Institution: University of Sussex

Unit of Assessment: UoA 4 Psychology, Psychiatry and Neuroscience

1. Overview

Psychology, Psychiatry and Neuroscience at Sussex combine cutting-edge, discovery-oriented research and strong engagement with policy-makers in health and social care, non-governmental organisations and the private sector. In this way we tackle contemporary challenges in mental and physical health, social inclusion and well-being.

This submission brings together five research groups, four in the School of Psychology and one in the Brighton and Sussex Medical School (BSMS):

- *Behavioural and Clinical Neuroscience*: this group focuses on addiction, ageing and learning. It conducts non-human animal, human and clinical research, emphasising translational links.
- *Cognitive Psychology*: the group has broad interests in language and communication, learning, memory, attention, visual perception and cognition and consciousness, with approaches that range from classic experimental psychology through to cutting-edge cognitive neuroscience techniques.
- *Clinical Brain Science*: the group is takes an integrative approach to clinical neuroscience, especially in the areas of neuro-degeneration, neuropsychiatry and neuro-inflammation, and it has strong interactions with clinicians.
- *Developmental and Clinical Psychology*: the core objective of the group is to translate research in human development to clinical, policy and public contexts. Its work spans developmental and experimental psychopathology, quantitative behaviour genetics, and the development of cognition.
- *Social and Applied Psychology*: the group focuses on group and intergroup processes, identity processes, culture, well-being and heath psychology. It uses a range of methodologies in laboratory and field settings, with a focus on applied relevance.

Cross-School and cross-university research centres facilitate interactions between these research groups and with other researchers in the University. Such centres are established to nurture new research activity, build more effectively on areas of academic strength and enhance the vitality of our research environment. They run research colloquia and facilitate shared access to important research populations (e.g. clinical samples, children and young people, participants in disasters and emergencies) and major items of equipment. The seven centres relevant to this submission are:

- *Centre for Innovation and Research in Childhood and Youth (CIRCY)*: based in the School of Education and Social Work, but with strong links to Psychology.
- *Clinical Imaging Sciences Centre (CISC*): provision of multimodal imaging facilities, with an emphasis on quantifying the function and structure of the brain.
- *Rudd Centre for Adoption Research and Practice*: developing new insights into the cultural, social-relational, cognitive and emotional processes in the development of adopted children.
- *Sackler Centre for Consciousness Science:* a unique interdisciplinary centre spanning informatics, engineering, psychiatry, psychology and cognitive science.
- *Sussex Addiction Research and Intervention Centre (SARIC)*: a merger of pre-clinical and clinical research in drug addiction to pursue translational projects in collaboration with the Sussex Partnership NHS Foundation Trust (SPT).
- *Sussex Health Outcomes Research and Education in Cancer Centre (SHORE-C):* a centre within the BSMS for psychosocial oncology, with close links to the health psychologists within the School of Psychology.
- *Sussex Neuroscience*: a cross-university centre to develop the scientific and educational strategy for basic and translational neuroscience.

2. Research strategy

Psychology and the BSMS have worked closely together since the RAE 2008 in order to achieve five

aims, the first four of which were explicitly stated in the Psychology 2008 submission:

- to build on distinctive strengths in behavioural and clinical neuroscience and applied psychology, using that capacity to bring different perspectives to bear on common problems, with a focus on underlying brain mechanisms;
- to work closely with users to inform policy and practice in health, education and social policy;
- to diversify funding sources;
- to maintain a comparatively large (45+) Psychology faculty with strong critical mass in each group; and
- to invest in senior academic appointments in neurology, psychiatry and dementia within the BSMS.

To achieve the above aims we have implemented a four-pronged research strategy:

- targeted staff recruitment, always seeking to build on and extend existing research groups (aims 1, 4 and 5);
- active engagement with external partners and philanthropic donors (aims 2 and 3);
- the encouragement of cross-School and other inter-disciplinary research collaborations (aims 1, 2 and 3); and
- enhancement of the research environment, through improvement in its physical infrastructure, and the development of robust research planning and decision-making processes (aims 1-5).

2.1. The Research Environment

The overall result of our research strategy has been a significant enrichment of the research environment, with new appointments, collaborative research and training ventures with the SPT and Local Authorities (LAs), four new Research Centres (Sussex Neuroscience, Sussex Addiction, Sackler and Rudd), substantial new research collaborations, and a growth and diversification of research income (see 4.1 below).

