Institution: University College London

Unit of Assessment: 4 - Psychology, Psychiatry and Neuroscience

a. Context

This submission to UoA4 comes from the UCL Faculty of Brain Sciences. Research on brain and behaviour involves many levels of enquiry including molecular, cellular, neuroimaging, social, cognitive and epidemiological approaches, so our research has a particularly **broad range of key non-academic users and beneficiaries**. This informs our strategic approach that provides specific institutional and UoA mechanisms and incentives targeting measurable impacts for each group. Our approach has been significantly strengthened by the 2011 reorganisation of the UoA to be **co-extensive with the new UCL Faculty of Brain Sciences** (excepting the Institute of Ophthalmology returned in UoA1). UoA4 enjoys **close partnership working with major NHS Trusts** including the UCLH NHS Foundation Trust (incorporating the National Hospital for Neurology and Neurosurgery), the Royal National Throat, Nose and Ear Hospital, the Royal Free Hospital London NHS Foundation Trust, the Camden & Islington Mental Health Trust and the North East London Foundation Trust; plus active engagement with NHS stakeholders through UCLP, our Academic Health Science Centre (AHSC) established in 2009 and Network (AHSN) established in 2012. This major realignment of the strategic context for our research has permitted a significant transformation in our ability to deliver focused knowledge transfer. Our key users and beneficiaries are:

1. **Patients, their carers and people at risk of disease** who benefit from our development and delivery of new diagnostics, better ways of monitoring disease and novel treatments; and through our work improving the effectiveness of existing treatments and disseminating best practice through training and continuing professional development. Our research has significantly improved the management of adults and children with a wide range of neurological and mental health disorders and also the modification of risk factors in healthy people.
2. **Local, national and international healthcare providers** who see lower costs from our interventions reducing risk of disease, and whose referral patterns benefit from our expertise. Approximately half the patients seen at our partner hospitals come from outside Camden, facilitating the development of highly specialized clinical services co-located with academic excellence. This has enabled us to make advances in the investigation and treatment of rare disease (for example, neuromuscular disease) as well as targeting special user groups such as individuals with hearing impairment Our expertise allows rapid dissemination and translation of research findings into clinical practice but also establishes standards of prevention, investigation, diagnosis and treatment for these patients nationally and internationally.
3. **Industry and entrepreneurs** who partner with us to translate discovery into impact. Our expertise in neuroscience has led to major collaborations in early phase development of new molecules and the repurposing of existing medicines for new indications. We have also been very active in clinical trials where partnership with industry has led to the development of new medicines for neurological disease; and in work with SMEs in the development, implementation and dissemination of new forms of treatment for neurological and mental health disorders.
4. **Professions outside academia including school teachers** benefit from our extensive outreach and public engagement work, which includes the co-creation of structures like the Centre for Educational Neuroscience to effect a two-way dialogue with teaching professionals.
5. **Government Departments, non-governmental organisations and other policy makers** via membership of key committees influencing policy through direct interaction; through major input into National Institute for Health and Clinical Excellence (NICE) guidelines particularly with respect to mental health; and through advice provided to UK Government including Ministers of State, all party Parliamentary Groups, the Department of Business Innovation and Skills, House of Commons Select Committees and the Department of Health (DH).
6. **Media and cultural organisations** through raising awareness of our research findings among a broad range of audiences and through dialogue to inform our research priorities.

Our expertise across a large portfolio including neurodegenerative disease, sensory systems, mental health and behavioral change has allowed us to deliver measurable benefits in terms of the development of novel diagnostic technologies and therapies. It has also supported extensive collaborative work with a wide range of industries, major impacts on government, NGO and NHS policy, and extensive public engagement activities. We seek to influence both the health and the

wealth of the nation.

