Institution: King's College London

Unit of Assessment: 4

a. Overview

The Institute of Psychiatry was founded nearly a hundred years ago as the "Maudsley Hospital Medical School" to pioneer research in mental and neurological disease. In the 1990s it took its present form as an integral part of **King's College London (KCL)** while continuing close links with the South London and Maudsley NHS Foundation Trust. KCL is a multi-faculty research-led institution ranked in the world's top 20 universities (QS rankings). It has more than 24,000 students (of whom some 10,000 are postgraduates) and 5 Health Schools, namely the School of Medicine, Biomedical Sciences, Dentistry, Nursing and Midwifery and **Institute of Psychiatry** (IoP).

The Institute's overarching aim is to discover knowledge that can help understand, prevent and treat mental and neurological disorders. To achieve this we are organised as **seven clinically focussed research areas**: Addictions; Developmental Psychiatry; Clinical and Basic Neurosciences; Mood, Anxiety and Personality Disorder; Dementia and Mental Health of Older Adults; Psychosis; Psychological Medicine; and a **cross-disciplinary group** which develops Enabling Technologies and Methodologies. Our clinical research groups link across to their NHS partners forming **integrated Clinical Academic Groups**. The Enabling Technologies and Methodologies Research Group innovates in the application of neuroimaging, biostatistics, health economics and genetics as well as bringing the unique patient perspective via our renowned **Service User Research Enterprise** (SURE). The breadth of our expertise allows us to integrate psychological, biological, social and health services perspectives and serve as Europe's leading destination for the training of the next generation of scientists in clinical psychology and psychiatric research – we train over 30 Academic Clinical Fellows and Academic Clinical Lecturers (psychiatrists and neurologists) and 370 post graduate research students including over 60 clinical psychology trainees in any year.

During this REF period we expanded our scientific infrastructure (especially in informatics and experimental medicine) and have **recruited 16 professors, 23 senior lecturers/readers and 13 lecturers** to lead and enhance our translational scientific strategy. We continue to focus on improving our science with new infrastructure (e.g. **Maurice Wohl Clinical Neurosciences Institute** opens 2014) and new partnerships (**Francis Crick Institute** for 2015) so we can further support our science from bench to bedside and our recent successful bid for an **NIHR Collaborative Leadership in Applied Health Research and Care (2013-2018)** will strengthen our translation from bedside to services.

We act as a "hub" for a number of national and international consortia hosting the: **NIHR Mental Health Research Network** coordinating centre (jointly with Manchester) which supports all mental health research in the NHS; the **Centre for Global Mental Health**, a collaborative initiative with the London School of Hygiene and Tropical Medicine, as well as leading several large scale European FP7 and Innovative Medicine Initiatives.

These scientific efforts are bearing fruit as we are now **2nd in the world** (we were 4th at RAE 2008) in terms of papers in the field of "Psychology and Psychiatry", second only to Harvard (source: InCites, Thomson Reuters, 2013; Science Watch, 2008).