Targeted staff recruitment. Natural staff mobility in Psychology and the BSMS has provided the opportunity to make outstanding new appointments. In these, we have consolidated our strengths in addiction (Badiani, Koya), extended our expertise in cognitive neuroscience (Bird, Kanai, Forster), branched out in new directions in clinical (Fowler) and developmental psychology (Franklin, Harold, Oliver, Gaysina), enhanced existing strengths in health psychology (Harris, Miles), and developed new streams of activity in clinical brain science (S. Banerjee, Cercignani, Leigh and Sigala). Each research group has sufficient research-active faculty to ensure critical mass. Importantly, these new colleagues are already developing collaborations across School and Unit boundaries (e.g., Bird and Chan; Dowell, Tabet and Rusted), following the lead of existing joint research projects (e.g., Brown with Walters (Law), Collyer (Global Studies) and Morrice (Education); Duka and Critchley; Leigh and Chan with Hafezparast and Caledcott (Life Sciences); Dienes, Ward, Critchley and Seth (Sackler)).

Specific changes to the research environment. Recent enhancements include:

- *Sussex Neuroscience*, with initial 'pump priming' of ~£1.3m and infrastructure development of £1.2m, both from the University's Strategic Development Fund (SDF) (Director: L. Lagnado);
- *Sackler Centre for Consciousness Science*, established with donations totalling £1.6m (Joint Directors: H. Critchley and A. Seth)*;*
- *Rudd Centre for Adoption Research and Practice,* set up with a gift of £1.5m and SDF support of £460k (Director: G. Harold);
- *Centre for Dementia Studies* – a strategic initiative bringing together the Universities of Sussex and Brighton with the NHS, Social Care and industry to deliver research, development, education and policy in dementia (Director: S. Banerjee);
- Strong collaborative research and training links, underpinned by formal collaboration agreements, with local acute and mental health NHS Trusts;
- Investment in the expansion and refurbishment of our laboratory facilities: ~£700k from the SDF to redesign and upgrade the developmental laboratory suite and create our new *Sussex Child Research* hub, and to increase research capacity in cognitive and social psychology by the building of a group of 11 laboratory-test rooms and a research meeting-room in the main Psychology building;

- The arrival of Koya, Kanai and Badiani – supported by investment of ~£750k in new facilities and equipment, thereby significantly expanding our capacity in behavioural and cognitive neuroscience;
- The University, again through the SDF, has also invested in laboratory facilities for research in basic neurobiology and neuro-inflammation (the *Trafford Centre*), and in upgraded imaging facilities with PET/CT and MRI (CISC), at a total cost of £562k. These improvements in physical infrastructure were each justified through a rigorous evaluation of both the expenditure and the anticipated outcomes, and will be monitored against agreed targets for research income and outputs.

2.2. Research Planning and the Implementation of the Research Strategy

The building of a long-term and sustainable research strategy is embedded within the University's annual planning process. Research Group leaders and Directors generate operational plans for the coming year through management meetings with Heads of School, subsequently agreed with the University's Executive Group. Strategic plans, looking forward five years, are also reviewed annually and updated as necessary. Targets for student numbers (both undergraduate and postgraduate) and research-grant income (set against benchmarks derived from comparator institutions) are agreed as part of this planning process. These plans support both our bids for new staff and for infrastructure improvement, and new initiatives through the SDF. At an individual level, research planning is also part of the annual appraisal process [see Section 3.1 below]. This planning process has generated a series of goals for the future, the overarching aim of which is to ensure the continued vitality and sustainability of research in Psychology, Psychiatry and Neuroscience at Sussex:

- We will continue to invest in new human and physical resources in order to maintain the vitality and strength of our existing research groupings (see Section 2.4 below).
- In particular, we plan to develop and strengthen our existing world-leading centres of excellence in Addiction, Consciousness, Developmental Psychopathology, Health Behaviour Change, and Social Inclusion.
- Consistent with the University's overall plan for growth, we anticipate expanding the number of faculty over the next five years by about 20 per cent.
- We will continue to expand research-student numbers through a renewal of the ESRC doctoral training centre and applications to BBSRC, EPSRC and the Wellcome Trust for training awards. In addition we shall continue with a successful scheme that matches School of Psychology funding with external funding (e.g. with the Gulbenkian Foundation, local authorities, the Sussex Partnership Trust and industrial sources) to create individual studentships. The University, through the SDF, is supporting 20 additional studentships as part of the creation of the Sussex Neuroscience Research Centre.

