women and National Institute Health Research; Professor tenureship reviewer for University of Southern California.

**Barnes:** Article reviewer for the Journal of Microbiological Methods, Immunology and Medical Microbiology, Ecological Entomology, Entomologia Experimentalis et Applicata and Tropical Biomedicine

**Huck:** Journal reviewer for Primates, Biological Conservation and Wildlife Biology; 14 reviews for small research grants for early stage researchers of the International Society for Primatology.

**Rowe:** Article peer reviewer for Proceedings of the Royal Society B.

External PhD examining **Lynch:** University of Reading 2009, University of Malaya (1 PhD 2011, 1 MPhil 2010), Universiti of Putra Malaysia 2010. **Mehra:** Nottingham University 2011, Sussex University 2010 and Curtin University of Technology, Perth, Australia **Vahed:** Oxford University, 2008 **Sowter:** Nottingham University 2008, UCL 2013 and Queen Mary College, London, 2012.

Project Collaboration **Barnes:** Dr Gennard at the University of Lincoln "insect succession on wrapped and unwrapped pig carcasses" Results have been published and should improve the accuracy post mortem interval estimations. **Bulling:** Prof. Rahbek at the Centre for Macroecology, Evolution and Climate in the Institute of Biology, University of Copenhagen and Dr. Ahrends at

## Environment template (REF5)

Royal Botanic Garden, Edinburgh examining the impact on plant biodiversity estimates in the Eastern Arc Mountains in Tanzania of potential sampling biases; Assistant Prof. Langenheder at the Department of Ecology and Evolution, Uppsala University examining the effects of environmental complexity on the biodiversity-ecosystem functioning relationship in microbial communities. **Vahed:** “Increasing the chances of survival of Whiteclawed Crayfish in the River Lathkill” with Prof. Rogers of David Rogers Associates (project awarded £ 23 K in June 2008); “Free amino acids as phagostimulants in cricket nuptial gifts” with Prof. Simpson, University of Sydney, Australia; “Forced mating behaviour in Alpine bushcrickets” with G. Carron, University of Geneva; “The evolution of testes size” with D. Parker, University of St.Andrews and J. Gilbert, University of Sydney, Australia; “Copulation duration and genitalia in bushcrickets with Prof. Lehmann, Humboldt University of Berlin and Dr Gilbert, University of Sydney, Aus., Dr Weissman, California Academy of Sciences and Dr Barrinetos-Lozano, Insituto Tecnologico, Victoria, Mexico; “The evolution of dance-fly mating systems” with Prof. Ritchie, University of St Andrews. **Mehra:** ‘Quantification of elemental interaction effects in Brussels sprouts plants irrigated with treated municipal wastewater’ with Dr Kalavrouziotis, University of Ioannina, Greece. **Lynch:** Garlic cryopreservation – Keith Harding (DAMAR Research Scientists) Joachim Keller (IPK Gatersleben, Germany). Olive cryopreservation – Erica Benson (DAMAR Research Scientists), Jason Johnson The New Zealand Institute for Plant and Food Research Ltd and Maurizio Lambardi and Carla Bennelli Istituto per la Valorizzazione del Legno e delle Specie Arboree. Tea cryopreservation – Uma Rani Sinniah, Universiti Putra Malaysia. **Sowter:** collaborates with the University of Southern California, and is a member of the ovarian tumour tissue association led by Dr Ramus. An ovarian cancer tissue microarray (TMA) incorporating 340 patient biopsies with linked prognostic data (developed by Sowter and Spendlove, University of Nottingham) is included in the consortium’s portfolio. The creation of this large data pool has increased the value of each patient sample and made our group part of an international effort to identify new therapeutic targets in ovarian cancer. **Knight:** Dr Roberts, School of Cancer Studies, University of Birmingham investigating levels of oral HPV infection in young adults. Two schools are participating in the investigation looking at children attitudes to the HPV vaccination; Tudor Grange Academy, Solihull, UK and De-ferrers Academy, Burton, Staffordshire, UK. Both Knight and Sowter are members of the Gynaecological Cancer Research Group at Derby Royal Hospital. Membership of Scientific Committees and groups **Lynch:** Member of the international scientific committee and organising committee for the First International Symposium on the Cryopreservation of Horticultural Species – Katholieke (University of Leuven, Belgium Mar 09) and Trustee for the Society of Low Temperature Biology (2005 – 2010). Vice Chair of COST 871 – Cryopreservation of European Crop Species (July 2006 – present). Member of International Scientific Committee of Cryo2010, 47th Annual Meeting of the Cryobiology Society, Bristol 2010 and 2011. **Mehra:** 2008-present: advisor to the Environment Agency on regional priorities impacting on regional policy making and to the Environment Agency’s ‘Regional Environment Protection Advisory Committee (REPAC) 2008-2011. The REPAC was a statutory committee under the Environment Act 1995. It reported to the Secretary of State for the Environment and the Board of the Environment Agency and helped form regional and national strategy and policy of the EA. Invited member of ‘Science Diploma Higher Education Working Group’, SEMTA (The Sector Skills Council for Science, Engineering and Manufacturing Technologies), June 2008 onwards. Elected Councillor, Executive Board, Society for Environmental Geochemistry & Health (SEGH) USA, Europe, Asia Pacific (2010). **Barnes:** Member of the European Association for Forensic Entomology and the Royal Entomological Society,. **Vahed:** Fellow of the Royal Entomological Society; member of the Association for the Study of Animal behaviour and the international Orthopterist society; member of the International Orthopterist society’s Grants Committee. **Sowter:** Member of British Association of Cancer Research, Member of the European Association of Cancer Research. **Huck:** Member of the Association for the Study of Animal Behaviour. **Ramsey:** Member of Society for conservation biology, Fellow of the Zoological society of London)