b. Approach to impact

UCL expects academic staff to seek out and actively pursue opportunities to engage directly with external organisations and key research users in ways that result in the direct transfer of expertise and knowledge to transform and benefit society. In UoA4, we have taken a multi-faceted approach to promoting such engagement with non-academic user groups. This has included: embedding such interactions in UoA4 strategy; active participation by senior academics in policy making, consultancy and industry collaboration; and a systematic approach to the dissemination of research findings to non-academic audiences. These activities are supported by UCL's knowledge transfer and enterprise support mechanisms, including the Faculty's Vice-Dean for Enterprise (**Moss**) and Faculty Knowledge Transfer champion (**Walsh**); a Knowledge Transfer and Enterprise Board delivers strategic leadership to several UoAs, including this one (chair **Rees**). We also capitalise on UCL-wide support, including the Translational Research Office (TRO), which delivers application and project management support for technology transfer, plus industrial partnership management; UCL Advances (our centre for entrepreneurship); UCL Business PLC (UCLB; UCL's technology transfer office); UCL Consultants Ltd (consultancy contracting services); the UCL Public Engagement Unit; and the UCL Media Relations office. Key performance indicators such as invention disclosures, technology transfer and industrial income, new industry-sponsored studentships sponsored by industry and consultancy contracts, are used within the UoA to measure and review the effectiveness and achievements of our approach. These activities are sustained through strategic consideration of how best to engage over time with non-academic users. Such engagement is managed in the staff appraisal system via the distribution of teaching and administrative load, and rewarded through explicit consideration in academic promotion.

i) Translating research for patient benefit

Our approach to delivering new diagnostics and therapeutics that alter the incidence and course of both common and rare human diseases is to seek, wherever possible, to co-localise a critical mass of researchers using key technologies with clinical research facilities and national NHS referral clinics. For example, our international strengths in neuroimaging technologies are co-localised in Queen Square with the National Hospital, which hosts major national clinics for Huntington's Disease (**Tabrizi**), Prion diseases (**Collinge**, **Mead**), Multiple Sclerosis (**Miller**, **Thompson**, **Cicarelli**), the Dementia Research Centre (**Rossor**, **Fox**) and MRC Neuromuscular Unit (**Hanna**, **Reilly**). The National Hospital also hosts major regional neurosurgical facilities, co-staffed by many UoA4 staff. Such co-location has led to the implementation in NHS patients of entirely new approaches, such as the use of deep brain stimulation in Parkinson's disease (**Hariz**, **Kennerley**, **Limousin**, **Yousry**, **Zrinzo**). Our work using MRI to predict the effects of surgical resections on individual patients (**Duncan**), supported by a Wellcome Trust/DoH Smart surgery £1.5M programme (with UoA11 **Ourselin**), is now in routine clinical use in the NHS.

Whilst impacts on the understanding and treatment of common neurological and mental health disorders allows us to reach many millions of patients, our approach equally emphasises impacts on rarer diseases and special populations with particular health needs. By exploiting the national reach of our NHS partners, who attract large numbers of specialist referrals, UoA4 staff have developed new diagnostic and treatment approaches including muscle channelopathies (**Hanna**), organ transplantation (**Birchall**, supported by £2.8M MRC DPFS) and new treatments in multiple sclerosis (**Miller**). We mirror this approach to impact in rarer neurological disease in other populations where it has, for example, led to work on new ways to assess and treat auditory processing disorder (**Rosen**), new tools to assess cognition and language in deaf people with neuropsychological disorders (**Woll**, **MacSweeney**), and novel interventions that improve patient health for children and adults with language impairments (**Bruce**, **Best**). By closely aligning and co-locating end-users, psychologists, allied health professionals and clinicians with UoA4 staff, we provide new clinical services for people who do not usually have access to such services, as exemplified by the national memory clinic for signers (**Woll**).

We enhance this strategic approach by leveraging and aligning investment from our NIHR Biomedical Research Centre (BRC) at UCL/UCLH (established since 2007, renewed in 2011 with total funding of £20M per annum over that period), and by capitalising on the opportunities presented by the inclusion of Neuroscience (led by **Wood**) among just four themes identified during a strategic refocus in 2012. In focusing on this theme, the BRC specifically seeks to invest in experimental medicine initiatives (diagnostics and first into human therapeutics) leading to

patient benefit in a short time frame. From 2012 a new Dementia NIHR Biomedical Research Unit (led by **Rossor**) has been awarded to UoA4 to deliver increased impact in neurodegenerative disease.

