Institution: University of Exeter

Unit of Assessment 4: Psychology, Psychiatry and Neuroscience

a. Overview

The School of Psychology at Exeter celebrated its 50th anniversary in 2013. In 2010, it became part of a College of Life and Environmental Sciences (with Biosciences, Geography, and Sports and Health Sciences). Research in Psychology is organised into four groups: Animal Behaviour, Clinical Psychology, Cognition, and Social, Environmental and Organisational Psychology (SEORG). All are housed in the Washington Singer Building and the linked Sir Henry Wellcome Building for Mood Disorders Research. Within and across these groups, we have integrated researchers with shared and complementary expertise to create specialist and internationally competitive research centres: a Mood Disorders Centre (MDC), a Centre for Identity and the Psychology of Self in Society (IPSIS), a Centre for Cognitive Control and Associative Learning (CCAL), a Centre for Clinical Neuropsychology Research (CCNR), and a Centre for Research in Animal Behaviour (CRAB). During the period covered by RAE2008, the number of academic staff in Psychology had approximately doubled to 35.4 FTE; over the current REF period we have consolidated this expansion, increasing Category A staff to 38.3 FTE.

Also returned in UoA 4, from the rapidly growing University of Exeter Medical School (UEMS), are Professors of Cognitive and Behavioural Neurology, **Zeman**†**,** and of Behaviour Change, ***Abraham***†, appointed 2011 as the nucleus of a Psychology Applied to Health group. (Some UEMS specialists in clinical neuroscience or psychiatry and health scientists with psychological expertise are returned in other Units of Assessment.)

[† Here and below, current staff are named in **bold**, and staff appointed since 2008 in ***italics***.]

b. Research strategy

The University of Exeter grew substantially during the REF period, increased research awards by £56M (2008-9) to £81M (2012-13), and joined the Russell Group in 2012. In keeping with the university's ambitious targets, in 2013 Psychology joined 15 UK Psychology departments in the world top 100 (QS World University rankings), and rose to 10th in the Sunday Times University Guide. Our research income has substantially increased and its provenance broadened (see Section d). These gains reflect both university and discipline-level strategy.

The university's Science Strategy has focused substantial investment (£230M) on five cross-disciplinary research themes. As of 2012, a Humanities and Social Sciences (HASS) Strategy similarly invests in six interdisciplinary themes. Our work fits under several of these themes and we contributed to their development. Coordinate with these priorities, our strategy is to use available new appointments to underpin high-quality areas of research activity with sufficient critical mass and focus to be sustainable, and we recruit staff in intra-and inter-disciplinary areas who will not only consolidate basic science strengths and maintain our teaching capacity, but also bridge research across our research groups towards key applied themes, especially:

- Mental Health, Physical Health, and Well-being (supported by the Science theme: Translational Medicine, Personalised Medicine, and Public Health);
- Environment and Sustainability (supported by the Science theme: Climate Change and Sustainable Futures, and HASS themes: Environment and Sustainability, and Food Security);
- Diversity and Social Inclusion (supported by HASS themes: Societal and Lifestyle Shifts, for which ***Barreto*** is university lead, and Identities and Beliefs);
- Animal Cognition and Animal Health & Welfare, including links with Biosciences (supported by two Science themes: Systems Biology; Climate Change and Sustainable Futures);
- Behaviour Change (supported by the Science Translational Medicine Theme, and the HASS Societal and Lifestyle Shifts theme).

Our strategy requires that we provide structures of research management, support, and monitoring that enable staff members to pursue world-class research (see Section c.1).

1. Development of the research environment. Through the REF period we have strategically used appointment opportunities created by growth in resources, and by retirements or departures, to recruit high-calibre researchers from leading institutions. Since 2008 we have appointed 19 full-time Category A staff: 3 professors, 2 associate professors, 9 senior lecturers (one, ***Verbruggen***, now a professor), 4 lecturers, and one HASS research fellow. Meanwhile, 4 existing research

fellows have become lecturers, one a senior lecturer and one a professor. The new appointments (about half our current Cat A total) have been used to concentrate expertise and critical mass in core areas of strength, avoiding research "islands" – while some previous areas of strength, such as economic psychology and infant cognition, have largely disappeared. All but one of the new Teaching and Research staff are among the 80% of Cat A staff whose outputs are showcased in REF 2. The number of postdocs has grown to 17 (including 2 in the UEMS).

We have responded to the increasing focus of Government, Research Councils (RCUK), and the National Institute of Health Research (NIHR) on research that impacts health, well-being, and the economy, by prioritising work that translates between basic science and clinical or applied outcomes. The most visible manifestation of this is a £3.6M award from the Wellcome Trust for a new building for the MDC (Section d.2); University match-funding (£3.36M) provided 3 appointments for the Clinical group under the Translational theme (***Dunn***, ***Lawrence***, ***Psychiogou***). Growth in the MDC has further built on the successful development of professional training programmes (DClinPsy, DClinRes, DClinPrac), and NHS SHA-commissioned Improving Access to Psychological Treatments (IAPT) high and low-intensity training programmes, with academic staff who deliver clinical training also engaged in research (e.g. ***Adlam, Karl, Moberly***). We have substantially broadened the portfolio of funding agencies supporting our work (Section d).