b. Research strategy

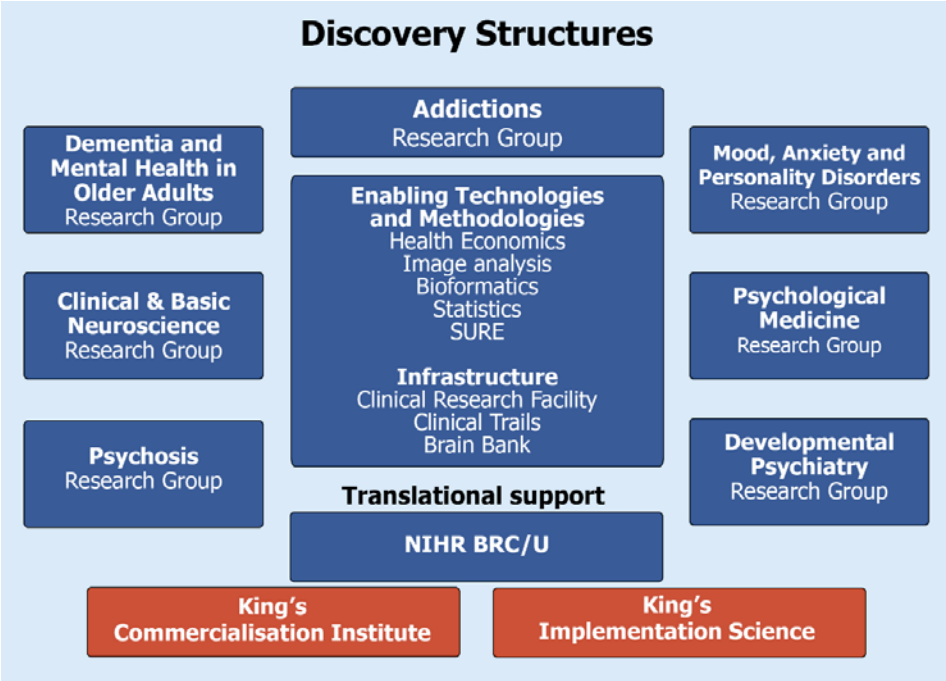
We focus on research that improves patient care and the needs of patients inform our research. Our clinical links aid this dynamic relationship and our investments in genetics, neuroimaging and cognitive behavioural therapy bring new tools to deliver these advances. This is exemplified by our discovery of the gene-environment linkages for cannabis and psychosis (Caspi, Moffit, Murray) which has changed public perception of cannabis; our use of brain imaging in the diagnosis of Alzheimer's Disease at an early stage (Lovestone, Simmons, Costafreda-Gonzalez) which is now clinically available; and the expansion of cognitive behaviour therapy into NICE guidance for a range of disorders and in the IAPT services (Garety, Kuipers, Clark to 2012).

Since RAE2008 we have undertaken **three major strategic initiatives** to increase the academic quality of our research and its impact on translation. This has entailed: the development of our **Academic Health Science Centre** with disease-focussed Clinical Academic Groups as the

delivery vehicle; a special emphasis on building **academic strengths in translational mechanisms** (clinical trials, health economics, improvement science); and a particular **prominence given to disseminating** our research academic (high impact papers and citations) as well as patient-public initiatives.

Integrating academic and clinical work to deliver translation

Since RAE 2008 we have been nominated as one of the nation's five Academic Health Science Centres – the **King's Health Partners (KHP)** - formed as a partnership between King's College London (the academic partner) and three NHS Foundation Trusts: Guy's and St Thomas's; King's College Hospital and the South London and Maudsley (SLaM). This designation led to two enhancements: First, we linked each of our clinical research groups with the respective hospital divisions of SLaM creating functional units called **Clinical Academic Groups**. Our close working relationship with SLaM is exemplified by £37m in NIHR grant funding to SLaM led by IoP staff, including 12 NIHR Applied Programmes and 11 NIHR Research for Patient Benefit Grants during the REF period. Second, forming closer links with 'acute' health trusts (Guy's and St Thomas's; King's College Hospital) has allowed us to focus on the large number of patients with co-morbid mental and physical health conditions (~20%-40% in different settings) - a key priority area for our Psychological Medicine Research Group.



Key partnerships and infrastructure established during the reporting period include:

- A major increase in BRC funding from £29.3m in 2007 to £51.1m in 2012 (now led by Matthew Hotopf and Emily Simonoff)
- A new NIHR Biomedical Research Unit in Dementia (BRU-D) - £4.5m (led by Clive Ballard)
- NIHR/Wellcome Trust Clinical Research Facility built with circa £20m (led by Peter Goadsby)
- Continued funding of our MRC Social, Genetic and Developmental Psychiatry Centre – £2.7m 2010-15 (led by Francesca Happe)
- A new NIHR Collaborative Leadership in Applied Health Research and Care - £18m 2013-18 (led by Graham Thornicroft)

Academic recruitment to support our translational ambitions

To capitalise on this infrastructure we have initiated a process of systematic academic recruitment to link our bench to bedside programmes.