We have further maximised the opportunities to deliver impact by helping establish and develop the UCL TRO, which supports UoA4 staff in developing, securing and project managing milestone-driven technology transfer funding (MRC Developmental Pathway Funding Scheme, Wellcome Trust (WT) technology transfer, TSB and other sources). UCL now has the UK's largest MRC DPFS portfolio and the overall technology transfer funding under management at the TRO is in excess of £36M, £10.7M of which is directly associated with UoA4 staff as principal applicant. We focus on systematically exploiting the resources available to us at an institutional level and co-locating NHS facilities and UoA4 staff engaged in technology transfer. We have, for example, worked with UCLB in applying our novel technologies to pioneer online therapies for stroke patients (**Leff, Crinion**) and novel virtual-reality treatments for schizophrenia (**Leff**, £1.3M WT Technology Transfer award). Similarly, our basic research on machine learning applied to brain imaging (translating approaches we pioneered for the analysis of functional MRI images) has secured £0.4M Wellcome Trust Technology Transfer funding for predicting outcome following stroke; that funding is now in use in our NHS hyperacute stroke unit (**Nachev, Rees**).

Our approach seeks to directly engage and influence UCLP - our Academic Health Sciences Centre (AHSC) and one of five such accredited systems in the UK created during the census period. This, the largest of 13 UK Academic Health Science Networks, seeks to deliver population health gain to the 6 million people covered by Partners who now extend beyond UCL to include sixteen NHS Trusts, three additional universities, UCL's three NIHR Biomedical Research Centres and other key stakeholders. We have ensured the representation of key aspects of the UoA strategy in UCLP programmes, with UoA4 staff (**Fonagy**, **Thompson**) leading in our AHSC, AHSN and the newly awarded North Thames Collaboration for Leadership in Applied Health Research and Care (CLAHRC) award (£9M with £28M matching funds from NHS Trusts and HEIs), all of which include mental health as a key theme. This has led to Mental Health being designated an Integrated Programme by UCLP, linked with a £2M budget in 2013 and focused on delivering measurable improvements in quality and outcomes in mental health across UCLP.

Finally, we prioritise working with the voluntary sector to help us reach populations largely inaccessible to statutory service providers. For example, we partner with KidsCompany, a children's charity that offers assistance to 16,000 of London's most deprived children. UoA4 staff provide staff training, assist with evaluation and provide opportunities for collaboration in neuroscience (**Viding**, **McCrory**, **Fearon**, **Fonagy**). Our long term partner, the Anna Freud Centre, houses the Evidence Based Practice Unit (**Wolpert**, **Fugard**, **Deighton**) a national leader in the dissemination of best practice in child and adolescent mental health. UoA staff also provide scientific leadership (**Barker**, **Fonagy**) to a Camden mental health charity (Music and Change) focused on gang violence, which has won numerous social enterprise awards.

ii) Industry collaboration and economic engagement

A second key pathway to impact is our delivery of collaborative research (aligned, wherever possible, with our research strategy) resulting from successful efforts to foster and sustain productive working relationships with a broad range of commercial organisations. We use institutional resources such as UCLB to provide technical, legal and business planning advice on our development of spin out companies, industry partnerships and the research environment. For example, the research focus of the MRC Prion Unit (**Collinge**, **Mead**) on delivering an effective therapy for human prion diseases led to a major partnership with GSK and unprecedented access to their compound libraries for screening. More recently, the Leonard Wolfson Experimental Neurology Centre (a £20M investment from the Wolfson Foundation with additional training contribution of £1.25M from Eisai, based at the National Hospital) is a new centre that we have constructed for the conduct of first-in-human studies of novel therapies for the treatment of neurodegenerative diseases. [text removed for publication]. By making explicit commitment to enterprise in our estates and science strategy we succeeded in securing a multi-million pound investment in 2012 from the global pharmaceutical company Eisai to establish a unique, open innovation collaboration model, the Therapeutic Innovation Group (with leadership from **Thompson**). This group of UCL and Eisai scientists brings together complementary skills and resources to develop novel drug therapies. Our approach also prioritises work with smaller companies such as Canbex Therapeutics Ltd, where a 2013 £1.9M TSB award will enable the first

clinical studies of a novel drug for the treatment of spasticity in multiple sclerosis. This project builds on work conducted with a WT Translational Award leveraging additional investment by UCLB, again illustrating the emphasis within our approach on making full use, of institutional assets to deliver translational pipelines. This is not restricted to neurological disease. For example, the UCL Ear Institute (part of UoA4) works with Autifony, a spin-out biotech from GSK in which UCL is a founder shareholder, to deliver novel assets targeting voltage-gated ion channels in the treatment of hearing disorders.

