Institution: University of Leeds

Unit of Assessment: 4 (Psychology and Neuroscience)

a. Context: Research in UoA4 at the University of Leeds (UoL) spans two faculties: Medicine and Health (FMH) and Biological Sciences (FBS). Leeds has a long-standing tradition of conducting distinctive (applied) research with major impact in the area of psychology and neuroscience (e.g. Hullin's work in the 1970s on treating bipolar disorder with lithium; Hamilton's development of the most widely used depression rating scale in psychiatry), that continues to this day (e.g. work on the satiety cascade widely used by the food industry - Case Study 1). Since RAE2008, we have sought to increase the impact of our research by establishing five integrated cutting-edge research Grand Challenges (GCs) that align with national and international priorities and are based on an analysis of where our research can contribute to the needs of our non-academic users (mainly in industry, health services and government). The GCs cover broad areas within which we aim for our research to have impact: Health and Well-Being (GC1); the Nervous System and its Disorders (GC2); Successful Ageing (GC3); Successful Childhood Development (GC4); and Behaviour Change (GC5). The GCs underpin a strategy for ensuring that our research impacts upon health/welfare, practitioner/professional services, economic/commercial/organizational outcomes and public awareness of science. The main non-academic beneficiaries of our research are:

1) Industry. Research in GC1&2 involves close collaboration with the pharmaceutical industry (e.g. AstraZeneca, Bayer, Bristol-Myers Squibb, Eli-Lilly, GlaxoSmithKline, Novartis, Pfizer, Roche and Sanofi-Aventis). Over the past decade, research within GC1&5 has built links with major companies in the food industry (e.g. Ajinomoto, Arla Foods, Cargill, Coca-Cola, Danone, Heinz, Kraft, National Starch, Nestle, Procter & Gamble, Tate & Lyle, Unilever and Welch's). The main types of impact have been achieved via improving our understanding of the effects of drugs and food (e.g. on appetite), particularly through the use of better methodologies (e.g. to measure satiety).

2) Health services. All GCs have strong links with the health service sector (e.g. strategic partnership with Bradford Institute of Health Research [BIHR]). To ensure and facilitate delivery of impact, we forged strong links with the Academic Health Science Network (AHSN) and retain close working relationships with key centres and units across Yorkshire (e.g. Centre for Reproductive Health, Seacroft Hospital; Diabetes Centre, Cystic Fibrosis Unit, Eye Dept, St. James University Hospital [SJUH]) and further afield (Obesity & Diabetes Unit, Salford Royal NHS Foundation Trust). We also work closely with public health networks (e.g. smoking services). The main types of impact include improving existing services or providing new ones, increasing understanding of major clinical conditions, influencing policy, delivering interventions to improve the safety of care across the region and assessing the impact of interventions to change behaviours such as diet and exercise.

3) Local government. Researchers within GC4&5 collaborate closely with local government (e.g. Education, Smoking Prevention). We also enjoy strategic partnerships with Leeds City Council (Children's Services; Complex Needs Services supported by ESRC funding) and the Schools Partnership Trust ([SPT] to help raise aspirations; SPT is set to become one of the largest children's charities in the UK). The main types of impact are improving existing services, developing new services and promoting behaviour change (e.g. psychological & physical health behaviour).

b. Approach to impact: Our GCs help staff maximise the impact of their research from the very beginning of the research process and encourage interdisciplinary working. For example, our NeuR@L forum (www.neural.leeds.ac.uk) for collaboration in neuroscience helps coordinate cross-institute support for research/impact in this area. Leaders for each GC provide specific support to staff and postgraduate research students around identifying, working with and disseminating findings to beneficiaries of their research. To support impact, we work closely with the University Innovation Sector Hubs (funded by Higher Education Innovation Fund [HEIF]) on commercialisation, Intellectual Property (IP) protection and licensing (e.g. patent: Case Study 2), KTPs, Public Engagement and Pathways to Impact, and Proof of Concept funding. To promote awareness and understanding of impact we provide examples of good practice with an 'impact agenda' annual workshop across UoA4. Staff across UoA4 benefit from the inclusion of time for impact activities in workload models. Impact and knowledge transfer activities are overseen by senior academics (**R.Lawton,** FMH; **Colyer,** FBS) working with the Innovation Hubs and Directors of Research and Innovation in each institute to formulate and drive our impact strategy. Governance for delivery of this strategy is provided via Faculty Research & Innovation Committees.