The University has committed £120m over four years (2014–2018) to significant infrastructure development of the Science campus at Sussex. Benefits for Psychology, Psychiatry and Neuroscience will include the provision of a new Life Sciences building with integrated facilities for cellular, molecular and behavioural neuroscience and, towards the end of that programme, replacement of the existing scanning facilities, which will be housed in a new building that will allow the integration of cognitive and clinical neuroscience research across the campus. There will also be significant investment in the main Psychology building to generate state-of-the-art accommodation designed to promote informal interaction at all levels and produce a creative research environment for faculty, post-docs and research students alike.

2.3 Effective Mechanisms for the Development, Promotion and Dissemination of Research

Through School Research Committees (chaired by School Directors of Research and Knowledge Exchange), more-informal research groupings, and the administrative support provided by School Research and Enterprise Coordinators, the two Schools comprising this submission (Psychology and BSMS) seek to maximise the research potential of their staff and to disseminate their research findings widely, both inside and beyond the confines of academia. They do so in the following ways:

- *Research Committees* meet termly to discuss research strategy, to review research funding achievements against targets, to administer School research funds, to consider applications for external Fellowship applications to be part-funded by the University (e.g. Leverhulme Early Career Fellowships – Charlton), to establish procedures for the internal review of grant applications, and to plan new initiatives, especially in response to new national and international funding priorities.

Success in this is evidenced by no fewer than three major ERC grants awarded to members of this submission in the assessment period (Bird, Critchley and Franklin). Current attention is focussed on the Horizon 2020 scheme. Both Schools involved in this submission have an internal research fund, supported from grant overheads. These funds are used to support 'seed-corn' research projects that are likely to lead to external grant applications. Examples include: Drury (£3k for proof-of-concept work on communication strategies in emergencies); Davey (£3k for an online study of chronic worriers, to develop an 'app' for anxiety reduction); De Visser (£1k for pilot work on alcohol-drink pouring, prior to an external research bid); and Horst (£2.5k for work on the role of colour in digit recognition in children, in preparation for a research bid and potential industrial partnership).

- To stimulate new research ideas, we have annual research-focused 'Awaydays' devoted to the planning of new projects, and involving faculty and post-docs, and invited colleagues and speakers from outside or elsewhere in the University.
- *Research and Enterprise Coordinators* assist Research Directors and faculty within Schools on all matters relating to research-grant funding and dissemination. They maintain databases of previous grant applications, assist grant applicants with the relevant budget information, prepare budgets and liaise with the University's Research Office over the submission of applications. They also provide the primary administrative support for maintaining School research web-pages, blogs and 'outreach' activities, including 'showcase' events [see REF 3A]. This UoA's work is supported by an annual allocation of £25k from HEFCE's Higher Education Innovation Fund.

2.4 Research Groupings

Research groups are our primary vehicles for the exchange of new research ideas, the development and informal peer review of new grant applications and articles, and the mentoring and appraisal of staff. Typically, groups meet fortnightly to discuss forthcoming conference presentations, ideas for new projects and work-in-progress. All grant applications are reviewed by senior colleagues to increase their quality and likely success rates. Short-listed candidates for Wellcome Fellowships and ERC Starter grants are extensively prepared using internal 'mock' interviews and 1:1 briefings. The grant success rate for the UoA over the census period is 38 per cent (aggregated over all funding sources), giving a clear indication of the value of this internal review process.

All faculty have one primary research-group affiliation, shown below. However, consistent with the interdisciplinary and collaborative ethos of this submission, in practice many actively participate in more than one grouping. The quality of these groups is evident from outputs in premier journals across neuroscience and medicine, through experimental psychology to social psychology, while also encompassing quantitative-behaviour genetics and developmental psychopathology. Reflecting their international prominence in their respective fields, researchers in these groups have published over 1,000 articles and 18 books and have won research grants and consultancies to a value in excess of £14m over the census period.

