Institution: University of Manchester

Unit of Assessment: UoA5

a. Context

This unit of assessment (UoA5) maps directly onto the Faculty of Life Sciences (FLS) at the University of Manchester (UoM).

One of the three central pillars of the UoM's research strategy, formalised in the strategic plan 'Manchester 2020', is for the University's research to have an impact beyond academia, which yields economic, health and social benefits.

Key types of impact of the research in FLS can be grouped into three themes, these are:

- economic and commercial – including the establishment of profitable spin out companies, creation of new products, industry investment in innovative research
- health – including translating research into new practices and products to deliver improvements in health and wellbeing
- environmental and social – through stimulating policy debate and influencing policy decisions, that inform urban planning and conservation work

Key audiences of the impact of FLS research include:

- national and international commercial companies including pharmaceuticals, biotechnology, bioprocessing and academic publishing houses
- healthcare professionals
- local and national governments both in and outside the UK

Key beneficiaries of the impact of FLS research include:

- commercial partners through supporting innovation and economic competitiveness
- patients and associated healthcare professionals
- general public (particularly urban dwellers) and ecosystems

b. Approach to impact

FLS's approach to impact over the REF period has focussed on support for key areas:

(i) Business development and commercialisation:

FLS aims to be the partner of choice for companies seeking academic collaborations in the life sciences. Its vision is to maintain and enhance further the reputation of FLS as having an entrepreneurial culture where the commercialisation and exploitation of research are encouraged, supported and rewarded. The two main strands of activity are:

Major strategic partnerships: An example of how FLS is linking fundamental science to patient benefits is the Manchester Collaborative Centre for Inflammation Research (MCCIR), a collaboration between the UoM, GlaxoSmithKline and AstraZeneca. The Centre was created with an initial investment of £15m (£5m from each partner) and is embedded within both FLS and the Faculty of Medical and Human Sciences (FMHS). MCCIR represents a ground-breaking approach to harnessing academic innovation in the life sciences to contribute to drug pipelines and tackle important unmet medical needs. Another example is the Centre of Excellence in Biopharmaceuticals (CoEBP), established in 2009 with regional ERDF/NWDA funding, which facilitates academic-industrial collaborations to accelerate the discovery and development of new biopharmaceuticals. To date, CoEBP has engaged with 52 companies in the North-West, the UK and internationally; successful outcomes include research income of over £6m (including industrial income, BBSRC BRIC funding and 16 CASE studentships).

Intellectual property commercialisation and business incubation: UoM Innovation Group (UMI^3) provides expertise on intellectual property (IP) commercialisation and business incubation to researchers in the University. UMI^3 offers generous rewards for commercialisation of IP (>85% of the net income to the investigator). UoM Intellectual Property (UMIP) is a division of UMI^3, founded to commercialise University research results and provides access to

significant seed funding (the UMIP Premier Fund has a value of £32m). Over the five year REF period, the entrepreneurial activity in FLS has achieved:

- total proof-of-principle funding - £1.4m
- total grant income associated with IP - £4.7m
- total number of disclosures - 283

Six spin-out companies: Gentronix [Walmsley impact case]; Conformetrix/C4X Discovery [Almond impact case]; Ai2 [Dobson impact case]; Alergenetica (Robson); PharmaKure (Doig); and Microsensor (Dobson) have been developed over the REF period. The University and UMIP were joint runners-up in the Activating Impact category of the 2013 BBSRC Fostering Innovation Awards. This award recognised Ai2 and Conformetrix/C4X Discovery. The success of Conformetrix/C4X was also highlighted in a BBSRC Impact Evidence Report (2012).

(ii) Translation of research to achieve health benefits

FLS's approach to translating fundamental biomedical research is achieved through three strands:

- A senior management position (Kielty) was created by FLS in 2012, with a remit to ensure that excellence in basic science is translated to patient benefits. Kielty has initiated a series of bi-monthly research fora on common biomedical areas between FLS and FHMS, to inform and stimulate research translation.
- Integrating appropriate biomedical research in FLS with FMHS and the Manchester Academic Health Science Centre (MAHSC) to create research collaborations.
- Co-localisation of FLS PIs with FMHS clinician scientists in the AV Hill and Core Technology Facility buildings, which allows joint working on clinically-focussed research projects in areas such as immunology, wound healing, inflammation and neuroscience.

Examples of translational research include; anti-ageing [Kielty impact case], diagnosis of musculo-skeletal disorders [Briggs impact case], diagnosis of endocrine diseases [White A impact case] and measurement of macular degeneration [Murray impact case].