As well as working directly with industry partners on collaborative projects, we actively promote commissioned research and analysis services. In the period 2008-2013 this has led to projects funded [text removed for publication]. As such, UoA4 income is now in excess of £15M since 2008. [text removed for publication]. We also encourage engagement beyond biopharmaceutical companies and this has been successful in engaging a much broader range of partners. For example, food companies Fresenius Kabi, Nutricia and Nestlé have used our research on fluid thickeners (**C. Smith**) to improve their products, and publisher Pearson produces and sells tests of frontal lobe function developed in UoA4 (**P. Burgess**).

To provide structure and support to UoA4 staff, we have exploited the institutional provision of dedicated Industrial Partnership Managers into the TRO by embedding them in UoA4 infrastructure (e.g. in the Ear Institute). This approach has already led to significant inward industry investment, including in a major new investment from Toyota in 2012, exploiting our research on cognitive load (**Lavie**) to deliver novel human-car interface design. Our approach has also promoted the use of UCLB to enable the disclosure of 43 new inventions, 4 proof-of-concept projects, 9 priority IP protection filings and 8 licensing deals within the census period.

Joint studentships and fellowships further help to engage industry users with our research. We have co-created and exploit institutional resources such as the Academic Careers Office (led by **Rees**), and have coordinated an institutional approach to our MRC/ BBSRC industrial CASE studentships that has led to a more than four-fold increase in UCL applications and awards since 2008. In turn, this has led to a wide range of collaborative PhD studentships with industry (66 in the assessment period), including the pharmaceutical (AstraZeneca, Eisai, GSK, Merck), manufacturing/technology (Magstim, Philips, Research in Motion, Toyota), retail (Dunnhumby), and media companies (Virgin Media) among many others. We are building links with other non-academic bodies such as the Ministry of Defence through shared studentships (**Lavie**, **Hamilton**). We encourage senior academics to seek and hold major awards enabling secondment to industry, such as a Royal Society Industry Professorship (**Walsh**). To consolidate these links with industry, we use UCL Consultants to help staff establish and maintain formal consultancy arrangements; specific examples of consultancies in new sectors beyond our pharmaceutical engagement between 2008-2013 include [text removed for publication]..

iii) Working with policy makers

We explicitly encourage UoA4 staff to contribute their research and expertise to a wide range of policy areas that have led to engagement with national and international policy making bodies. In so doing, our approach incorporates the use of institutional resources such as the Public Policy Unit, which has supported two public policy events (**Hassiottis**, **Sharot**), two parliamentary receptions (**Blakemore**, **Birchall**), and secondments to the Government Office for Science and the UCL Public Policy Commission on Climate Science. More broadly, research at UCL developed a 'screen and treat' model for dealing with mental health problems in the aftermath of disasters that has been incorporated into NHS London major incident plans, including those for the 2012 Olympics (**Brewin**). **Fonagy** is National Clinical Advisor for Children and Young People Improving Access to Psychological Therapies, has advised two ministers of State (Lamb, Burstow), and works with DH (including the Chief Medical Officer) and NHS Employers (McShane, Strathdee, Cornish) on issues of child mental health. **Blakemore** advises Rt Hon David Willetts MP, Minister for Universities and Science, and his colleagues at the Department for Business, Innovation and Skills, and **Collinge** has served on numerous Government advisory committees on prion disease at a national, European Union and international level. We also contribute to emerging areas of ethical concern: **Walsh**, for example was a member of the Nuffield Council on Bioethics Working Party, whose major 2012 review on novel neurotechnologies received global media coverage.