2. Research plans and future growth. Psychology plans to continue to grow at a modest rate, while supporting existing staff and developing expertise in such a way as to (a) reflect our commitment to national priorities and applied research, while maintaining basic science expertise, (b) consolidate our existing and developing foci of expertise, (c) maintain and increase the widening portfolio and amount of income from UK and EU research councils and major charities as well as partnerships with industry and the public sector, and (d) to cover areas of need in our teaching in ways that ensure appropriate expertise without creating isolated areas of research.

Recent and ongoing infrastructure investment in laboratories (Section d.2) will assist future outcomes. Among long term investments already made whose payoff we will not see until the next REF period are:

i. large scale, multi-site NIHR-HTA funded randomised controlled trials of: mindfulness-based cognitive therapy versus continuation antidepressants for prevention of depressive relapse (the PREVENT trial, **Kuyken** & **Watkins**, completing 2014); behavioural activation versus cognitive-behaviour therapy for treating acute depression, with a focus on cost-effectiveness of treatments (**Kuyke**n, **Watkins**, **Wright**, **O'Mahen**, completing 2016).

ii. the very recent appointment of a group of researchers with expertise in psycho-pharmacology (***Morgan***, ***Dodds***), learning and addiction (***Hogarth***), and emotion regulation and impulse control (***Lawrence***) to join our existing experts in cognitive and emotion control and associative learning in research on addiction and impulse-control disorders.

Within the overall strategy, our main objectives over the next 5 years are as follows:

1) The Animal Behaviour group will develop its strengths in social behaviour, animal cognition and animal welfare, with further collaborations with social and bio-scientists.

2) The Clinical Group will consolidate the MDC's position as a world-leading centre for research on depression and bipolar disorder, developing programmatic research with local, national and international collaborators, and stronger links with key stakeholders (NHS SHA, Wellcome Trust, NIHR, charities). It will focus on understanding cognitive processes and emotional dysregulation underpinning mood disorders, developing better interventions and increasing their availability as well as broadening its neuroscience, virtual reality and psychophysiology expertise.

3) The Cognition group, having consolidated its previously diverse portfolio, will build on its strengths in associative learning and cognitive control, and its impactful work in applied neuropsychology. It will further develop ongoing collaborations with members of the Clinical group and other partners to apply the basic science of learning and cognitive control to understand and ameliorate addictive and impulsive behaviours.

4) SEORG, having replaced its E for "economic" with an E for "environmental" psychology, will continue to develop this new theme, while consolidating its major strengths in social and organisational psychology with research on diversity, social inclusion, well-being, leadership, and sustainability, underpinned by the unique Social Identity focus represented in the IPSIS Centre, and the university's HASS themes.

Meanwhile, Abraham's group in UEMS will continue to develop its programme of supporting

the design and evaluation (mainly trials) of interventions involving behaviour change (e.g., in health professionals or patients), using methodologies outlined in ***Abraham*** and Michie's widely cited paper (REF 2), and will develop further collaborations with Psychology colleagues.

3. Mechanisms for the development, promotion, and dissemination of research

1. Discipline Structures. Promoting and developing research in Psychology is the responsibility of a Director of Research (DoR), four Research Group Leaders (RGLs), and a Director of Postgraduate Research (DPGR). A research budget, managed by the DoR, provides funds for laboratory equipment and consumables, pump-priming projects, research and conference expenses for members of staff, research seminar speakers, and PGR research expenses. A workload model, managed by the Psychology executive, ensures equitable teaching and administrative loads, and strategically allocates research time, including appropriate academic time on grant-funded projects.

To improve the quality of grant applications and research programmes, and to respond to RCUK demand management, we have developed a rigorous internal review process for grant applications. Following informal rapid peer feedback on viability and ways to develop ideas from within their research groups, potential applicants submit a draft application to an internal review panel (DoR plus suitable colleagues) for feedback and revision before submission is approved.

2. College and University Structures. Research management and appointments are overseen by the Deputy Vice-Chancellor for Research and the College's Associate Dean for Research, who ensure coherence with university strategy and meet regularly with DoRs (e.g. for annual monitoring of research output, discussion of research strategy and appointments). Budget allocations are the responsibility of the College Dean and Associate Deans for Research and Education. The College has a Strategic Research Development fund (~£225k p.a.) to pump-prime and support strategic research developments beyond the scope of the Psychology research budget (examples in d.2).

The College provides a Research and Finance Team to manage grant submission, costing, and administration, a PGR Administration team, and a business liaison manager. At University level there is a Research and Knowledge Transfer team, which supports project development and management, business and commercialisation schemes, the development of research networks, research monitoring, and support and training on matters such as Open Access.