Our **NIHR Biomedical Research Centre** and new NIHR Wellcome Trust **Clinical Research Facility** (CRF) uniquely focus on mental health, supporting our current and future experimental medicine and early translational research. This has allowed us to attract ***Prof. Peter Goadsby***, a world leader in the biology and therapeutics of headache (ex UCSF) to lead our CRF; and ***Prof.***

Allan Young, widely respected for his expertise in mood and bipolar disease therapeutics (ex British Columbia/Imperial). At the time of the last RAE we had limited access to PET imaging – in the intervening period we (KCL) have partnered with the MRC, UCL and Imperial to float a free-standing molecular imaging company (IMANOVA Imaging Sciences) and have recruited ***Prof. Frederico Turkheimer*** (ex Imperial) and ***Prof. Tony Gee*** (ex GSK, currently returned in the General Engineering Unit) to support radiochemistry and modelling associated with PET imaging.

To enhance translation from the bench to the bedside we have recruited ***Prof. Annalisa Pastore*** (ex MRC NIMR, structural biologist) who uses NMR and computational modelling to study protein misfolding and dysfunction in neurodegeneration. We have initiated **joint posts in statistical genetics** and shared infrastructure across KCL (e.g. ***Prof. Cathryn Lewis***) to support our basic genomic groups and have increased our integration of basic and translational psychology (***Prof. Tony Charman, Prof. Nick Tarrier, Prof. Paul Chadwick***) to develop and then perform first in man and large randomised trials of innovative psychological therapies.

In response to national priorities we have expanded our efforts in **Addictions research** with two new appointments: for smoking research ***Prof. Ann McNeill*** (ex Nottingham, Deputy Director of the UK Centre for Tobacco Control Studies) and ***Prof. Michael Lynskey*** (ex Washington University) for research on the interactive effects of genes and environments on drug use. We have capitalised on the possibilities provided by King's Health Partners for increased **research in the mental-physical interface** and recruited two expert health psychologists with complementary skills in randomised treatment trials (***Prof. Rona Moss-Morris***: ex Southampton) and pain management (***Prof. Lance McCracken***: ex Royal National Hospital for Rheumatic Diseases, Bath).

To formally evaluate the efficacy, effectiveness and economic feasibility of emerging research we host the UKCRC-registered **King's Clinical Trials Unit**, directed by IoP's Head of Biostatistics (***Prof. Andrew Pickles***, recruited in 2010), the **KHP Clinical Trials Office** and the **Centre for Economics in Mental and Physical Health** (McCrone, Knapp) now celebrating its 20th anniversary.

Finally, we are fully aware that a balanced exploration of mental health and illness includes **qualitative analysis** that aids generalisation of our scientific results and enhances our prospects of impact, therefore, we recruited ***Prof. Susan Lea*** (ex Plymouth) and ***Dr Jo Neale*** (ex Oxford Brooks). To cement our leadership and support our translation into policy, KCL recently (2011) recruited ***Prof. Nik Rose*** (ex LSE) to establish a Department of Social Science, Health and Medicine at KCL and we secured the part-time appointment of ***Prof. Wayne Hall*** (ex University of Queensland) to increase our expertise in the social and ethical implications of our research.

At the other end of the translational pathway we lead the newly formed **King's Improvement Science Centre** (KIS: Led by Graham Thornicroft) within KCL. This "implementation science" group brings together scientific staff, patients, managers and clinicians to achieve service improvement. Using purpose-built Clinical Implementation Teams, KIS will identify difficult clinical challenges in the NHS to make measurable improvements in patient experience and outcomes by using research results and implementation science methods. This work is supported by the recruitment of ***Prof. Len Bowers*** an expert in nursing and services research (ex City University). The KIS, which started as an academic initiative in 2012, has been successful in securing external funding as the new Collaboration for Leadership in Applied Health Science Centre starting in 2014.