UoA4 staff are also encouraged to contribute to national health policy through NICE committees and clinical guideline groups. Since 2008, this has resulted in contributions to more than 23 NICE guidelines development initiatives on mental health. Thirteen (57%) of these

guidelines were led from this UoA (e.g. **Pilling**) and two chaired by UoA4 staff (**Cape**, **Fonagy**). Research carried out in UoA4 has made major contributions to a range of NICE guidelines including treatments for multiple sclerosis (**Miller**), needs assessment tools for older people (**Orrell**), quality standards for end of life care (**Jones**), evaluation of Parkinson's disease (**Schapira**), cognitive stimulation therapy in dementia (**Serpell**), and mentalization based therapy (**Fonagy**). **Pilling** is a member of the NICE Strategy Board.

Finally, UoA4 staff influence and engage policy makers by chairing major professional bodies including the Association of British Neurologists (**Rossor**), UK Faculty of Old Age Psychiatry (**Orrell**), the Cognitive Science Society (**Love**), the Joint Epilepsy Council (**Walker**), British Peripheral Nerve Society (**Reilly**), and British Neurosychiatry Association (**Joyce**). In addition ,we have Trusteeships on major charities including Epilepsy Research UK and the Guarantors of Brain, and serve on national grant awarding bodies including the MRC Neuroscience and Mental Health Board, Wellcome Trust and many others.

iv) Engagement with practitioners

We provide CPD for clinicians and researchers involved in neuroscience-associated healthcare, capitalizing on the opportunities that this presents to train specific groups to exploit our research. Our training of professionals in the UK and around the world, for example, has ensured that botulinum toxin has become part of the normal protocol for treating patients with common forms of urinary incontinences. Our evidence-based competences for delivering behavioural support in the English Stop Smoking Services (**Michie**) have led to assessment, certification and training of 4,000 practitioners in England.

To support and encourage such engagement, we provide (and exploit) resources such as CPD@PaLS, a unit within Psychology and Language Sciences (part of UoA4) that provides focused support for an extensive programme of CPD courses predominantly for speech and language therapists, teachers and psychologists, seeking either to acquire specific skills or to update their knowledge. The topics covered relate to both adults and children with speech and language difficulties, and reflect the wide range of our research interests, including adult and paediatric dysphagia, dyspraxia, CAMH, behavioural issues, supervision, counselling, language disorders and British Sign Language. As with our approach to translational research, we co-locate CPD activity targeting practitioners alongside our distinctive research strengths and addressing particular professional groups.

We engage large groups of professionals through targeted collaboration with our AHSN and other partners. This approach has resulted, for example, in the Clinical Psychology (PALS) programme becoming the largest in Europe (150 doctoral students) and we deliver CPD (workshops and 3 annual conferences) for its network of 1,000 North Thames clinical supervisors. Similarly, Educational Psychology offers 6-10 annual CPD update programmes for alumni and supervisors. The UCLP mental health high impact education programme has been responsible for training 2,000 acute and mental health trust NHS staff in dementia and we are currently engaged in an ambitious project to train 12,000 staff across the whole pathway - from primary care to specialist services - in dementia awareness. UoA staff working with the Anna Freud Centre (AFC) provide cutting-edge training for ~3,000 professionals who work with young people each year. This includes over 30 different courses covering a wide range of topics from mentalization (**Fonagy**) to evaluation methods (**Fugard**).

To enhance their accessibility and thereby extend the reach of non-academic engagement with them, we make our educational materials accessible online. For example, key competencies in all NICE approved psychological therapies have been drawn up (**Pilling**, **Roth**) and made available through a web portal. We also encourage the use of new approaches to CPD through internet-based learning. For example, during the census period we have provided resources to establish one of the world's largest and most comprehensive internet based learning resources, eBrain, through a partnership between UoA4 staff (led by **Shorvon**), the Joint Neurosciences Council, the European Federation of Neurological Societies and the European Neurological Society.