The University's central Communication and Marketing Services provide support in disseminating research beyond academia. Between Nov 2011 and Oct 2013, 33 press releases were issued about Psychology research to target media directly, through Eurekalert!, the University website, Facebook and Twitter; over the same period the Press Office detected 717 pieces of media coverage about our research across external websites, international, national and regional newspapers, consumer and trade magazines and broadcast media. High profile stories have included: (i) mindfulness-based cognitive therapy as an efficacious treatment for depression (The Daily Telegraph, Daily Mail); (ii) research on the 'glass cliff' phenomenon (Financial Times, New York Times), (iii) history of brain injury among young offenders (Guardian).

4. The research culture. Each research group runs weekly or fortnightly research seminars, with a mixture of internal (including PhD student) and external speakers. There are occasional discipline-wide seminars with external speakers, and many other research group and lab lunch meetings. An important contribution to the ambience is made not only by research students (Section c.2), but by the 40-60 students in 3 taught MSc programmes: Research Methods in Psychology, Social and Organisational Psychology, and Animal Behaviour; each MSc student completes a supervised research dissertation (50% of their credit). Undergraduates also participate, through both third year research projects, and a popular new internship programme in which they and a few MSc students undertake voluntary research in labs or research teams: 25 in 2011-12, 42 in 2012-13.

Examples of ad hoc research training sessions by visiting experts arranged for staff and graduate students include: Zoltan Dienes on Bayesian statistics, Dan Scheepers on social psychophysiology, and Rik Henson on fMRI analysis with SPM. The university puts on one-hour "research speed updating" sessions" as one way of stimulating collaborative and applied work and we are emulating this in Psychology with thematic lunch-time sessions with 5-minute talks on current research projects from across the discipline (e.g. on Behaviour Change projects).

4.1 The Animal Behaviour Group *(5.4 FTE Cat A staff, 3 postdoc RAs, 1 technician, 12 PhD students; £1.52M grant awards notified between Aug 2008 and July 2013)*

Exeter's long tradition of animal behaviour research led in 2006 to the establishment of the

Centre for Research in Animal Behaviour (CRAB), with ***Collett***, ***Croft*** and ***Darden*** appointed since 2008. In conjunction with colleagues in Biosciences, the Centre forms one of the premier Animal Behaviour concentrations in the UK. The group is uniquely placed to bring animal model systems to bear on questions of broad psychological interest, with particular research strength in animal social behaviour and animal cognition. Funding has come from BBSRC, NERC, Leverhulme, Royal Society, Nuffield, Fisheries Society of the British Isles and from government (Defra) and industry partners (e.g. the Game and Wildlife Conservation Trust [GWCT], DairyCo).

In the area of animal social behaviour, highlights include work on: the role of the social environment in the development of male sexual signals in bower birds (**Madden**, BBSRC); implications of social structure for the battle of the sexes (***Darden***, Leverhulme); the importance of social structure in the evolution of cooperation (***Croft***, Leverhulme, NERC). The strong theoretical and empirical research base has spawned a series of applied studies focusing on effects of social interactions on behaviour, welfare and productivity in farmed animals (**Madden**, ***Croft***, Royal Society, and industry partnerships with GWCT, Defra and DairyCo).

In the area of animal cognition, achievements include work on insect navigation (***Collett***), the role of colour vision in bees for finding flowers, and how perception and learning processes exert selective pressures on the evolution of flower displays (**Hempel de Ibarra**, BBSRC). An example of economic/environmental impact is our studies of how environmental pollutants disrupt individual foraging behaviours (**Hempel de Ibarra**, funded by a major food retailer).

4.2 The Clinical Psychology Group *(9.9 FTE Cat A staff; 5 postdoc RAs, 5 other RAs; 17 PhD, 55 DClinPsych, and 10 DClinRes students, £3.49M grant awards notified).*

This group's core component, the Mood Disorders Centre (MDC), conducts psychological research, assessment, treatment, and training for the benefit of people who suffer from emotional disorders. It focuses on: (1) Understanding the psychological mechanisms underpinning mood disorders via basic experimental research; (2) Translating this understanding into more effective evidence-based psychological therapies, via process-outcome and randomized controlled trial (RCT) research (efficacy research); (3) Increasing treatment accessibility and availability, by conducting implementation and effectiveness research, and by using technological advances to widen access to treatment gains. Its impact is described in a Case Study. As well as staff enumerated above, the group's research involves research-active members of staff who teach in the CEDAR (Clinical Education Development and Research) training and CPD programmes, research therapists in the in-house AccEPT research clinic, Medical School colleagues in a Health and Wellbeing Network, and a programmer and statistician funded by a Wellcome Trust ISSF Hub.