(iii) Influencing policy development:

FLS researchers contribute to setting and driving the science policy of the wider discipline in several ways:

- The Environmental, Ecology and Evolution Research Group in FLS has been particularly successful in achieving impact through stimulating environmental policy debate and influencing policy decisions, as well as informing planning decisions and environmental conservation work. Examples include conservation work in Ecuador [Preziosi impact case], urban planning [Ennos impact case] and waterway regeneration [White K impact case].
- In 2012 a strategic decision was made to incorporate the Institute for Science, Ethics and Innovation (iSEI) into FLS and thereby facilitate an interdisciplinary ethical dimension to new and existing research projects, in addition to offering novel pathways to impact. iSEI addresses issues at the science–society interface, concentrating on ethics, regulation and policy in relation to new and emerging technologies ranging from synthetic biology, neuroscience, stem cell biology and reproduction. iSEI has led debate on many topics, including joint reports with the Academy of Medical Sciences ('Animals containing human materials') and the Royal Society ('Brain Waves').
- FLS is working with the organisation Understanding Animal Research to develop a concordat outlining responsibilities for a more transparent and open approach to research involving animals. In October 2012, FLS along with over 40 organisations involved with bioscience in the UK, signed a Declaration on Openness on Animal Research. Kimber was Chair of the UK's National Centre for the Replacement, Refinement and Reduction of Animals in Research (NC3Rs) from 2008 to 2013.

(iv) Providing the infrastructure to support impact:

During the REF period, FLS has demonstrated its commitment to supporting and providing leadership for impact activities through the following mechanisms:

Dedicated leadership and specialist support staff:

- The current Associate Dean for Business Development (Kimber I, previously a research head for Syngenta) was appointed to this post in 2009, with a remit to deliver FLS's commitment to forging close and productive partnerships with industry, and ensuring that there is rapid and effective exploitation and commercialisation of research. Additional support is provided by a BBSRC funded Industrial Impact Fellow (Rhodes) and three dedicated PhD-qualified Business Development Managers with responsibility for enabling business development opportunities in FLS.
- The Associate Dean for Social Responsibility position (Cobb) was created in 2010 with responsibility for raising awareness of societal impact. Core to this is supporting public engagement activities and to develop FLS's involvement in the local community and in policy development. This position is supported by dedicated posts for public engagement and communications (a Public Engagement Programme Manager for Wellcome Trust Centre for Cell-Matrix Research and a Communications Officer).

Provision of staff training: FLS recognises the need to provide development opportunities early in researcher careers from postgraduate student onwards. All FLS postgraduates are encouraged to communicate their science through public engagement and communication events (e.g. Manchester Science Fair), as well as teaming up with PDRAs for entrepreneurial challenges such as Biotechnology YES (Young Entrepreneurs Scheme). In 2010, FLS won this national competition overall, with awards in specific categories in 2008 and 2012. Similarly, FLS runs an annual one-day training event on business development for postgraduates and PDRAs, where patent lawyers, UMI^3, venture capitalists, business angels and other experts present. Students can also benefit from the Manchester Enterprise Centre which includes mentoring, workshops, guest entrepreneur events (ideas factory) and a resource centre. Training in enterprise is also delivered as part of the New Academics Programme and to postgraduate students as part of Doctoral Training programmes.

Recognising and rewarding impact: A significant part of FLS's strategy has been to recognise and support individuals that undertake activities leading to impact from research. Contribution Mapping for academic staff was introduced in 2009, this framework has allowed FLS to set targets and monitor progress, not just on academic time spent on teaching, research and administration, but also on impact-related activities (business development and public engagement). Against a baseline level of approximately 14% in 2009-10, academic staff ascribed 19% of their time to business development and public engagement activities in 2011-12. This framework is linked to FLS's annual performance and development review cycle and aligns with the University's strategic vision of giving parity of esteem to knowledge transfer for promotion cases (e.g. one promotion to Readership in 2013). FLS actively enables secondments for academics to devote time to business development activities; Almond, Dobson and Walmsley are all currently seconded to their spin-out companies for a significant portion of their time.

c. Strategy and plans

Impact is integral to the University's strategy in research and in all of its activities, as formalised in its strategic plan 'Manchester 2020'. The vision is that from a base of excellence, the University will be at the leading edge of realising impact from its research and training. This will be achieved through: the commercialisation of intellectual property; partnering with businesses; linking fundamental science to patient benefits, providing the foundation for influencing public policy (especially in the context of societal challenges); engaging widely with communities and building on public engagement activities, and by giving students and early career staff, training and support in enterprise and entrepreneurship.