Our approach deliberately encourages key individuals to seek out entirely new audiences that may benefit from our research. For example, **Walsh** (a Royal Society Industry Professor) is applying principles of cognitive neuroscience to the challenges faced by sporting elites. New beneficiary groups include the English RFU, the English Hockey team, Team GB canoeing, the Royal Yachting Association and the England and Wales Cricket Board. Walsh was a scientific

advisor to the RFU's two day Talent Symposium, held at the Royal Society and is now a special advisor to the English Institute of Sport and Cognition Advisor to the GSK Human Performance Laboratory, a facility built to examine and promote elite performance.

v) Working with schools and education professionals

Our research on brain plasticity, cognitive enhancement and the determinants of common problems such as conduct disorder, dyslexia and dyscalculia has direct relevance to teachers in mainstream and specialist schools and we have encouraged strategic interactions in this area. UoA4 staff (e.g. **Rees**, **Blakemore**, **Frith**, **Maguire**) have been actively engaged in bidirectional knowledge transfer with schools and their staff (including the UCL Academy) through seminars, lectures and participation in curriculum design. Staff participate more widely by giving talks on the brain in schools and at school conferences, with over 60 such interactions recorded in the census period. Explicit engagement with a more specialised user community of teachers has already led to UoA4 academics developing joint research and therapy programmes with the Swiss Cottage School in Camden. With UoA4 support, our long term partner, the Anna Freud Centre, has obtained a Department for Education license to launch the first free school in the UK (possibly the world) based on a family therapy model, designed to serve both the educational and mental health needs of the most challenging young people.

To further encourage teacher-scientist interaction, we established the Centre for Educational Neuroscience in 2008, jointly with Birkbeck and the Institute of Education. The Centre (to which UoA4 staff including **MacSweeney**, **Blakemore** and **Rees** contribute active leadership) has already had a major impact on practitioners and policy makers through the delivery of CPD courses, seminars, lectures and direct influencing of Ministers. UoA staff have become known for their expertise in this area and trusted advisors to policy makers and Government. **Blakemore** in particular has provided oral advice to the Minister for Universities and Science (and colleagues at BIS) and written a 2008 UK Foresight report on adolescent brain development; **Rees** and **Blakemore** were also active contributors to the Royal Society Brain Waves project on *Neuroscience: Implications for Education and Lifelong Learning*.

vi) Public engagement and the media

In response to the significant interest in our research among both patients and the public, we have worked hard to develop and refine an approach ensuring the effective communication of new research findings to those audiences. To that end, we work proactively both with the UCL Media Relations office and the press offices of funding organisations (e.g. MRC, WT) to ensure that publication of important findings is linked to press releases and media contacts.

We record the extensive media coverage of UoA4 research in our institutional information systems: our staff appear weekly in print and broadcast media, and during the census period have been interviewed or featured on every major news and current affairs programme, among them R4 *Today*, BBC News 24, Sky News, Channel 4 News, BBC *Newsnight*, CNN, Al Jazeera) and all major print media (e.g. *Guardian, Independent, Times, Telegraph, NY Times, Reuters, Time, Wall Street Journal*). UoA4 staff were also personally featured on BBC R4's 'The Life Scientific' (**Scott**, **Frith**) and Desert Island Discs (**Frith**). These activities have helped us secure new funding specifically to engage external audiences (e.g. innovation seed funding, Wellcome Trust People award delivering the radio drama, video, performance and debate *Interior Traces*) and facilitated major public outreach events with non-academic external bodies. We support UoA4 staff (e.g. **Yasin**, **Linden**, **Scott**, **Diedrichsen**, **Haggard**) to participate in major public outreach events about brain science, such as those organised in collaboration with the British Library on topics including hearing (2010), movement control (2012), and creativity (2013). We deliberately coordinate our external engagement activity around major (inter)national events such as the annual DANA Brain Awareness week in March.