The group has grown substantially over the REF period, adding expertise on PTSD and psychophysiology (***Karl***), motivational approaches to psychopathology and experience sampling methodology (***Moberly***), experimental psychopathology and cognitive neuroscience of affect regulation, reward, and mood (***Dunn, Karl, Lawrence***), intergenerational transmission of depression (***Psychogiou***), and psychopharmacology and addiction (***Morgan***). These new appointments built on established strengths in experimental psychopathology and cognitive processes in mood disorders (**Watkins, Wright**), bipolar disorder (**Wright**), peri-natal depression (**O'Mahen**), and cognitive-behavioural interventions (**Watkins, Kuyken**). The MDC has an excellent network of relationships with NHS services in primary and secondary care, the Peninsula Comprehensive, Mental Health, and Primary Care Research Networks, and is integrated into the Peninsula CLAHRC (Collaborative Leadership Applied Research in Health Care). ***Dalgleish***, based at the Cambridge MRC-CBU, is appointed part-time at Exeter to provide international expertise across the translational spectrum from experimental psychopathology to treatment development, including developing trans-diagnostic modular psychological interventions with **Kuyken**, ***Dunn***, **Watkins**, and mindfulness research with **Kuyken**. The research on basic neural mechanisms of cognitive and emotional processing of ***Lawrence***, ***Karl*** and ***Morgan*** has created new opportunities for cross-group collaboration (see below).

Major achievements during the assessment period include: understanding the thinking styles underpinning helpful versus pathological rumination (**Watkins**): the first intensive experience sampling investigation of rumination in daily life (***Moberly***); experimental and diary investigations of dysregulation in the behavioural activation system in mania (**Wright**); the study of effects of paternal depression on children's risk for developing psychopathology (***Psychogiou***); pioneering research on effects of cannabis and ketamine use (***Morgan***). Major achievements in translation and accessibility research include: the first trial comparing Mindfulness CBT to continuation

antidepressant to prevent relapse in recurrent depression (**Kuyken**, **Watkins**), leading to the ongoing PREVENT trial (see b.2); the largest UK CBT trial for treatment-resistant depression (NIHR HTA funded, N=469, **Kuyken**); (c) translation of experimental research into (i) the first targeted CBT treatment for rumination, which was superior to antidepressants alone for treatment-resistant depression in a Phase II trial (**Watkins**), and (ii) into low-intensity self-help **Watkins**, MRC Experimental Medicine grant) and internet-based treatments (***O'Mahen***: Netmums).

4.3 The Cognition Group (*11 FTE Cat A staff, 2 postdoc RAs, 2 other RAs, 10 PhD students, £1.65M grant awards notified since 2008)*

The Cognition group seeks to understand aspects of cognition through the integration of behavioural and neuroscience experimental methodologies, computational modelling, and neuropsychology. During the assessment period, retirements and appointments enabled consolidation of our research in three areas where we have internationally recognised expertise: (1) the psychology and neuroscience of cognitive control — executive function, control of task-set and attention, behavioural and cognitive inhibition (***Dodds*****, Lavric, Monsell, *Verbruggen***); (2) the role of associative learning in human cognition **(*Hogarth*, McLaren, Milton**); (3) applied cognitive neuropsychology through the life cycle, and social consequences of traumatic brain injury (***Adlam***, **Williams**), while (4) rebuilding our expertise in psycholinguistics (***Dumay*****, Lavric**).

Members of the first two subgroups combined with ***Lawrence*** in the Clinical group to create (2012) the Cognitive Control and Associative Learning centre, focusing both on basic mechanisms and on applications to the remediation of addictive and impulsive behaviour; both kinds of work are supported by recent ERC, ESRC and BBSRC awards to ***Verbruggen***, **McLaren** and **Lavric**. The recent addition of ***Hogarth*** and ***Dodds*** and (in the Clinical group) ***Morgan*** promises to create a very strong group working on addiction and impulsive disorders. The Centre for Clinical Neuropsychology Research has also been re-invigorated by the appointment of cognitive neuropsychologist ***Adlam*****,** with expertise in memory and executive control in young people**.**

Among our achievements, ***Verbruggen*** has developed his well-known work on behavioural inhibition using stop-signal and go-nogo tasks (recognised by the recent award of an ERC starter grant), probing the neural substrate with TMS, and demonstrating generalization from practice at stopping overt actions to avoidance of risky choices in monetary gambling. **Lavric** and **Monsel**l have demonstrated ERP correlates of task preparation and used ERP and eyetracking to demonstrate a major contribution of "attentional inertia" to task-switch costs. **McLaren** has continued to apply computational modelling of associative learning to a wide range of phenonema, including sequential learning, peak shift, and Pavlovian conditioning in humans. **Milton** and **Zeman** have established important parameters of memory dysfunction in transient epileptic amnesia. **Williams**' recent work on traumatic brain injury in young offenders is described in Impact Case Study 2, and with C.Haslam (left 2012) and the IPSIS Centre he has made important contributions on the role of social identity in recovery of cognitive function.