Different kinds of science translate into impact at different rates and so we have balanced our investments. We maintain our longer term research, such as cohorts, for up to 50 years, molecular pathogenesis and drug discovery for about 20 years and RCTs are supported for 7 years from research idea to publication. However, our combination of infrastructure and academic expertise gives us an advantage to convert our findings into impact faster. We cite two examples here both achieved since RAE2008. Chris Shaw and Caroline Vance **identified genetic mutations** (TARDP and FUS) in familial and sporadic motor neuron disease (Caroline Vance et al, Science 2009) which are now rolled-out into **clinical diagnostic services internationally** and used to create many cellular and animal models of disease. Second, the RIOTT trial was the very first RCT to incorporate laboratory bio-assay to **measure clinical benefit with supervised heroin treatment for treatment-refractory chronic heroin addicts** and demonstrated cost-effectiveness and reduced street heroin use (John Strang, Lancet, 2010; Sarah Byford, BJPsych). Since 2012 this high-intensity low-volume treatment is recommended by Department of Health as an evidence-based treatment for patients with otherwise untreatable chronic heroin addiction.

Academic and Public Dissemination of Research

Since the 2008 RAE we have made a special effort to direct our scientists, especially early career researchers, to publish selectively and to target higher impact journals. This has led to a number of high profile publications: Nature (16), Science (6), Nature Neuroscience (12), Nature Genetics (42), JAMA Psychiatry (67), American Journal of Psychiatry (60) New England Journal of Medicine (2), PNAS (37), Molecular Psychiatry (87), BMJ (60), Lancet (53), Social Science and Medicine (8) and Journal of Abnormal Psychology (24). We have 38 of the 100 most highly cited UK researchers (ROAMER consortium report 2013) and 12 of the world's most highly cited researchers (source: Thompson Reuter Web of Knowledge). A recent RAND report commissioned by the Department of Health (England) found that King's produces 20% of the most highly cited papers globally in the field of Psychiatry and 7% in Dementia. Since RAE2008 this has improved our position from 4th to 2nd in overall publications in the field of Psychiatry and Psychology in the world (second to Harvard) and from 4th to 3rd in total citations (next to Harvard and Columbia University).

We have made special efforts to ensure that our work is informed by, involves and disseminates to patients and the public. This guiding philosophy is converted to action through the Service User Research Enterprise (SURE: led jointly by Til Wykes and Diana Rose) – the largest unit of its kind which brings together service users and academics in co-designing research. This produced demonstrable changes in our research – we are one of the few NIHR BRC/BRUs to explicitly embed a Patient and Carer Participation Research Theme; we host the national FAST-r service (Feasibility And Support to Timely recruitment for Research: Lead Tom Craig) which provides a free, 7-day-turnaround feasibility-assessment service for UK researchers with feedback on design, conduct and information and consent forms from a service users' perspective.

Increasing the understanding of mental health through public dissemination is critical as we have shown that ignorance and stigma are major barriers to seeking treatment (Lancet, 2009). We provided the academic input to MIND and Rethink Mental Illness on the largest-ever, national anti-stigma programme: Time to Change. Our scientists promote mental health research in newspapers, TV, radio and YouTube and we have an active training collaboration with the Science Media Centre to highlight our scientific advances and improve optimism about mental ill health. We engage locally through our annual series of the very popular public Maudsley debates on issues such as child protection ('Prudent or Paranoid') and assisted suicide ('Care or Killing') which attract full houses and hundreds of downloads (>600 for the June 2013 debate). We hold well-attended open days on Alzheimer's research and this year's SGDP celebration of 100 years of the MRC attracted nearly 500 participants including local school children. Our website 'Making a Difference' celebrates how our research led to direct benefits to mental health and wellbeing (>10,000 downloads per year). The newly opened (2013) 16,000 sqft Maudsley Learning Centre, ORTUS, provides access to a state-of-the-art learning environment which will further enhance our research dissemination opportunities.

