

## Impact template (REF3a)

<b>Institution:</b> Queen Mary University of London (QMUL)
<b>Unit of Assessment:</b> B8 (Chemistry)
<p><b>a. Context</b></p> <p>Chemistry research and strengths at QMUL are currently focused on the areas of <u>Synthesis and Catalysis</u> as well as <u>Materials Chemistry</u>, with targeted growth identified in <u>Physical &amp; Theoretical Chemistry</u>. Our main non-academic user groups lie within the pharmaceutical, agrochemical and fine chemicals industries. In all these industries catalysis plays a major role, since 75% of all manufactured chemicals are obtained by catalytic processes, generating products that total £700 billion in revenues. Our other major audience is the general public, through outreach and public engagement activities.</p> <p>The types of impact relevant to QMUL Chemistry include: investment funding through venture capital for start-up businesses, creating jobs, new products brought to market and international licences (economic impact); long-term commitment to public engagement, in particular targeting interests and awareness in schoolchildren towards chemical sciences (impact on society, culture and creativity); clinical trial data and the use of improved processes in developing countries (health impact); and increased levels of skills and capability in individuals arising from training received (impact on professional services).</p>
<p><b>b. Approach to impact</b></p> <p>Historically, interactions of academics with industry and environmental bodies have largely been the result of personal initiatives, supported by the School of Biological and Chemical Sciences (SBCS) and QMUL structures detailed below. Since restructuring in 2011-12, SBCS promotes impact more proactively, especially through its Research Strategy Group (RSG).</p> <p><b>How SBCS supports and enables staff to achieve impact.</b> Support is achieved by:</p> <p>(1) Our <u>Research Strategy Group (RSG)</u> that 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; (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 (including <b>di Tommaso</b>); (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 businesses (e.g. CLCbio, GeneTwister); (6) Annual Careers and Partnership forums (first forum in 11/2013) also promote our research to industrial end-users.</p> <p><b>How QMUL supports our impact.</b> To foster impact, QMUL has developed the following:</p> <p><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 provide specific support by actively attracting industrial collaborators and there are three managers dedicated to the Science and Engineering Faculty, with one, Charlie Ellis, dedicated to strengthening links between SBCS and industry. A representative of BDO sits on RSG.</p> <p><u>Queen Mary Innovation (QMI)</u> negotiates 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. Both our Case Studies exemplify the involvement of QMI and BDO. Proof-of-concept funding from QMI (calls every four months) can be secured in order to develop intellectual property, with a view to its exploitation through licensing or spin-out companies.</p> <p>The <u>effectiveness of our approach</u> is evidenced by a wide range of impacts achieved during the reporting period, including: (1) <b>CASE awards with industry</b>, Syngenta (x2, <b>Bray and Larrosa</b>), Phosphonics (x3, Prof Sullivan), Pfizer (<b>Larrosa</b>), Warwick International (<b>Watkinson</b>), Astra Zeneca (Dr Dobbs x 2); (2) <b>Funded collaborations with industry</b> including Procter &amp; Gamble (<b>Watkinson</b>), BP (Dr Zerbakhsh), GSK (Prof Resmini and <b>Larrosa</b>), Sanofi-Aventis and Polyintell (Resmini), GE Healthcare (Prof Griffiths); (3) <b>Coordination of Initial Training Networks</b> (x3, 2 in Chemistry active in the REF period) and Industry Academia Partnerships Pathways project (Resmini), both EU-funded partnerships, which supported early stage researchers and experienced researchers from QMUL seconded to industry (Kodak, Polyintell, Sanofi Aventis, MJR</p>

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Pharmjet) as well as researchers from industry coming to QMUL for transfer of knowledge purposes.

Relationships with industry have also been developed and supported via other funding streams including BBSRC follow-on fund, Technology Strategy Board scheme, Knowledge Transfer Network, venture capital support, and ImpactQM. ImpactQM is a unique impact-promoting scheme designed and hosted by QMUL. It has made a fundamental difference to the way universities, government and companies look at the impact of world-class science and technology research. Funded by EPSRC (£2.9m), this scheme is a knowledge transfer account designed to ensure that funded research is fully exploited, by supporting a portfolio of projects to develop collaborative research ventures for PhD students and industrial enterprises (nine in chemistry), and to establish new academic-industry partnership (two in chemistry) by providing teaching-replacement funding. Follow-through of these activities is evidenced by the two impact case-studies presented, where the research results were evaluated by the BDO and the relevant intellectual properties patented, leading to additional proof-of-concept funding and venture capital support.

Outreach activities are also central to the unit's commitment to increase the public's awareness of science. During the assessment period nearly 1,000 schoolchildren every year have engaged with academics from the unit in science-based events at QMUL, e.g. master-classes in spectroscopy, Salters' Festival, Scientist for a day. In addition, QMUL is a co-sponsor of the new Drapers' Academy for 11-18 year-olds in Harold Hill, Essex, which has a specialism in Maths and Science, with **Watkinson** as one of the three QMUL governors. Drapers' Academy is one of the most improved schools in the UK. We are also involved in wider University outreach activities, supported by two dedicated units:

i) The Queen Mary Centre for Public Engagement aims to set a new international standard for the ways HEIs engage with the public. Using a ca. £300k grant from RCUK and £1m HEIF5 funding starting from 2011, the Centre (with two full-time members of staff) provides training, support and funding for new and existing public engagement activities. It has a £214k pa Pump Priming Fund for innovative forms of public engagement and is working with the Learning Institute to offer public engagement training, including for post-docs and PhD students; working with colleagues in the BDO to provide guidance and training on Pathways to Impact activity; and providing advice and support to members of staff across QMUL, such as one-to-ones, speaking at seminars and open meetings, and reviewing public engagement grant applications.

ii) The QMUL Public Relations Group 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 press releases, Twitter and RSS feeds, podcasts, iTunesU and a Youtube channel. An active record of staff research expertise is maintained for external users ('Find an Expert') and media appearances are archived centrally.