4.4 Social, Environmental, and Organisational Psychology (SEORG) *(12 FTE Cat A staff, 4 other postdocs, 5 other RAs, 21 PhD students, £2.21M grant awards notified since 2008)*

The SEORG group is internationally recognised for its work on social identity and group processes – specialising in both basic and applied research on social identity, group behaviour and environmental psychology. The core work of the group (inaugurated by an ESRC Large Grant, 2006-11, to **A. Haslam, Ryan**, C. Haslam, & **Williams,** and reflected in the foundation of IPSIS, the centre for Identity and the Psychology of Self in Society) has been the investigation of the contribution of identity to coping with organisational transitions, and the role of identity processes in health and well-being (**A. Haslam**, **Morton**, **Ryan** & **Smith)**. The group has been further strengthened and diversified since 2008 by appointments in the areas of intergroup relations (***Barreto***), pro and anti-social behaviour (***Levine***), collective action (***Livingstone, Sweetman***), communication (**Rabinovich**), environmental sustainability (***Kurz***), and prejudice reduction (***Koschate-Reis***). SEORG now has one of the largest concentrations of group process researchers in the world. Grant support for this work has come from ESRC, EPSRC, BA, EC(Fp7), Dstl, ARC and the Canadian Institute for Advanced Research.

In collaboration, members of SEORG and colleagues have made ground-breaking contributions to the study of social identity processes in social, organisational, and health contexts. This work has challenged long-held assumptions within social psychology, and advanced powerful

alternative analyses of: (a) the expression of prejudice, its consequences, and targets' coping responses (***Barreto*, Morton, Ryan**), (b) the contribution of social identity processes to the dynamics of stress, illness, health, and well-being (**A. Haslam**, C. Haslam, ***Levine*, Morton, *Rabinovich*, Smith, Williams**), (c) the dynamics of leadership and resistance (**A. Haslam's** BBC Prison Study [Impact Case Study 4], together with the work of ***Barreto***, **Ryan** and Peters [left 2013]), and (d) psychosocial factors that motivate pro-environmental behaviour and facilitate communication about climate change (***Kurz*, Morton, *Rabinovich,* Smith**).

Through external partnerships and interdisciplinary links, SEORG has led the discipline in translating theoretical insights about identity to practical settings, including (i) high-profile ESRC-funded experimental work on the "glass cliff" where women occupy risky leadership positions—see Impact Case Study 3 (**Ryan, A. Haslam**); (ii) ESRC and EC funded work showing that identity-based group interventions can reduce the impact of cognitive decline and protect well-being in the elderly and survivors of brain injury (C. Haslam, **Morton, Williams**) iii) Recent EPSRC (**Levine, Koschate-Reis**) and ESRC (**Pendry**) funded work exploring the role of identity in online and offline behaviours in the digital age; (iv) work funded by the Office of Fair Trading and HM Court Services on the "everyday" cognitive biases that lead people to fall victim to internet fraud, and on psychological responses to debt (**Lea, Mewse).**

c. People.

1. Staffing strategy and staff development. Once staff are appointed (see Section b for recruitment strategy) we aim to provide an environment that enables junior academics to become effective and independent researchers, and seasoned researchers to maintain their development, while also promoting collaborations, through the following mechanisms:

1. PDP. Early-career staff members are supported through the University's Professional Development Programme, which sets specified goals for research, teaching and wider academic contributions. The university-accredited Certificate in Academic Practice supports this development process for new lecturers and leads to membership of the Higher Education Academy.

2. Workload. New academic staff members have a reduced teaching and administration load in their first two years, allowing them to concentrate on getting their research under way. They are given appropriate start-up funds.

3. Mentoring. New lecturers and research staff are assigned a mentor who, with their Research Group Leader and Academic Lead (if different), provides support and guidance in preparing publications and grant applications, advice on research direction, and development of facilities. These matters are also discussed in meetings of labs, research groups, and the Centres, which are particularly important for developing collaborations across the Research Groups. University Research Development Officers also meet with new or inexperienced academics to identify possible sources of research funding.

4. PDR. Each staff member's progress and plans for research, impact, teaching, and internationalisation are reviewed annually through the University's Performance and Development Review (PDR) scheme by their Academic Lead, usually a senior member of the same research group, who also helps negotiate workload allocation with the Psychology executive.

5. Research staff. The University adheres to the CVCP/Research Council Concordat for Contract Research Staff in aiming to provide secure career paths for RAs and post-docs.

6. Synergy with clinical treatment and training. In the Clinical group, academics work closely alongside clinical staff employed to offer therapy in the MDC AccEPT Clinic and clinical teaching fellows, in ways that enrich research as well as clinical provision and research-led teaching.

7. Gender equality. The College is committed to the aims of the Athena Swann charter. Following an institutional bronze award to the University, Psychology, with other disciplines, is working towards the silver award, aided by the research expertise in gender equality issues of **Ryan**, ***Darden*** and ***Barreto,*** a member of the university's gender equality group. Of Cat A staff 43.4% [FTE] (and 36.7% of those whose outputs are returned) are women. Of 19 full-time Cat A appointees since 2008, 9 are women; 26% [FTE] of professors are women (vs 9% in RAE2008).