Behavioural and Clinical Neuroscience (9.6 FTE; grants, £3.2m; 155 papers and 1 book published)

Within this group there is a close inter-relationship between non-human animal, human and clinical work, with a strong translational emphasis. Four key areas of activity are: *Ageing and Dementia*; *Appetite and Obesity*; *Addictive Behaviours*; *Influences of Early Developmental Insults on Adult Behaviour*. Notable research achievements include:

- Rusted's identification of aberrant neural activity in carriers of the APOEe4 genotype which is apparent from young adulthood, and which may provide a route to innovative interventions to target these early changes;
- Koya's demonstration of the causal role of sparsely distributed groups of accumbal neurons in context-specific sensitisation by cocaine;
- Badiani's evidence for substance-specific influences of context in drug addiction; both have important implications for therapeutic intervention;
- Clifton's work contributing to the development of serotonin 2C agonists as anti-obesity agents – part of the group's wider interests in the neural and behavioural mechanisms underlying eating;
- King's, Stephens', and Duka's work on GABA alpha2 receptors' role in cocaine and alcohol addictions;
- Stephens' and Duka's pioneering work in adapting their own rodent behavioural model for human

use, demonstrating loss of control in alcoholic patients, and identifying brain areas associated with these effects. With Crombag, they have also established a role for glutamate receptors in incentive learning and relapse to cocaine taking;

- Findings from non-human and human studies that link early life stress to impulsivity, anxiety and hence to substance abuse (Ripley, King, Stephens and Duka).

Cognitive Psychology (14 FTE; grants, £2.9m; 227 papers and 6 books published)

The four key research themes of the Cognitive Group are: *Language and Communication*, *Learning, Memory and Attention*, *Visual Perception* and *Cognition and Consciousness*. Members of the group combine modern neuroscientific methods to record or modulate brain activity and eye movements, with more traditional behavioural measures of reaction time or discrimination. We have productive collaborations with members of the Developmental and Clinical Group investigating cognitive development and various pathologies, and close links with the Clinical Brain Science research group, CISC, and the Sackler Centre. Noteworthy research achievements include:

- Oakhill's work on children's comprehension, its influence on the national curriculum and the development of adaptive learning systems for poor comprehenders;
- McComb's prize-winning demonstration that non-human animals such as horses can form multi-modal representations of conspecifics and humans;
- Kanai's demonstration that a focal region of the left superior parietal cortex is critical in avoiding everyday distractibility;
- Ward's work on synaesthesia, phantom limbs and contagious itch, which has attracted widespread international attention, and which provides important new insights into normal cognition;
- The delineation by Scott and Dienes of the limits of unconscious learning and awareness of knowledge states, together with the development of increasingly used tools for measuring conscious states and a technique for evaluating awareness in brain-injured patients;
- Bird's research on long-term memory, and his development of a test sensitive to the earliest cognitive changes in Alzheimer-type dementia;
- Dienes is also internationally known for his promotion of Bayesian statistical methods for analysing behavioural data, and for providing widely available tools for their implementation.

Developmental and Clinical Psychology (14 FTE; grants, £2.7m; 222 papers and 6 books published)

The broad research aim for this group is to chart the developmental pathways that underlie normal and abnormal emotional, social, cognitive and behavioural development across the lifespan. While the group has a primary research orientation to its work, it also has a practice and policy agenda in its outputs and has established strong links with practitioners in clinical psychology and education. The three key areas of research are:

- *Development of Cognition and Communication:* a particular focus is on the development of visual perception and language. Notable research achievements include Franklin's discovery of infant colour categories, Horst's development of new paradigms for the study of early language acquisition, and Leavens' research on chimpanzee gestures, supporting new theoretical interpretations of what were previously regarded as uniquely human cognitive adaptations for reference and intentionality;
- *Mental Health through the Lifespan*: Fowler has specified early risk factors for first-episode psychosis and Harold, Oliver and Pike study the interplay between genetic and environmental factors underlying children's emotional, behavioural and social development; other work by Field and colleagues examines the acquisition and treatment of childhood anxiety and the proximal mechanisms that underlie perseverative psychopathologies. Field is also well known for his SPSS and R textbooks which, in addition to their success at undergraduate level, have been instrumental in introducing more advanced statistical techniques to the wider research community.
- *Social and Emotional Development*: a key theme is examination of the interplay between developmental processes and the social contexts within which they occur (e.g. family, institutional, community, school). R. Banerjee has developed school-based work to promote 'Social and Emotional Learning' and support children's mental health. Further achievements include Oliver's development of interventions for children with conduct problems, and Pike and Harold's

contributions to an understanding of the roles of family and school environment in children's adjustment.