Research plans – key objectives and activities over the next 5 years

The IoP represents an effective balance of psychiatrists, neurologists and psychologists and other basic scientists but over the next five years we will **grow our psychology research and consolidate our neurosciences strengths.**

We will grow in psychology by **recruiting experimental psychology research leaders to launch a new undergraduate psychology degree**. We expect to recruit 16 new academic members (from Lecturer to Professor) to deliver an innovative programme starting 2015 (the innovative BPS-approved curriculum will focus on Problem Based Learning, greater links to neuroscience, extensive immersion in research). These leaders will bring additional expertise in psychological models, information technologies and computational methods to support the next generation of mental health research.

Neuroscience at King's has been managed under two different Schools – the IoP and the School of Biomedical Sciences. As a part of an academic-led strategic reorganisation KCL will **bring all of its neuroscience research together within the Institute.** This will allow further integration of basic and clinical neuroscience bringing to the IoP two major basic neuroscience departments: the MRC Centre for Developmental Neurobiology (nearly 20 basic neuroscience PIs) and the Wolfson Centre for Age Related Disorders (focussing on dementia, neurodegeneration and drug discovery, with nearly 25 neuroscience PIs). To accommodate this expansion, we will be opening a brand-new neurosciences building (stand alone, basic science and animal facility) called

the Maurice Wohl Clinical Neurosciences Institute (more on this in section d). Finally, to expand our interactions with other basic biomedical sciences, we will be an integral partner (via KCL subscription) of the new Francis Crick Institute (2015, details in section d). Collectively, these moves in neuroscience mean we will offer an integrated discovery platform that embraces basic and clinical neuroscientists and clinicians spanning gene discovery to behaviour.

To reflect the expanded breadth, the IoP will be renamed the **Institute of Psychiatry, Psychology and Neuroscience (IoPPN),** starting August 2014.

In the next decade there will be an electronic revolution in mental health care provision. Working with SLaM we have pioneered the use of mental health electronic medical records for research - the **Clinical Research Interactive Search** (CRIS) system - allowing us to interrogate the large scale data set of 220,000 case records, of which nearly 30,000 are "live" – updated every night. Over the next five years we will link these rich clinical data to biological, educational (National Pupils Database) and other clinical data (e.g. Hospital Episode Statistics, ONS mortality). A major focus for the year ahead will be working with our partner NHS Trusts on the application of D-CRIS (CRIS for Dementia) to facilitate biomarker, stratified medicines and outcomes effectiveness research in Dementia.

We see the IT revolution as not just a data-mining exercise, but something that provides access to new perspectives. Supported by service-user researchers we have developed a new portal **myhealthlocker** (funded by NIHR BRC https://www.myhealthlockerlondon.nhs.uk/) which allows mental health service users to access their case records and to input into them, thus increasing the richness of personal data available for research and clinical care. Thus we are able to use myhealthlocker to identify a large pool of participants who have given consent to be contacted for trials and we get their patient-reported outcomes to inform naturalistic outcomes. We have prepared for this **informatics revolution by recruiting** fifteen staff members (e.g. Richard Dobson, Richard Hayes) within the BRC and have extended our PhD programme (6 new students) in this area to train the next generation of graduates in this fast-moving field.

Two recent developments will support our translational research agenda. KHP, with St George's NHS Healthcare Trust and other partners, developed the new **Academic Health Science Network (AHSN) for South London** (£4.4m, 2013-2018; Mental Health component led by Prof. Colin Drummond (alcohol misuse) and Dr Hugo De Waal (dementia)). We also led a successful bid for an **NIHR Collaboration for Leadership in Applied Research and Care (CLAHRC)** (led by Prof. Graham Thornicroft, £18m, 2013-2018). Together these offer opportunities to pull our research through the translational pipeline, to build our implementation science in a wider range of services to drive lasting improvements in patient care.