2. Research students As of Oct 2013, Psychology has 60 MPhil/PhD students registered, distributed across research groups as indicated in Section b.4; Abraham supervises 4 more in the Medical School. There are also 55 students in the Doctorate in Clinical Psychology programme, and 10 in an innovative Doctorate in Clinical Research programme; the clinical students produce a

research thesis of publishable quality, supervised by Clinical group and associated researchers, and occasionally (5 currently) by members of the other research groups.

The ESRC Southwest Doctoral Training Centre (SWDTC: Exeter, Bristol and Bath, awarded 2010) currently funds a studentship per year in Psychology and one interdisciplinary studentship, both doubled by the College through matched funding, We have access to studentships from the BBSRC SWDTP (Exeter, Bristol, Bath, Rothamsted, awarded 2012), and from the new GW4+ NERC DTP (announced Nov 2013). We currently have 2 students funded by the University's Science Strategy, and 14 by the university as graduate teaching assistants (who teach 180 hrs/year). Since 2008 the university has invested over £30M in PhD scholarships.

Partnerships with industry and the public sector have included ESRC CASE or GWR studentships with: Devon Partnership Trust (**Watkins**); Jockey Club, on traumatic brain injury (**Williams**); the Met Office (**Morton, *Rabinovich***); Somerset Care (**A**. & C. **Haslam, Ryan**); Rentokil (**A. Haslam**). The university also match-funded PhD partnerships with DairyCo (***Croft***), the GWCT (**Madden),** Dstl (***Barreto, Levine***), and Springer Publishers (**Lea**); 6 PhD students in the Clinical group were match-funded to support the Wellcome MDC building grant. The Fisheries Society of the British Isles fully funded two students (***Croft***). Such partnerships have particular potential for non-academic impact. For example, **A**. **Haslam**'s Rentokil-funded project, on Identity and Space Management in Offices and Care Homes, led to significant impact in organisations and architect training and provided our first reserve Impact Case Study.

PGR students are selected through competitive application, presentation and interview. Non-clinical students are initially enrolled as MPhil students. To progress to PhD registration, they must, within12-18 months, present a research seminar and defend a report on work to date and research plans at a viva with the DGPR and an independent assessor. Regular contacts and summaries of discussions with supervisors are now logged via an online monitoring system "myPGR". The DGPR reviews each student's progress annually with their supervisor's research group. New students sign a learning agreement: this defines the roles and responsibilities of student and supervisor(s), the reporting structure, the regularity of supervisory contact, and identifies training and support needs, which are revisited in an annual skills audit. Students have a second supervisor, who may act largely as an independent mentor or be a full co-supervisor (in which case an additional mentor is appointed). In addition to ad hoc skills training conducted within labs and research groups, and access to MSc modules (e.g. advanced statistics and methods) students must attend required university Researcher Development Programme courses on generic and specific transferable skills. Students with RCUK DTC/P studentships have the additional benefit of Centre/Partnership training programmes, communication events, and research experience opportunities at partner institutions. All students have access to the Psychology employability officer, who organises regular careers-related events.

For PhD students without a research training support grant from RCUK or a sponsor, research and conference expenses are allocated from a discipline-level PGR expenses fund and a College-level Postgraduate Research Enhancement Fund. All MPhil/PhD students have a desk and computer in a shared office. Students in the clinical programmes are embedded off-site within the NHS except for block teaching periods on-site, when they have access to appropriate working space and facilities. As well as being central to the research culture (b.4), PGR students participate in staff-student liaison committees, and contribute to teaching and student support.

Of the 44 PhD students who completed between 2008-2013, 8 are (as of Oct 2013) lecturers or equivalent in UK, European or American HEIs, 14 are postdocs in HEIs, 6 hold comparable research positions in other institutions (3 in zoos), 6 engage in business management/consultancy work related to their psychological expertise, 2 are in DClinPsych programmes, 2 in scientific management, 3 in university administration or local government, 2 recent graduates are unemployed for family reasons but research-active, and one works for a community not-for-profit organisation. DClinPsych students are, of course, already NHS employees, and almost all proceed to clinical positions.

d. Income, infrastructure and facilities

1. Income. A strategic aim identified after RAE2008 was to increase the level of external research income. The research income figures shown in REF 4b indicate a sharp upward turn in 2012-13. Even more encouraging for the future, of the award total of £9.48M notified during the 5-year REF period, 57% was notified in the last two years. The portfolio of funding agencies has

broadened to include major awards from the ERC, EU Framework 7, and NERC, and further substantial awards have been made by the sources listed in RAE2008, including ESRC, EPSRC, BBSRC, MRC, and the Wellcome Trust. With the help of our Business Liaison Manager, there has been a substantial increase in income from partnerships with industry/organisations.