UCL has identified a series of Grand Challenges that foster cross-disciplinary expertise and public involvement, two of which (Global Health and Human Wellbeing) are specifically aligned with the Unit's research and in which UoA4 staff (e.g. **Michie**) play a leadership role. Public engagement activities also draw on the UCL Beacon Project, and staff are encouraged to apply for the funds available through the Beacon bursary scheme. UCL is one of six national Beacons for Public Engagement (and the only one in the capital) and our UoA has taken advantage of the increased funding (11 small bursaries and 3 innovation seed grants funded 2008-12) and engagement this brings to build explicit links to enhance the impact of our research. For example, the UCL Institute of Cognitive Neuroscience has set up a Public Activities Committee to engage

and coordinate activity within the Institute and ensure direct liaison, significantly increasing volume and coverage of UoA4 cognitive neuroscience research.

We seek to reach diverse audiences by regularly presenting major exhibits at the Royal Society Summer Science Exhibition (**Blakemore**, **Scott**), and by presenting our research every year for general audiences at the major scientific festivals including the Cheltenham Science Festival and Hay Festival of Literature, as well as for specialist audiences (e.g. BNA Christmas Symposium; **Chait**) and by giving major TED talks (**N. Burgess**, **Blakemore**) that have attracted over 500,000 views. We encourage staff to use social media to engage with the public, and both individual staff and Institutes within UoA4 are highly active on Twitter/Facebook. Our willingness to take and support novel approaches to engagement is evident in the high-profile contributions of UoA staff to the Bright Club series of research comedy events (**Scott**, **McAlpine**; plus **Fonagy** & Ruby Wax with Bethnal Green Workman's Club) organised by UCL's Public Engagement Unit. In addition, **Scott** established the annual YouTube "Brains On Film" competition (highlighted in 2011 in the Guardian) and won the 2012 Provost's Public Engagement Prize. Our staff produced the Bionic Ear Show (with Deafness Research UK) and Centrally Heated Knickers, both of which have engaged children and parents in understanding hearing and of deafness. We also seek to reach very specialised audiences with particular needs; for example the DCAL Roadshow toured the UK bringing results of research to members of the Deaf community in sign language.

c. Strategy and plans

This UoA has successfully delivered better outcomes for a wide range of patients with neurological, psychological and mental health disorders through participation in the rapid translation and dissemination of research findings to practice. We have, in many instances, contributed directly to closing the translational gap. We have achieved this through the commitment of our most successful scientists to work to address issues of global health and human wellbeing, in line with UCL strategy over the last decade. Our future strategy will build upon this, significantly increasing our activity now we have established the 'pull through' demonstrated above by creating 'pipelines' for knowledge transfer in many complementary areas. In particular, we plan to:

1. **Maintain and enhance these aspects of our impact strategy that have been successful**. Specifically, the co-location of a critical mass of clinical academics in an appropriate health-care environment with appropriate facilities and technology, which has been critical to our translational impact on health care. Major estates renewal is anticipated in the next census period and we will maintain a full commitment to translation through exploiting successful partnership working with our NIHR Biomedical Research Centres, Dementia Biomedical Research Unit, CLAHRC and the AHSN. For example, we will use the Leonard Wolfson Experimental Neurology Centre to drive forward new treatments for dementia, linking with Eisai and other industrial partners.
2. **Strengthen the wealth creation potential** of the UoA's scientific achievements. To do this we will now build in explicit space and facilities provision for 'incubators' and commercial interaction as part of our strategy for translation, and fully exploit institutional resources such as the TRO to build our already large technology transfer portfolio.
3. **Augment our use of institutional resources** such as UCLB to assist with technology transfer and UCL Consultants for consultancy. For example, we will appoint business development managers in core areas of our UoA strategy (see Environment template) and work closely with UCLB and the TRO to ensure that all of our translational 'pipelines' are closely scrutinised for their knowledge transfer opportunities and for potential industry partners, including SMEs and social enterprises. Interactions of UoA4 staff members with these support mechanisms and attendance on courses offered by UCL Advances will be documented to allow quantification of their year-by-year use, and thus provide an assessment of the use being made of them by UoA4 members.
4. **Embed impact as an important aim for every academic.** We will include sessions on technology and knowledge transfer in the induction of new UoA4 staff; make enterprise and knowledge transfer agenda items for staff meetings to ensure sustained engagement; require our academics to use institutional resources such as our institutional records system to document their own impact-related activity; and work with UCL to enhance the assessment and integration of knowledge transfer and enterprise activity in promotion and appraisal criteria. We will also incorporate enterprise training into our postgraduate training and tuition to ensure the sustainability of this approach in future generations of research leaders.

