

Impact template (REF3a)

Institution: Queen Mary University of London (QMUL)
Unit of Assessment: A5 (Biological Sciences)
<p>a. Context</p> <p>Biological sciences activity in the QMUL School of Biological and Chemical Sciences (SBCS) has diverse impact, as would be expected in a School where research activity ranges from ecology to structural biology. Beneficiaries range from government policy makers and NGOs to pharmaceutical companies. SBCS's research strategy in Biological Sciences focuses on the development of four distinctive clusters of research excellence, which also provide a focus for impact activity. For each research grouping we have identified specific potential for future impact, as detailed in section c.</p>
<p>b. Approach to impact</p> <p>Historically interactions of academics with industry and environmental bodies have been the result of personal initiatives, supported by QMUL structures (see below). Since restructuring in 2011-12, SBCS promotes impact proactively, especially through the Research Strategy Group (RSG).</p> <p>How SBCS supports and enables staff to achieve impact. Support is achieved by:</p> <p>(1) RSG oversees the allocation of funds that promote impact, including: studentship, "pump-priming" (£50k pa) and "continuation" funds; (2) RSG organises internal peer-review of grant applications, including impact statements; (3) SBCS funds public engagement, e.g. funds for Dr Brennan's Royal Society Summer Science Exhibition 2013 exhibit "Are you as impulsive as a fish?"; (4) SBCS support of Industrial Fellowships by teaching relief for the duration of the fellowship, e.g. two current Royal Society Industry Fellowships (Dr Brennan, Dr di Tommaso); (5) SBCS funds professional services for major initiatives, e.g. a professional consultancy (Innovayt) assisted in the application of our successful Marie Curie ITN involving several businesses across Europe (e.g. CLCbio, GeneTwister); (6) Annual Careers and Partnership forums (first forum in 11/2013) also promotes our research to industrial end-users.</p> <p>How QMUL supports our impact. To foster impact QMUL has developed the following:</p> <p>(1) <u>Queen Mary Innovation (QMI)</u> negotiate agreements with industry to commercialise innovations arising from the QMUL research base, including licensing and other royalty-bearing agreements in order to ensure the effective translation of the College's research for societal and economic impact.</p> <p>(2) <u>Queen Mary Business Development Office (BDO)</u> links business with academic researchers and facilities at QMUL. BDO managers identify relevant academic expertise to meet commercial requirements through collaborative research, contract research and consultancy. They actively attract industrial collaborators. Three managers are dedicated to the Science and Engineering Faculty, one acting as a specific link with SBCS.</p> <p>(3) <u>Queen Mary Centre for Public Engagement</u> aims to set a new international standard for the ways HEIs engage with the public. Using a £300k grant from RCUK and £1 million HEIF5 funding for 2011-15, the Centre (with two full-time members of staff) provides training, support and funding for public engagement activities. It has a £214k pa Pump Priming Fund for innovative forms of public engagement and works with the Learning Institute to offer public engagement training, including for post-docs and PhD students; and with the BDO to provide guidance and training on impact activity.</p> <p>(4) <u>QMUL Public Relations</u> provides expert advice to academics to maximise their communication skills, and builds tailored strategies focused on impact and connecting research with the right audience via e.g. press releases, Twitter and RSS feeds, podcasts, iTunesU and a YouTube channel.</p> <p>How SBCS makes use of institutional facilities, expertise or resources: This is achieved by SBCS: (1) facilitating the development of new strategic directions in research, including the impact agenda. A BDO Manager attends RSG meetings in order to promote links with industry; (2) using QMUL structures to find partners and promote our research to outside users, e.g. QMI helped assemble the Marie Curie ITN network INTERCROSSING; (3) using our press office to publicise our work, e.g. Buggs' work on ash dieback which has been extensively covered by the media (www.qmul.ac.uk/media/news/items/se/88532.html); (4) encouraging collaborations, e.g. QMUL invested £18k with the University of Warwick to conduct <i>Brassica</i> research involving Leitch, now built on through the INTERCROSSING ITN network; (5) helping to find: i) CASE partners for 15 studentships (10 NERC, 2 EPSRC, 1 MRC, 2 BBSRC) in the REF period and (ii) industrial sponsors for research (e.g. multiple collaborations of Dr Ron Cutler with sanitation firms).</p> <p><u>Specific examples</u> showing how we interacted with end-users, developed impact and followed through with our activities are detailed in section c, together with our future aspirations and impact strategies in our areas of research strength.</p>