***2. Infrastructure and facilities*.** Prior to 2008 there had been substantial investment in animal labs (well-equipped operant lab, sensory and behavioural ecology labs, and a specialist fish lab), and cognitive neuroscience labs (two eye trackers, electrophysiology and transcranial magnetic stimulation [TMS] labs, testing rooms) and access to the University's research-dedicated Philips 1.5T MR scanner. Notable further investment over the REF period includes:

(1) The £3.6 million Capital Grant from the Wellcome Trust has built the Sir Henry Wellcome Building for Mood Disorders Research (completed Dec 2011) and renovated existing space in Washington Singer. We now have a state-of the-art clinical research facility including 2 group and 4 individual treatment rooms, with AV recording, for high-quality psychological treatment trials, an innovative Biobehavioural and Virtual Reality laboratory that includes advanced psychophysiology-ical recording (EEG, EMG, SCR, heart rate, respiration) in a virtual-reality environment, and eye-tracking, for research into basic processes of cognitive and emotional regulation.

(2) Following an ERC grant to ***Verbruggen*** (€1.2M) and ESRC grant (£0.5M) to ***Verbruggen***, **Lavric** and **McLaren**, the College invested £75K from its Strategic Research Fund to augment the cognitive neuroscience labs with an additional TMS lab with concurrent EEG, plus transcranial direct current stimulation, and BioPac physiological recording.

(3) To support the appointments of ***Barreto*** and ***Levine***, a Social Behavioural Lab has been developed, with test rooms and psychophysiological equipment (about £40K)

(4) Psychopharmacology lab space and a test room have just been created on the St Luke's campus, near the scanner and UEMS, to facilitate the work of ***Morgan***, ***Hogarth*** and ***Dodds***.

Participant panels include: (a) first year undergraduates acting as study participants as part of their research methods training, (b) a large panel of paid student participants recruited at the beginning of each year, (c) a general community panel; (d) a MDC database of over 1000 patients with depression; (e) a database of patients with acquired head injuries, strokes and memory problems, built up from NHS links (Royal Devon & Exeter Hospital) and charities (Encephalitis Society, Epilepsy Association). The MDC has an active Lived Experience Group of individuals who have experienced depression or are carers, and are involved in all stages of research.

e. Collaboration or contribution to the discipline or research base

1. Collaboration. We work with numerous commercial, government, and charitable bodies. The MDC is formally a partnership with the NHS and provides a treatment clinic commissioned by the local Clinical Commissioning Group. Its clinical trials research with NIHR & MRC Clinical Trials Units is inherently multi-disciplinary, involving psychologists, statisticians, psychiatrists, GPs and health economists, and is supported by the Peninsula CLARHC award. It has an expert advisory board. SEORG's researchers collaborate with economists, political scientists, sociologists and others through the Centre for Energy and Environment (Physics), the Centre for Leadership Studies (Business School), the Behaviour and Environmental Change Knowledge Network and the Social Interactions, Identity and Well-being research programme of the Canadian Institute of Advanced Research. A recent £2.54M (fEC) EPSRC grant to ***Levine*** (PI) funds a multi-centre (Oxford, Bath, QMC, UWE) collaboration with computer scientists and others on tracking emotional behaviour in public spaces. Other funded collaborations have been with CIPD, Royal College of Surgeons, the Royal Navy and IBM. The Cognition group's research partnerships include Qinetiq (Wills, left 2012), FlyBe (**Lavric**) and web company Optix (**Lavric**). CRAB's external collaborators are listed in Section b.4.1.

Within the university, 20% by value of our grant awards 2008-13 involved another Unit of Assessment (11 grants, of which 7 were awarded in the last 2 years). Awards (£0.6M) from the EPSRC-funded Bridging the Gaps scheme to Exeter, on which Wills was a co-applicant, encouraged inter-disciplinary projects between Engineering and other disciplines, and we have benefited from its 68 pump-priming awards (***Croft*****, Lavric,** ***Levine*****, Watkins,** Wills). CRAB works closely with Exeter's excellent behavioural ecology group on the Cornwall campus (e.g. a joint NERC grant, participation in the NERC DTP), and has several industrial partnerships (see b.4.1).

Collaborations with other HEIs and local business and public services were stimulated by the

Great Western Research Initiative (funding from South West RDA to Bath, Bristol and Exeter Universities); in Psychology it funded three research students and two fellows (now lecturers, **Milton**, **Rabinovich**) during the REF period. In 2013 the Great Western 4 (GW4) collaboration of the region's four major research universities – Bath, Bristol, Cardiff and Exeter – was announced, bringing together their expertise to maximise the return on investment from research funding; the Psychology departments are working together to build upon our already numerous collaborations.