5. We will **build and facilitate interactions between academics and specific industrial partners** using newly established Faculty structures such as Knowledge Transfer Champions, our role in leading the School Enterprise & Knowledge Transfer Board and our Vice-Dean (Enterprise). We will develop outward facing 'one stop' web **portals to clarify the types of technology transfer activities** in which we wish to engage, based on Faculty strategy to provide a clear structure and framework. This will allow potential industrial partners to find out about the scope and extent of research within the Faculty and engage effectively with our academics. And we will conduct a minimum of two 'industry days' aligned with our Faculty strategy each year, inviting entrepreneurs and commercial partners to a showcase of our partnership opportunities. Building on the opportunistic consultancy work documented above, we will now work with UCL Consultants to highlight areas where we have critical mass (e.g. sensory systems, neurodegeneration) and establish strategic consultancy activity in these areas that specifically seeks to engage the community of end users.

At a UoA (Faculty) level, we will monitor our core set of five KPIs to evaluate the success of our strategy. The Knowledge Transfer and Enterprise Board (see above) will work with each Faculty to produce explicit goals for each KPI, aiming to at least double the overall volume and value of this enterprise related activity over the next assessment period. We will also ensure that our inclusive approach reaches under-represented groups; for example, we will incorporate such goals in our equality and diversity action plans.

d. Relationship to case studies

Reflecting our integrated approach to impact across the six areas highlighted in our approach, the common theme running through almost all the studies is our approach to **translation of research for patient benefit** by close working and co-location with clinicians. This has had impacts on a broad range of neurological (UCL04-BRO, UCL04-DUN, UCL04-FOL, UCL04-LEF, UCL04-MIL, UCL04-SMI), psychological (UCL04-BRE, UCL04-CUR, UCL04-FEA, UCL04-MIC) and mental health (UCL04-FON, UCL04-ORR, UCL04-PIL, UCL04-ROT) problems. We have also chosen cases to illustrate how our approach can lead to the discontinuation of ineffective treatments (UCL04-JOH), tackle less common diseases (UCL04-HAN) and be deployed at the end of life (UCL04-JON). We illustrate how our approach to patient benefit has led to the development, evaluation and deployment of new diagnostics transforming a broad range of disorders (UCL04-BUR, UCL04-COL, UCL04-FOX, UCL04-FRE, UCL04-HAN, UCL04-MAN, UCL04-SCH, UCL04-WAL, UCL04-WOO), but also the evaluation of healthy people (UCL04-PET).

Many of these cases illustrate how our approach to **industry collaboration** has enabled impact (e.g. UCL04-BUR, UCL04-COL, UCL04-DUN, UCL04-FOX, UCL04-JAT, UCL04-MIL, UCL04-SMI) or the creation of new enterprise opportunities (UCL04-LEF). Our emphasis on **working with practitioners** to deliver new treatments includes collaboration with educationalists (UCL04-FEA) and a wide range of medical and allied health professionals (UCL04-BRO, UCL04-FON, UCL04-FOL, UCL04-FRE, UCL04-HAN, UCL04-MAN, UCL04-MIC, UCL04-PIL, UCL04-ROT, UCL04-SCH). Our approach to **influencing policymakers** is illustrated by cases where our translation of research for patient benefit is either in the context of or has defined major public policy areas (UCL04-BRE, UCL04-COL, UCL04-CUR, UCL04-MIC, UCL04-PIL).

Finally, we illustrate how our approaches highlight not only important and common problems but also special user groups can benefit from our research (UCL04-WOL); how we can create significant impact through **public interest and engagement** (e.g. UCL04-BIR); and how our approach can lead to the creation of entirely new fields (UCL04-FRI) attracting worldwide interest and informing our approaches to knowledge transfer. At the same time many of our other case studies illustrate the **strong media interest and impact** that we can generate through our advances (e.g. UCL04-COL, UCL04-DUN, UCL04-HAN, UCL04-LEF, UCL04-WOO and others).