Our approach to impact is exemplified in the following activities:

1) Development of strategic partnerships. We have a strategic partnership with BIHR including joint staff at all levels from lecturer (e.g. **Kellar & Johnson**) to Professor (**R.Lawton**), collaborative PhD studentships (N=8), and shared grants (N=3, value £3.85m) to increase interdisciplinary working and address real needs of NHS services (across all GCs but particularly around patient safety and the Born in Bradford [BiB] project). In GC1, since 2007 we have held a strategic partnership with Kellogg's that has included a KTP (**Dye** & **C.Lawton**; £594k). In GC2, the University's Biomedicine and Health Strategic funding supported grants to UoA4 staff (**Deuchars** & **McKibbin**) to promote partnerships between the University and health sector (£67k). **McKibbin** (Eye Dept, SJUH) was Ophthalmic speciality lead for West Yorkshire Comprehensive Local Research Network (2009-11) and is Leeds Teaching Hospital Trust Ophthalmic Research Lead (2008-present) providing an important link to users of our research in this area.

2) Establishing long-term links with industry. In relation to GC1&5 we have strong links with different food companies (e.g. Danone: **Hetherington** seconded during Marie Curie IAPP; Unilever and Slimming world: visiting Professors to Leeds to work with **Conner** & **Prestwich** and **Finlayson** & **Blundell**, respectively) including significant industrial funding (£1.52m expenditure in REF period). We also contribute to high-level strategic decision making and priorities across the food industry (**Blundell:** Governorship, British Nutrition Foundation; **Hetherington**: Industrial Advisory Committee Membership, Hillshire Brands, Wrigley Science Institute, Feeding for Life Foundation; **Blundell** & **Finlayson**: Academic membership of the BBSRC Diet Research Industry Club; **Finlayson**: expert advisory panel for Nestlé Health Science, US; **Blundell, Dye, C.Lawton** & **Hetherington**: authors International Life Sciences Institute reviews). In GC2 we have developed an EU-funded Initial Training Network (EyeTN) co-ordinated by **Inglehearn** involving 7 academic centres and 7 commercial companies, including SMEs working in bioinformatics and Biomarker discovery and the Pharmaceuticals company Novartis (value £925k), giving excellent opportunities to foster new commercial partnerships in this area (e.g. Case Study 5). GC2 works closely with various pharmaceutical companies (Wyeth, BMS & Sanofi-Aventis: **Clapcote** phenotyped the DISC1 mouse, a schizophrenia model licensed for therapy testing).

3) Knowledge Transfer Partnerships (KTPs). We identified KTPs as an important strategic enabler in the delivery of research impact. With University support (Keyworth Institute) we hosted 3 KTPs in the REF period (value £418k over 63 months). A KTP with Kellogg's (£149k) developed the evidence base for potential breakfast cereal health claims (health, cognitive performance, appetite; GC1: **Dye** & **C.Lawton**). Two KTPs with NHS organisations helped identify effective health behaviour change ('Make Every Contact Count'; GC5: **Prestwich, Conner, R.Lawton** & **Gardner**) and improve the safety of clients in adult mental health (GC5: **R.Lawton**). Relatedly, we hosted 6 externally funded PhD CASE studentships across the REF period.

4) Fostering panel focus groups and meetings with patients and users. Understanding patient/user views is a key aspect of ensuring our research has impact. In GC2 **McKibbin** facilitates discussion groups among his patients on the impact and value of genetic testing; **Inglehearn** & **McKibbin** work with a large cohort of patients (N=2573) with inherited neurological disease from **McKibbin's** NIHR project to underpin the gene discovery research within the Neurogenetics group and feed findings back (e.g. via Jules Thorn community group meetings). In GC3 **Bunce** & **Allen** hold regular events with the Older Adult Participant Panel. In GC4, **Waterman, Billington** & **L.Hill** meet with headteachers in Bradford to discuss translation of research into educational approaches. In GC5 **R.Lawton** & **Kellar** run patient panel focus groups in collaboration with BIHR to inform research and interventions (health behaviour change; patient safety). Our work in GC5 is also informed by work with panels of adolescents (e.g. ESRC, NPRI/MRC funded projects).