FLS strategy for developing impact

Building on FLS's strengths in its current impact programme, the challenge is now to integrate its impact agenda across all research activities and provide enhanced training and support for staff and students. Planned initiatives include:

FLS Impact Board: This Board (constituted in 2013) will integrate with existing University-wide governance structures for Business Development and Social Responsibility, it will ensure that:

- Key research areas and users in FLS are targeted for engagement and support
- All synergies are identified at an early stage, and academics and allied beneficiaries (e.g. businesses, the general public, policy bodies, etc.) are brought into contact
- Impact performance against targets is monitored to measure successes
- Best-practice and successes are communicated widely and rewarded

Engagement with RCUK impact schemes: FLS plans to continue its successful involvement in EPSRC and NERC Impact Acceleration Account funded activities [Attwood and Preziosi impact cases]. An institutional bid to the BBSRC Excellence with Impact competition 2013-16 was recently submitted by FLS. The FLS impact strategy will be developed by its active participation and partnership with BBSRC over the competition period to 2016. Though this competition necessarily has a BBSRC focus, FLS aims to pilot new impact activities through this scheme and roll out recommendations to all its research areas.

Mentoring: Dobson (Ai2) and Almond (Conformetrix/C4X Discovery) are experienced and successful entrepreneurs who act as Impact Mentors in ensuring that FLS seizes opportunities to derive impact from the fruits of research. These Impact Mentors will work closely with academics to guide them through the complex routes to commercialising research.

Enhance impact training: To boost impact awareness and equip staff and students with the necessary skills in delivering impact, a comprehensive training programme in enterprise and public engagement will be further developed and delivered primarily through the New Academics Programme. The planned step change is to provide training at all levels of staff and to integrate programmes with a substantive mentoring component as described above.

Influencing policy: FLS's contribution to setting and driving the science policy of the wider discipline is seen as an important area for development. The integration of iSEI into FLS presents an outstanding opportunity to catalyse a two-way exchange of ideas, between FLS scientists and world-leading researchers interested in their work and its social and ethical significance. In order to cement this relationship further, FLS will second staff for short periods into iSEI to develop materials and evidence to influence policy makers.

Public engagement: FLS will continue to develop its major activities in public engagement, building on its strong track record. FLS aims to identify major themes via the Impact Board for development and support, which will be championed as areas for public engagement, education and debate.

d. Relationship to case studies		
Author	**Title**	**Relationship to Faculty approach**
Almond, Andrew	Opening the door to ligand-based drug discovery: a rapid and accurate technology for determining bioactive 3D molecular shapes	FLS and the University have aided the commercialisation of research for all these impact cases with leadership from an Associate Dean for Business Development and support from the dedicated FLS Business Development Team. Conformetrix/C4X Discovery (Almond), Ai2 (Dobson) and Gentronix (Walmsley) are spin out companies from FLS, which have also benefitted from the services of UMIP. Gentronix has also benefitted from UMIC (a UoM incubator company) providing physical facilities and support to start-ups. Almond, Dobson and Walmsley have been supported by FLS with secondments to allow them to focus on nurturing their spin out companies.
Dobson, Curtis	Ai2 / Anti-infective medical device coatings from human apolipoprotein E	
Murray, Ian	Macular pigment measurement in humans: a new instrument, the Macular Pigment Screener (MPS)	
Walmsley, Richard	Accurate in vitro prediction of in vivo genotoxicity and cancer hazard	
White, Anne	Antibodies to ACTH and related hormones as diagnostic tools	
Attwood, Teresa	The Utopia Suite	This impact case was supported by the University EPSRC KTA (£8m, 2009-12) in collaboration with Pfizer and AstraZeneca.
Attwood, Teresa	The PRINTS and InterPro databases	These impact cases demonstrate how bioinformatics resources have been developed by the individual to benefit industrial users, mainly in the pharmaceutical sector.
Griffiths-Jones, Sam	The miRBase database of microRNA sequences and annotation	
Briggs, Mike	Identification of genes and mutations in genetic skeletal diseases	These impact cases demonstrate how basic science has been translated into patient benefits, reflecting the entrepreneurial nature of the individuals, which has been supported by FLS.
Kielty, Cay	The Manchester Patch Test Assay: providing a scientific test for the efficacy of anti-ageing products	
Lucas, Robert	Redesigning artificial lights to suit our biological needs	
Ennos, Roland	Climate-proofing cities using urban greenspace	These impact cases demonstrate how impact arising from environmental policy debate and influence on policy decisions in conservation have been achieved by FLS. As a result of strengths in this area FLS has further invested in new positions in environment/ecology/evolution including funding a new chair (Bardgett).
Preziosi, Richard	Conservation research in Sumaco National Park, Ecuador	
White, Keith	Impact of research on regeneration of Salford Quays	
Cruickshank, Sheena	Providing healthcare training and increasing public awareness of neglected tropical diseases via national and international engagement activities	FLS and the University have aided the public awareness of research for this impact case; this activity has been supported by the appointment of an Associate Dean for Social Responsibility in FLS.