Clinical Brain Science (12 FTE; grants, £2.3m; 255 papers and 1 book published)

Three key areas of activity are: *Psychiatry and Psychosomatic Medicine; Neurodegeneration; and Neuroinflammation*. Key research achievements include:

- Critchley's team's identification of neural pathways in the human brain through which cardiovascular signals gate the processing of emotive stimuli, with mechanistic and interventional relevance to the control of pain, anxiety and hypertension;
- Critchley's development (collaborating with Seth, in the Sackler Centre) of the theory of interoceptive predictive coding, enhancing the 'neuro-informational' understanding of emotions and substrates underpinning self-representation and providing a fresh perspective on dissociative and psychotic symptoms;
- Harrison's and Critchley's experimental delineation of neural pathways through which inflammation and pro-inflammatory cytokines affect cognition and mood. This research provides new insights into the pathogenesis and potential treatment of sickness symptoms including mental fatigue and confusion, suggesting how adaptive illness responses are 'hijacked' in clinical depression;
- Sigala's and Harrison's translation of methods from animal studies of spatial memory into human neuroimaging approaches for early dementia diagnosis;
- S. Banerjee's evaluation and implementation of strategies to enhance quality of life and care in dementia patients, leading to changes in national dementia policy;
- Leigh's creation of a Sussex genetic and biomarker 'biobank' of tissue and cells from large cohorts of patients with Motor Neuron Disease, Parkinsonian disorders and dementia. This research is integrated with basic molecular biology and induced stem research within Sussex Life Sciences (Hafezparast, Caldecott – UoA5). These examples of innovative neuroscience research are coherent with, and contribute to, the wider expertise present within the BSMS in the clinical science of infection, immunity and rheumatology;
- Cercignani's development of advanced neuroimaging methods to characterise structural pathology within the 'normally appearing' brain in psychiatric and neurological conditions (notably, the inflammatory neurodegeneration of multiple sclerosis).

Social and Applied Psychology (14.6 FTE; grants, £3.0m; 261 papers and 4 books published)

The hallmark of the group is research that combines a theoretical focus with a concern for applied relevance, and covers three main areas:

- *Group and Intergroup Processes*: Brown's research on acculturation and contact has focused on well-being and social-inclusion outcomes among refugees and ethnic minorities in Britain and Europe, and shows how good-quality intergroup contact is critical for positive intergroup attitudes and social integration. Another key strand is Drury's innovative work on crowd dynamics and collective responses to emergencies, both with proven policy implications;
- *Identity Processes*: Vignoles and Brown have conducted pioneering research with collaborators in 38 nations, clarifying the interplay between cultural and motivational influences on self and identity processes, and also developing a new model of cultural differences in self-construal. Their work challenges stereotypical thinking about cross-cultural differences, providing a richer understanding of global cultural variation than conventional 'East–West' dichotomous thinking. This work complements Dittmar's research on the well-being implications of cultural and individual differences in materialism values;
- *Health Psychology:* This work focuses on the application of social-psychological theory to the analysis and amelioration of defensive resistance to health promotion materials and the promotion of healthier behaviour. Researchers in this area (Good, Harris, Jessop, Miles) were the first to demonstrate that self-affirmation promotes health behaviour change, reduces over- and under-reactions to health warnings, thereby focusing their impact, and reduces defensive resistance early in the process of attention allocation.

3. People, including:

3.1 Staffing strategy and staff development

Consistent with our research strategy (see Section 2 above), we aim for all faculty to be active researchers, capable of achieving an international reputation. We have a policy of recruiting junior staff to ensure the long-term sustainability of research groups. Of the 21 appointments made since January 2008, 16 have not held a previous permanent faculty position. The recruitment of senior staff has also been a strategic priority to provide research leadership in particular areas (e.g. Badiani, S. Banerjee, Fowler, Harris, Harold). Teaching and research faculty are appraised annually by a senior faculty member. Appraisal reports are passed to the HoS, who then responds to action points in these reports. New and postdoctoral staff are also assigned a mentor, normally an established colleague in their research group, with whom they discuss career-development issues and progress towards the satisfactory completion of probation.

The University has established a Doctoral School to work with senior academic staff, especially Principal Investigators, to ensure that the interests of research staff early in their research careers, as well as research students, are institutionally represented. It's aims are to:

- ensure that researchers are supported in managing their careers and are able to plan for a variety of career paths;
- ensure that researchers can disseminate their results and develop their ability to transfer and exploit knowledge;
- develop transferable skills through embedded training within our Academic Schools and through the Doctoral School

Staff development budgets support both full-time teaching faculty and research staff in individual activities, such as attendance on courses and School activities, including at least one research '*Awayday*' per year. We also mount courses to develop research skills and run workshops on structural equation modelling, multilevel modelling, web-based technology for surveys, the use of experiment generators such as *E-Prime,* and the design and analysis of fMRI experiments. The University has implemented the '*Concordat to Support Career Development of Researchers*', thus ensuring that research staff receive appropriate mentoring and appraisal from line-managers or senior colleagues. Contributing Schools to this UoA have Equalities Groups that monitor patterns of staff recruitment, promotion and study-leave allocation and assist in the development of 'family-friendly' working practices. These groups also lead on School-based applications for Athena Swan accreditation.