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c. Strategy and plans: Facilitation of future impact will proceed through:

(1) Greater focus on impact through RSG; (2) Providing internal peer-review of progress towards impact at regular (typically yearly) intervals; (3) Allocating time for work towards impact on the work-load model (which can be offset against other teaching and administrative duties, as is already done for our Royal Society Industrial Fellows); (4) Allocating funds for PhD students (as described under b). Two PhD students, as well as 72 months of PDRA time will be funded by SBCS to facilitate impact-generating activities in the next REF period; (5) Encouraging CASE studentships (as with "Aquatic Ecology", below); (6) Stimulating collaborative and interdisciplinary work within QMUL, e.g. QMUL has allocated four PhD students this year as part of its Life Science Initiative, and is establishing "Centres of Excellence" across the College, e.g. Research Centre for Psychology; (7) Appointing a "Director of Industrial Innovation": see below; (8) Introducing performance criteria that ensure recognition for impact activities alongside traditional yardsticks of publications, grant income and teaching performance; (9) The **recognition of impact** and public engagement is now formally embedded in the QMUL appraisal process and is a clearly identified promotion criterion. Exceptional impact activity is also recognised through the annual QMUL staff bonus scheme; (10) Recruitment of staff with high promise of impact, as achieved in Aquatic Ecology and Biological Psychology and planned in "Structural biology"; (11) engaging an intern to write copy specifically directed at policy makers and opinion-formers.

Director of Industrial Innovation (DII): The first key step of the strategy has been the recognition that the implementation of such plan would require a dedicated role. The School has appointed Prof. Resmini as Director of Industrial Innovation (DII) since September 2013, to facilitate industrial liaison and to develop new initiatives to achieve research impact, working closely with the BDO and QMI. The DII has a seat on the SBCS Senior Executive and is a member of RSG. A networking event in Nov 2013 was attended by a wide range of local and national businesses and showcased SBCS's more translational research.

Future impacts in our areas of research strength are envisaged, as follows:

Aquatic Ecology: Following the model of CS2, we foresee further impact from Aquatic Ecology in influencing public policy through the provision of advice and tools for the management of aquatic environments. QMUL Aquatic Ecology is particularly concerned with assessing and predicting the influence of climate change, habitat loss, pollution and invasive species on biogeochemical cycles and food-webs (papers by **Grey, Hirst** and **Trimmer**). This information will be of vital importance for shaping future government environmental policy. Our current NERC consortium projects have stakeholders fully embedded within them (e.g. DEFRA, Environment Agency, Wessex Water, RSPB). **Harrod** is involved in consultancy for government agencies and private companies on the impacts of invasive species and alternative energy on aquatic ecosystems, and he manages a large project for the Chilean research council on "Provision of key information for marine resource management in Northern Chile". We will be holding a CASE partner forum to bring together our CASE and consortium grant partners to hear presentations by, and share experiences with, PhD students and post-docs. Output from NERC consortia, key appointments and CASE PhDs are steps towards greater impact from the Aquatic Ecology group in the future. We have already CASE PhD studentships with Environment Agency (2 with **Grey** in the REF period); Natural England, the Salmon & Trout Association and the National Lobster Hatchery (CASE funders in the new NERC DTP). Changes in environmental policy typically arise through personal contact between individuals in organisations and HEIs, and CASE studentships are a good way to achieve this.

Biological Psychology: Future impacts from this developing group build as follows: (1) Dr Brennan is currently developing zebrafish as a model organism for understanding the neurogenetics of behaviour (especially propensity to drug addiction). This work is in collaboration with Pfizer (currently supported by a Royal Society Industry Fellowship). We are further developing CASE studentships jointly with pharma and biotech companies (Brennan already has had three within REF period with Pfizer, Nucana, Gnostics). (2) We foresee Biological Psychology as having a pivotal role in driving public policy on decision-making and health and well-being within modern/urban environments, in particular by bridging from mechanistic animal models (e.g., Brennan, **Chittka, Clayton, McElligott**) to human behaviour. The division has taken important steps to this goal with recent hires: Bright, Jones, **Mareschal, Pluess**, whose research spans the range of human psychology (Cognition, Developmental, Psychophysics, Neuroscience, Social). Dr Osman's work investigates the clinical benefits of assessment tools for examining the decision-making capabilities of the elderly (Care UK - a national organisation of care homes across the UK)

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and clinical patients (e.g., patients with Parkinson's Disease). The research aligns with the Government initiative (www.hse.gov.uk/hwwwb/) for innovative, practical approaches towards a more integrated health and care system, aiming to provide a set of simple assessment tools to be used by careers to better evaluate and coordinate with support services.