5) Training. Researchers in GC5 (e.g. **R.Lawton** & **Conner**) provide regular continuing professional development courses on health behaviour change and mindfulness to various groups of professionals (e.g. health, social care, probation officers, youth workers, teachers). **R.Lawton** provides impact training to postgraduate students. Staff and students across all GCs benefit from impact being at the heart of training offered by the University's Staff and Departmental Development Unit (SDDU). SDDU runs an enterprise workshop programme covering topics such as intellectual property, business simulation for start-up companies, impact and what it means for researchers, how to influence policy, and developing enterprise and innovation skills. The University's quarterly

flagship research and innovation publication 'Impact' is distributed to all UoA4 staff.

6) Public engagement. Researchers across the GCs have strong involvement in public engagement with psychology/neuroscience including work with schoolchildren (over 25 sessions run in local schools each year; Discovery Zone, a UoL annual science event for 480 8-14 year olds partly funded by BBRSC/Physiology Society), students (British Psychological Society [BPS] student lectures), and the public (e.g. Café Scientifiques; Physiology Friday at Leeds Light shopping centre; Public lectures at BiB Annual Conference; annual Grand Challenge Public lecture; BBC One Show).

c. Strategy and plans: Our strategy and plans in relation to impact are central to the continued development of our GCs. These reflect critical research questions of importance to the users of our research and society and represent areas where our research will continue to have impact. The GCs outline where we anticipate delivering impact in the medium term (next 5 years) and are significant drivers of investment in staff (e.g. **Bunce** appointed to GC3) and facilities (e.g. investment in laboratory facilities to meet needs of each GC) and form the basis of funding bids for knowledge exchange and impact (e.g. each GC plans to host a KTP across the next REF cycle). Academic staff play leading roles in relation to advising/sitting on various policy groups linked to our GCs (e.g. **Blundell:** Chairing Energy Balance Task Force; **R.Lawton**: academic advisor to AHSN). Under each GC we address research questions of importance to society; support dissemination; identify opportunities for commercialisation; transfer tacit as well as explicit knowledge; improve knowledge and skills for employers, patients and communities. Our current activities (points 1-6 in **section b**) allow us to remain aware of the needs of the users of our research and to proactively influence and engage with end user agendas (e.g. through steering committees linked to each GC). More formal review of the extent to which each GC continues to meet the needs of the users of our research will be conducted every 2-3 years through meetings between researchers and users.

We have a clear set of strategic objectives to maximise the impact of our research under each GC:

1) Engaging with users. One part of our strategy is close collaboration with our research users. Local and national communities, industry, health services and local government benefit from strategic partnerships with our staff. Our GCs play an important role in facilitating communication and work with these users. Specifically, such engagement helps us build links with non-academic groups, better recognise their needs, design research in close industry partnerships, facilitate engagement with and more widely disseminate the results of our research, and ultimately maximise impact outside academic settings. Since 2012, GC leads have established strategic links with the community (e.g. via the Jules Thorn Trust funded initiative, the Neurogenetics community in GC2 meet biannually with members of the Asian community to report on findings and raise awareness of issues around consanguinity, recessively inherited disease, coordination problems and new therapies). Going forward we aim to:

a) Incorporate a broad range of non-academics from the local community into teams addressing the GCs (e.g. as part of meetings to discuss each GC with users; ESRC-funded community-based conference on mindfulness in 2014; Yorkshire DeNDRoN network links);
b) Encourage non-academic user representation on steering committees linked to each GC (e.g. each GC steering committee has at least one such member);
c) Deliver an annual Grand Challenge Public Lecture (GC3: **Bunce** to deliver inaugural lecture on ageing in early 2014; GC2: **Inglehearn** on genetics in late 2014);
d) Work with users of our research in each GC to deliver newsletters, a twitter account and an impact portal (highlighting our impact) tailored to community groups and business.

2) Further develop an impact culture. We have implemented written procedures to:

a) Embed innovation and impact generation into all our core activities via workload models;
b) Embed impact in staff induction and probation, and include a discussion of impact activities in annual Staff Review and Development and in promotion decisions;
c) Ensure that all modes of impact are explored for every research project;
d) Share and disseminate best practice in relation to impact (e.g. through impact mentors – **Blundell, R.Lawton, Mon-Williams, Morley** & **Inglehearn** as impact case study authors).