There has been a deliberate policy of engagement with local NHS partners. This has borne fruit in high-profile joint appointments with SPT to lead research in dementia (S. Banerjee) and child and young people's mental health (Fowler), and NHS Visiting Research Fellows to develop research on early intervention in psychosis (Greenwood, Hayward).

3.2 Research students

We have a thriving community of 83 PhD students (Psychology, 81; BSMS, 2), selected from a competitive field (typically, ~80 applicants per annum). In the census period, 73 students successfully completed a PhD. Our major sources of PhD funding are BBSRC and ESRC, for which Sussex received a Doctoral Training Centre (DTC) award, one of 12 single-site DTCs in the UK, and Psychology takes around 5 ESRC students annually. The other RCs (MRC, EPSRC) and charities (Wellcome, Alzheimer's Trust, Breast Cancer Campaign) collectively make up the remaining studentships. In addition, the University funds Graduate Teaching Assistantships (GTAs) – typically about 8 per annum across the UoA. These may be the sole source of funding for some students, but are typically used on a match-funded basis either for RC studentships or for 'third-stream' funding, which is particularly attractive to external partners (costs are split ~50/50). We have secured 9 CASE studentships since 2008, including 3 with BBSRC (partners: Eli Lilly, Johnson & Johnson, Leatherhead Food Research), 2 with the ESRC (partners: SPT), and 1 with the Centre for Team Excellence. We also attract students on overseas government scholarships (typically 2–3 per annum).

All students are allocated a main and a secondary supervisor from appropriate faculty in each research group. There is a strong emphasis on skills training. At the start of each academic year, students are required to complete a Training Needs Analysis (*Vitae* Researcher Development Framework) in which they assess their current and desired skills. The DTC and Doctoral School organise workshops

grouped around these training needs. In addition, students are offered various M-level modules in advanced methods (e.g. Ethics, Structural Equation Modelling, Advanced fMRI, multi-level modelling, Linear Models, Meta-analysis, Eye-tracking, Discourse Analysis, and MatLab). Second-year PhD students give an oral presentation at a 'research day' attended by faculty, postdocs and their peers. At the start of each year, there is a half-day Poster Session of PhD research, an excellent way of inducting new PhD students into our research culture. In January, there is an '*Awayday*' for PhD students and postdocs (typical topics: Getting Published; and Grant-Writing). Students' progress is monitored annually through a piece of written work and independent statements from the supervisor and student. Each student is allocated an 'assessor' who acts as a 'critical friend'. Sussex also runs a Researcher Mentoring Programme in which post-doctoral researchers, coordinated by the Doctoral School, act as mentors to PhD students.

One objective measure of the success of our PhD research environment: students completing between 2008 and 2012 have an average of 1.9 peer-reviewed publications arising from their PhD research within 2 years of PhD completion. In two successive years (2012, 2013), a PhD student in Psychology won a competitive ESRC Research Internship to work in a government department for 3 months. Career destinations of PhDs from Psychology are indicative of their successful training: 89 per cent are in full-time employment, of whom 83 per cent are in teaching or research, 11 per cent in the private sector, and 6 per cent in other sectors.

4. Income, infrastructure and facilities

4.1 Research income growth and diversification

The research strategy described in Section 2.2 is linked with an increase in external grant income for this UoA over the census period: grant income for the first two years of the census period averaged £0.95m/annum; in the last two years, this has grown to £1.61m. For Psychology alone, according to HESA data, the grant income *per capita* in 2007/8 (the beginning of the REF period) was £33k; in 2011/12, the last year for which complete data are available, the figure was £43k, an increase of 31 per cent (compared to 5 per cent for all pre-1992 universities and 15 per cent for Russell Group universities). Comparable figures are not available for BSMS colleagues since they are not separately classified in the HESA data.