In an Oct 2013 survey, staff named active international collaborators in countries and institutions including: Australia (Deakin, Melbourne, Murdoch, Queensland, Western Australia, UNSW, CSIRO), Bulgaria (Acad of Sciences), Belgium (Ghent, Leuven, Liège), Canada (UBC), China (Acad. of Sciences, East China Normal U.), Denmark (Copenhagen), France (Bordeaux, Paris X), Germany (FU Berlin, Bielefeld, Bonn, Humboldt, Osnabrück), India (Allahabad, Indian Inst. of Science Education at Trivandrum), Netherlands (U. of Amsterdam, Groningen, Leiden), New Zealand (Auckland, Victoria), Mexico (UNAM), Spain (Barcelona, Granada, San Sebastian), Sweden (Linköping), Switzerland (Zürich), USA (Colorado-Boulder, Northwestern, NY Stony Brook, Ohio State, Oregon, Penn, Pittsburgh, UCSD, UC Irvine, Vanderbilt, U of Washington).

2. Contribution to the discipline and its impact. During the REF period, **Lea** served as Editor of *Animal Cognition* and 12 of us as Associate Editors – for *J Exp Psych: Gen* (**Monsell**), *Quart J Exp Psy* (***Hogarth***, ***Verbruggen***), *Proc Roy Soc B* (**Madden**), *Exp Psy* (***Verbruggen***), *Beh Ecol & Sociobiol* (***Croft***), *Eur J Soc Psy* (***Barreto***), *B J Soc Psy* (***Livingstone***, **Morton**, **Ryan**), *Beh & Cog Psychotherapy* (**O'Mahen**), and *J Traum Stress* (***Dalgleish***). Two guest-edited special issues; 16 were on boards of consulting editors of 31 journals, including *J Abnormal Psych* (**Kuyken**, **Moberly**, **Watkins**) *J Exp Psy: Anim Behav Processes* (**McLaren**), *Soc Psych & Pers Bull* (**A. Haslam**), *Anim Behav* (***Croft***), *Annals of Beh Med* (***Abraham***), Clin Psych Sci (***Dalgleish***).

Members of grant proposal review panels included **Kuyken** (NIHR Research for Patient Benefit), **Monsell** (ESRC Research Grants Board) and **Watkins** (Wellcome Trust Expert Review Group for Cognitive Neuroscience and Mental Health). Six of us are members of the ESRC Virtual Peer Review college (***Levine***, ***Livingstone,*** **McLaren**, ***Moberly***, **Pendry**, ***Verbruggen***).

Learned/professional society executive committees on which staff have served since 2008 include those of the European Association of Social Psychology (***Barreto***, **A. Haslam** – chair & treasurer), European Society of Cognitive Psychology (**Monsell**), British Neuropsychiatry Association (**Zeman** – chair). **Williams** chaired, and ***Adlam*** served, on the BPS Division of Neuropsychology Executive Committee; ***Adlam*** is also on the BPS Research Board. Staff members organised international conferences in Exeter of the Association for the Study of Animal Behaviour (2010, ***Croft***), and International Association for Research in Economic Psychology (2011, **Lea**) and were members of organising or scientific committees for numerous other international meetings, symposia, and workshops for practitioners (e.g. **Kuyken**: workshops on Mindfulness CBT in Australia, Iceland, Sweden, UK and US). Staff delivering invited keynote addresses to international research meetings outside the UK included ***Abraham*** (6), ***Adlam*** (1), ***Dalgleish*** (5), **A. Haslam** (3), ***Levine*** (4), **McLaren** (2), **Watkins** (4), **Zeman** (5).

Abraham served as scientific advisor to a House of Lords Science and Technology Committee enquiry into Behaviour Change. ***Levine*** was a member of the project Lead Expert Group on the 2013 Government Office for Science Foresight report on Future Identities. **Williams** advised parliament and criminal justice bodies on brain damage in young offenders (see Impact Case Study 2 on Brain Injury). Several staff were members of NICE guideline development/update groups: ***Abraham*** (behaviour change in health care), **Kuyken** (depression), **O'Mahen** (perinatal mental health). ***Lawrence*** has a £3K Catalyst public engagement seed fund grant to support the development of a new rapid-response service for linking politicians and scientists.

Recognised since 2008 for their contributions were: ***Adlam*** – BPS Pre-Qualification Award for contribution to Clinical Psychology 2011; ***Dodds*** – 2010 International College of Neuropsychopharmacology Young Investigator of the Year; **McLaren** - Fellow of the BPS 2012 and EPA 2012; ***Dalgleish*** (2009) and **Monsell** (2010) – Fellows of the APS; and ***Morgan*** – British Association of Psychopharmacology 2011 Prize for 10 year contribution to Psychopharmacology, and two international "young investigator" awards. Best paper awards went to ***Dunn*** (*Cogn Affect & Beh Neuroscience*, 2012) and **Watkins** (*J of Palliative Care*, 2012). ***Dalgleish*** won the 2013 BPS President's Award, and **Watkins** was nominated as a NIHR Senior Leader.