**Recognition of impact** and public engagement is now formally embedded in the QMUL appraisal process and is a clearly identified promotion criterion. In addition special awards to staff within the Faculty celebrate these achievements (Resmini and **Larrosa**, 2011 Faculty of Science and Engineering, Research Awards). Within SBCS exceptional impact activity has also been recognised through the yearly QMUL staff bonus scheme.

### c. Strategy and plans

The **research strategy** for Chemistry in SBCS will focus on the consolidation of the clusters of excellence in Synthesis and Catalysis and Materials Chemistry while growing the Physical & Theoretical Chemistry group (including a new initiative in Computational Chemistry). All of these areas have been supported by recruitment of a cohort of young, research-active staff during the REF period, with further appointments planned to bring the total Chemistry staff to 20. At both School and College level there is strong support for interdisciplinary work, exemplified by major investments in the new Materials Research Institute (established 2012), the Institute of Bioengineering (established 2011) and the Life Sciences Institute (projected to open in 2017-18), with excellent opportunities for further developing research impact in catalytic materials and pharmaceuticals.

The **impact strategy** will proceed through: (1) Greater focus on impact through the 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 done for our Royal Society Industrial Fellows); (4) Allocating funds for PhD students: two PhD students, as well as 72 months of PDRA time funded by SBCS to

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facilitate impact-generating activities in the next REF period; (5) maximising translational opportunities (below); (6) Appointing a “Director of Industrial Innovation”: see below; (7) Introducing performance criteria that ensure recognition for impact activities alongside traditional yardsticks of publications, grant income and teaching performance; (8) Staff promotions based on criteria relating to impact and public engagement; (9) Recruitment of staff with high promise of impact; (10) engaging an intern specifically to write copy translating research into papers directed at policy makers and opinion formers; (11) Increasing our public visibility (below).

The first key step of the strategy has been the recognition that the implementation of such a 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 the RSG. Prof. Resmini has an exceptional track record of attracting industrial interest in her projects, as exemplified by the award of two large EU projects in Materials Chemistry with major industrial input during the REF period.

**Maximising translational opportunities.** We will strengthen links with industry via two approaches: establishment of partnerships for new research projects, via CASE awards, industrial placements, RCUK projects, charities; identification of early-stage innovations by liaising with the BDO and QMI that offer support in securing follow-on and proof of concept funds. We will seek substantial funds through Horizon 2020, to establish collaborations with industrial partners both in the UK and in Europe, supported by a dedicated EU unit building on our existing expertise (Resmini, coordinator of two ITN and one IAPP, Larrosa ERC grant).

**Increasing our visibility.** Enhancing the impact of research requires high visibility and a number of strategies have been identified: showcasing research and innovation (e.g. yearly Industrial Liaison forum with innovation flash talks and poster sessions, attended by representatives from industry; increased use of on-line and social media to disseminate; outreach activities targeting also policy makers and governing bodies.

**Specific examples of developing impact**

i) **di Tommaso** holds a prestigious Royal Society Industry Fellowship (2011-2015) to develop (in association with AstraZeneca) computational chemistry methods to address the problem of molecular crystal polymorphism during pharmaceutical preparation. ii) CASE collaborations during the REF period with agrochemical manufacturers (two x Syngenta) and pharmaceutical companies (Pfizer and AstraZeneca) and a KTA award (**Larrosa** with GlaxoSmithKline). (iii) Modelling of drug-target interactions by our computational chemists, exploiting collaborations with SBCS structural biologists: this theme will be further promoted by the QMUL Life Sciences Institute. (iv) developing nanoparticles for efficient and safe drug delivery, currently supported by Prof Resmini's EU Industry Academia Partnerships Pathways award and exploiting connections with SBCS Biologists (Dr Brennan) through the use of zebrafish as model organisms.

**d. Relationship to case studies**

Both our case studies exemplify the effectiveness of our approach to impact in the assessment period, in particular demonstrating the support provided to the academics and the opportunities accorded to secure funding from a range of sources and the protection of intellectual property.

**CS1: Innovative chemistry reduces the environmental impact of mining and pharmaceutical manufacture.** The formation of the spin-out company PhosphonicS Ltd was supported by Queen Mary Innovation & Enterprise (now QMI), exemplifying the role played by QMI in the translation of underpinning research into impact. The connection of PhosphonicS with QMUL Chemistry has been maintained through CASE research studentships, as well as post-doctoral positions, a key feature of our strategy for interaction with industry.

**CS2: The development of low-cost point of care sensors for the detection of protease enzymes.** The underpinning research arose from a collaboration between **Watkinson (SBCS)** and Dr Steffi Krause (School of Engineering and Materials Science) supported by the BBSRC follow-on fund and Heptagon Fund. Both QMI and the QMUL Business unit helped the researchers to secure subsequent TSB and venture capital support. Further internal support for the development of the impact was secured through QMI's proof-of-concept fund and the Barts and the London Charity. The spin-out company Degrasense, which owns the intellectual property, was formed with the help of QMI.