Modal sources of funding for research in this submission have historically been Research Councils (RCs), followed by charities. In the *previous* funding period (2002–2007) an average of 52 per cent of research income derived from RCs, 32 per cent from UK-based charities, 10 per cent from government and industry and 4 per cent from EU sources; the corresponding figures for *this* submission indicate a more diverse portfolio of funding, with small but noticeable shifts away from RCs (47 per cent) and charities (29 per cent) and towards government/industry (12 per cent) and EU funding (8 per cent). These trends, derived from actual spend in the census period, will accelerate over the coming years as the impact of recent ERC awards becomes apparent. Thus, diversification has both increased overall funding and enriched the multidisciplinary and applied aspects of our research portfolio.

4.2 Engagement with external partners and donors leading to diversification of funding.

We have been successful in developing strong research partnerships with user-groups within the NHS and LAs. With the Brighton and Sussex University Hospitals (Acute) and Sussex Partnership (Mental Health) Trusts, we have made joint appointments to support research into dementia, psychosis, forensic psychiatry, adult anxiety and mood disorders and childhood anxiety (e.g., S. Banerjee, Fowler). With LAs, we have secured funding to support a research programme into children's social and emotional well-being in schools. Through securing two large (>£1.5m) charitable donations, we have established two interdisciplinary Research Centres: donations from the Dr Mortimer and Theresa Sackler Foundation underpin our Centre for Consciousness Science; and a donation from Virginia and Andrew Rudd established the Centre for Adoption Research and Practice.

4.3 Research Facilities

As noted in Section 2.2, we have made significant investments in our research infrastructure since RAE 2008, with almost all laboratories being relocated in refurbished space and the establishment of significant new facilities. We enjoy the use of an animal unit and an imaging centre, and 1,200+ m^2 of laboratory space, well-equipped to support our research needs. Particular infrastructure developments are as follows:

- *Behavioural Neuroscience laboratories* (270 m^2): sole use of a microscopy and histological suite and two laboratories dedicated to electrophysiological studies in brain slices; shared use of molecular biology laboratories, all of which have seen significant recent investment (100 m^2; see Section 2.2). We are the main user of the University's animal unit, which comprises breeding, holding and experimental facilities for rodents and includes a surgery equipped with digital stereotaxic equipment for both rats and mice. The behavioural laboratories (c.170 m^2) are equipped for sophisticated operant and observational studies with rats and mice.
- *Clinical Imaging Sciences Centre*: CISC houses a 1.5T Siemens MRI and PET/CT scanners, and hosts an autonomic psychophysiology laboratory that extends to world-leading capacity for integrating functional MRI with multi-axis physiological and neurophysiological measurements. It is also a centre for scanning patients enrolled into Phase II and III interventional treatment trials for neurodegenerative and neuro-inflammatory disorders and, through clinical scanning of patients from memory clinics across Sussex, is building the UK's largest high-quality neuroimaging research dataset of patients at the onset of dementia.
- *Sussex Child Research Hub* (110 m^2): ten research rooms, including a child-interaction observation unit with one-way mirror, a room with CCTV for videoing child sessions, two rooms for experimental infant techniques with coding facilities, and a developmental psychophysics and eye-tracking room. The suite also includes multiple waiting and play areas appropriate for infants, toddlers and older children, and tea/coffee facilities for visiting parents.
- *Human Psychopharmacology laboratory* (145 m^2): two medical rooms, a wet lab, 12 specialised testing cubicles, Eyelink eye-trackers, and a fully equipped kitchen for the preparation of food for research on human ingestion.
- *Human Psychophysiology and Psychoacoustic laboratories* (129 m^2): six cubicles, two acoustic booths and a reception area. Equipment includes both Neuroscan and EGI rigs for EEG/ERP, a Magstim TMS rig, and three Eyelink II eye-trackers.
- *The Trafford Centre:* purposed for 'wet' labs, containing approximately 200 m^2 of lab space equipped with facilities for standard PCR, quantitative PCR, Pyrosequencing, Biobanking (-80°C and liquid nitrogen) and standard molecular biology and an extensive cell culture facility.
- *Vision laboratories* (80 m^2): A suite of six rooms – of which some are designed to exclude all natural light – include specialist equipment for presenting visual stimuli.

In addition to these dedicated facilities, Psychology has 85 m^2 of new general-facility, bookable lab space, including 11 test cubicles for faculty and student research projects and other research, a meeting-room, waiting area and kitchen facility (see Section 2.2 above).