3) Embed impact-related activities in our teaching. Our commitment to impact on society extends beyond our research to teaching developments (e.g. an industrial degree programme as a route to impact). In these programmes students can opt to take a four year degree with one year

spent working (supervised by an academic) with an external partner (e.g. local business, healthcare organisation, local council or school) on a mutually agreed project. Similarly, in GC2 the FP7 EU EyeTN Initial training network led by **Inglehearn** delivers postgraduate training in collaboration with 7 companies. In addition, GC4&5 staff provide new knowledge/skills through research-based CPD programmes for professionals and local groups (e.g. health-behaviour change; mindfulness; patient safety; training to educationalists via BiB 'Teacher Days').

4) Innovation Sector Hubs. The University has invested significant HEIF into 14 outward facing sector hubs providing a focused and strategic gateway to developing partnerships with users (e.g. industry, health services, local/national government and commissioning services). Each hub has targeted resources to facilitate and support academically driven innovative research to achieve significant impact. Leading academics have been appointed as Hub Directors supported by Innovation Managers and advised by External stakeholders. Each GC maps on to one or more of the hubs. For example, GC2&5 maps to the Health Services Innovation Hub and this facilitates planning, delivery and evaluation of health services. The hub is supporting knowledge exchange and partnership for patient benefit, specifically around technological advances in the support of behaviour change and Health Informatics. The hub has close links with those delivering new commissioning arrangements, a wide range of providers in NHS partner organisations, social care, the 3rd sector, clinical research networks and patient led innovation initiatives. The GCs enable strategic leverage of support from the hub teams. Thus, GC1 has links with the pharmaceutical, biopharmaceutical and food security hubs (e.g. **Dye** on steering committee for the Food Security hub), while GC2 has begun to establish links with the stratified medicine and medical technology hubs (**Mon-Williams**). We will strategically exploit the opportunities afforded by these hubs in order to promote our impact. In particular, we will work with the hubs to further map external needs against internal capability within each GC to allow us to develop further strategic partnerships with companies/providers, NHS Trusts, health/social care commissioning groups and the 3rd sector. Health is a key sector and this hub has an allocation of over £1m to provide staff funding for strategies to bring academic strengths to the external market. We plan to use available funding/hub staff to showcase our research to potential users (GC1: a food-based day for industry; GC2: a themed day around genetics & health; GC5: further HEIF supported research meetings with Leeds Council, these have already led to: Children's Services Strategic Partnership, ESRC support for knowledge exchange, BIHR-hosted International Patient Safety Conference).

d. Relationship to case studies: The submitted impact case studies exemplify aspects of our approach to impact and have also informed this approach. One aspect is supporting the development of long-term links with industry. For example, a long-standing relationship between the food industry and the Human Appetite Research Unit (led by **Blundell, Dye** & **Hetherington**; GC1) over several decades facilitated a better understanding of satiety and the development of tools to assess satiety by industry. The strong links with industry also assisted the uptake of the research by key workers in the food industry and informed the development of new foods (Case Study 1). The success of this approach reinforced our commitment to being responsive to user needs and has informed two other aspects of our approach to impact: the development of strategic partnerships and KTPs as means to promote greater understanding and close collaboration with the different users of our research. For example, work on how to develop safer medical connectors (GC5: Case Study 2) was strongly influenced by a strategic partnership link to local anaesthetists. Similarly, partnerships with BIHR have been central to the development of psychomotor tests used to assess neurological conditions in schoolchildren (GC4; Case Study 3). This partnership assisted us in working with schools in Bradford, helped isolate the need for tools to identify children with difficulties that could be targeted for early intervention, and aided the development of a tool based on teacher needs. This work generated a patent and a licensing deal. Relatedly, work on pain and its treatment (Case Study 4) arose from our long-standing NHS links in pain treatment and management resulting in the implementation of the best evidence-based practice. Our other case study exemplifies another aspect of our approach to impact: fostering panel focus groups and meetings with patients and users. Work on the development of genetic tests for different inherited diseases (GC2: Case Study 5) emerged in part from the opportunity to work with and assist a local (Bradford) population with high levels of genetic abnormalities. The success of this approach informed **McKibbin's** Research for Patient Benefit award that supports a series of patient discussion groups on the implications of genetic diagnoses of retinal dystrophy.