Evolution & Genetics: CS3 derives from human genetics studies. Future impacts build as follows:

(1) Understanding disease spread using new mathematical techniques that locate infection sources (e.g. tuberculosis and Legionella in London), in collaboration with Public Health England and the UCL Centre For Infectious Disease Epidemiology (Dr Le Comber). This work will be interfaced with Prof Nichols' work on virus evolution in amphibians and humans, done in collaboration with the Institute of Zoology and Barts and The London, respectively, and studies on invasive diseases, e.g. crayfish plague infection in collaboration with IoZ. (2) **Buggs'** work on conservation genomics of the dwarf birch builds on collaboration with Trees For Life and Highland Birchwoods. His work on ash dieback aims to identify resistance genes. DEFRA has appointed him as a "research lead" for the Chalara Oversight Group which provides scientific and policy oversight of ash dieback projects funded by DEFRA, JNCC and RCUK. In November 2013 he will present at the first meeting of the group and will organise a conference on ash dieback to be attended by 100 stakeholders, policy makers and the press. To further impact, we will make genomic data available to the wider community, through our web pages and by engaging with stakeholders and policy makers. Of relevance to the latter are our partners in the Marie Curie ITN "INTERCROSSING", including the bioinformatics companies, CLC, Era7 (cloud computing) and Eagle Genomics.

Structural Biology & Photosynthesis: Future impact from this group builds as follows: (1) Through promoting Synthetic Biology applications of **Pickersgill's** work on bacterial microcompartments and biomedical applications of **Viles'** work on amyloid fibrils. Both research areas will be actively promoted to industry and impact will also be developed through a strategic LoLa involving Pfizer and two UK SMEs. (2) We will develop our bioenergy profile, capitalising on the fundamental knowledge of photosynthesis (from **Krauss, Mullineaux, Nield and Ruban**) to gain new bioenergy solutions. **Mullineaux** and **Ruban** were involved in a Carbon Trust project to develop improved strains of marine algae for biofuel production, and are now seeking industrial partners to continue this programme of research. Impact will also be developed through a current Marie Curie ITN, and its projected successor, which will have extensive industrial participation. **Ruban's** studies on photoprotective mechanisms in plants will be applied to the development of crop plants optimised for growth in controlled environments such as glasshouses. To further impact, we will employ a lecturer in plant molecular biology in this area, in Spring 2014.

d. Relationship to case studies

CS1: Commercial bumblebee trade – protecting Britain's native pollinators. The underpinning research arose from the work of Dr Tom Ings, who moved from CABI Bioscience to take up a PhD studentship with **Chittka**, later moving to a Leverhulme Early-Career Fellowship in SBCS. Ing's PhD studentship was College-funded, while the initial studies were partly funded by an award from the University of London Central Research Fund. SBCS then contributed matched funding for the Leverhulme Fellowship. Thus the development of this impact results from pump-priming support at School, College and University of London levels, an approach that will be maintained through QMUL support for PhD studentships and interdisciplinary initiatives, and SBCS support for small pump-priming awards (a scheme that we set up because we recognise the importance of such funding for facilitating the development of new research directions). **CS2: Acidification and recovery of surface waters.** The current impact is a result of a long-term research theme at QMUL, underpinned by our participation in the UK Acid Water Monitoring Network, initiated and then led by Prof Hildrew. SBCS continues to develop Aquatic Ecology at QMUL, with a research focus on environmental change and a continuing commitment to interaction with government agencies. Some of the impact coming online is underpinned by research and consultancy made possible by interaction with the NERC Centre for Ecology and Hydrology, part of which (The River Communities Group) was incorporated into SBCS in 2009. **CS3: Trimethylaminuria is a genetic disorder.** The underpinning research arose from collaborations between Prof Ian Phillips at QMUL with partners at UCL and St Mary's Hospital Medical School. QMUL's projected new Life Sciences Institute is a significant ongoing enabler of such research impact in the future. The Institute will have a specific focus on the interactions between clinical medicine and human genetics which led to the impact described in CS3.