4.4 Research Governance

The University has a dedicated Research Governance Officer and a cross-School research governance framework. All research, including undergraduate and postgraduate projects, are subject to ethical scrutiny by a School Research Ethics Committee, according to the likely level of risk involved. Higher risk research is submitted to a cross-School panel with significant lay representation. The cross-School panels report to, and are represented on, the University Research Governance Committee, chaired by an independent member.

5. Collaboration or contribution to the discipline or research base

5.1 National and international collaborations

Researchers in this UoA are partners in a wide range of both national and international collaborations. Consistent with UK developments in treatment and training in mental and physical health, we have developed close research and training links with local NHS Trusts and with other governmental and non-governmental organisations as well as the private sector (see Section 2.1 above). Evidence of success on the international stage includes:

- Badiani is co-PI in research funded by the Norwegian Institute of Public Health and has collaborations with colleagues in France, Italy and the USA (National Institute on Drug Abuse);
- S. Banerjee has active collaborations with dementia researchers at Columbia University and Johns Hopkins Hospital;

- Brown collaborates with colleagues in Belgium, Italy and the USA on acculturation dynamics and, in Bosnia, on intergroup reconciliation;
- Critchley is a partner in research funded by the Italian Ministry of Health and is the recipient of an ERC Advanced Grant;
- Duka is a Project Leader within a consortium supported by the National Institute of Health (NIH) for research on stress, impulsive behaviour and alcohol use;
- Ripley leads an EU-supported project with colleagues in France exploring the consequences of alcohol use in young people;
- Franklin's European Research Council (ERC) project on the origins of colour categories in language and thought involves extensive cross-national collaboration, as does Bird's ERC project on innovative experimental approaches to the study of long-term memory;
- Harold has active research collaborations with colleagues in the USA, New Zealand, Russia and China, including the lead role on existing and newly established longitudinal studies within each of these countries;
- Harris works extensively with colleagues in Canada, the Netherlands and the US on optimism biases and self-affirmation processes in health, with financial support from NSF (US) and SSHRC (Canada);
- Stephens was a work-package leader for an EC FP7 Framework programme IMAGEN conducting genetic, behavioural and fMRI analyses of adolescent mental health. Stephens now leads on an MRC/ESRC Addiction Strategy Cluster (GABA) project, involving scientists from UK universities and UK and European pharmaceutical companies (Eli Lilly, Johnson & Johnson, Pfizer); and, finally
- Vignoles heads a large network of researchers based in 37 countries, arising out of his ESRC supported work on identity motives (*Culture and Identity Research Network*).

5.2 Contribution to the discipline and research base

Consistent with their salient international profile and extensive collaborations, many of the UoA's members play a prominent role in their respective disciplines.

- **Behavioural and Clinical Neuroscience**: Badiani is past-President of the European Behavioural Pharmacology Society; Duka is President of the European Behavioural Pharmacology Society; Stephens chairs the Evaluation Panel of the ERA-Net Neuron, Network of European Funding for Neuroscience Research; Rusted is on the specialist advisory panel for the Alzheimer's Society;
- **Cognitive Psychology**: McComb won the Cozzarelli Prize for the best paper in the Behavioral and Social Sciences section of *PNAS* in 2008, and is Associate Editor of *PLoS1*; Ward founded and edits *Cognitive Neuroscience*.
- **Developmental and Clinical Psychology**: Banerjee is Co-Editor of *Infant and Child Development* and was Associate Editor of *British Journal of Developmental Psychology*, Franklin of *Infant and Child Development* and Horst of *Frontiers in Developmental Psychology*; Pike was guest-editor of *European Journal of Developmental Science* and *Infant and Child Development*.
- **Clinical Brain Science:** S.Banerjee leads the National Dementia Strategy for England and is an advisor to the Department of Health, WHO, Alzheimer's Disease International and Alzheimer Europe. Leigh chaired the Motor Neurone Disease Association Strategic Review Panel, (2010–11); Cercignani is Consulting Editor (Neuroimaging and Neurostimulation) for *Functional Neurology and Trends in Neuroscience;* Critchley is on the Academic Executive of the Royal College of Psychiatrists.
- **Social and Applied Psychology**: Brown edits *The European Monographs in Social Psychology,* co-edits *Social Issues and Policy Review* and has served on the Board of Netherlands Organisation for Scientific Research (NWO); Harris serves on the Population Research Committee and Cancer Research UK, and served on the Department of Health Scientific Pandemic Influenza Advisory Sub-Committee on Behaviour and Communication (SPI B&C) during the 2009 flu pandemic; Vignoles is Associate Editor of *European Journal of Social Psychology*.