Since 2008 we have focussed on developing our translational abilities in a systematic and sustained way. With the help of our seven clinically focussed research groups and the strength of our enabling technologies and methodologies we hope not only to consolidate our current academic position but aim to be known as *the world leading centre* for bench-to-services translation of discoveries in psychology, psychiatry and neurosciences.

Research Groups - Achievements, objectives and future plans

All grant values are for KCL research awards over the REF period excluding capital awards and income remaining with our NHS partners.

Enabling Technologies & Methodologies (Awards £42.1: 51PIs)

This Group spans several key technologies: Neuroimaging, Biostatistics, Health Economics, Bioinformatics and Service User Defined Methodology.

Our **Neuroimaging strategy** is focused on improving our understanding of the biology of central nervous system disorders (lead: Steve Williams). Our group provides expertise in MR physics (e.g. Gareth Barker, Fernando Zelaya, Andy Simmons), image analysis (e.g. Federico Turkheimer, Mick Brammer), clinical applications (e.g. Mitul Mehta, Matt Howard) as well as preclinical imaging (e.g. Steve Williams, Po Wah-So). Our neuroimaging data are combined with other measures including genetics, -omics, clinical history and cognitive data for integrative statistical analysis. This is achieved using a suite of novel machine learning approaches we have developed (Ecker: PNAS, 2013) which are fast becoming a critical element of contemporary image analysis. This whole effort is supported by major public funders (EU, MRC and Wellcome Trust) as well as industrial collaboration with medical engineering (e.g. GE Healthcare), specialist CROs

(e.g. IXICO and P1Vital) and pharmaceutical companies (e.g. J&J, Pfizer, Lilly and Roche) to ensure we maximise impact within the shortest timeframe. Strategic investment in a new **Clinical Research Facility** with state-of-the-art 3T MR imaging equipment together with our partnership in IMANOVA (Eugenii Rabiner, Frederico Turkheimer, Qi Guo) and St Thomas' Clinical PET Centre (Tony Gee) brings a critical mass of expertise for target validation (Howes: Brain, 2013) and optimal dosing of new treatments (Politis: Neurology, 2010). We have over 20 PIs and >£40M of external funding over this REF period (e.g. EUAIMS, NEWMEDS, PSYSCAN and Wellcome Trust Medical Engineering Centre)

These efforts are delivering clinically applicable findings: we led the development of MRI analysis as an early imaging diagnostic-aid for Alzheimer's disease integrated into routine care (Arch Gen Psychiatry 2010) and the application of machine learning methods in neuroimaging to discriminate autism from other developmental disorders (e.g. J. Neuroscience, 2010). Our multivariate statistical approaches have also been applied to discriminate between subtypes of Parkinsonian patients (Annals of Applied Stats, 2012) and the central action of different psychotropic agents (Neuroimage 2012) as well as the prediction of treatment response in depression (Biol Psychiatry, 2008). These efforts have resulted in >30 high profile papers specifically dedicated to pattern recognition as well as substantial (>£10m) grant support from EU (NEWMEDS, PSYSCAN), MRC (DPFS) and Industry (Roche) to apply these methods in psychosis, pain and mood disorders.

Biostatistics and Health Economics has an extensive network of applied and methodological collaborations both within and beyond the IoP (leads: Pickles, McCrone, Knapp). We continue to develop our analyses to detect therapeutic mechanisms through on-going work in complex, latent variable modelling. Our **UKCRC-registered Clinical Trials Unit** undertakes some of the UK's most influential therapeutic studies in mental health with growing expertise in early phase and experimental medicine methods. Our **health economics** expertise allows assessment of cost-effectiveness in both early and late phase trials (e.g. BJPsych, 2013, Lancet, 2013) and we continue to develop innovative cost measures with vital instruments that can guide the NHS and NICE decision making. For instance, the measurement of specific inpatient costs per-individual rather than per-inpatient-unit captured in the CITRINE measure (Epidem. Psych Sciences, 2012).

We are addressing the opportunities of "Big Data" by growing a **Bioinformatics** group from zero to 15 staff members in 3 years. This is a mix of postdoctoral researchers/analysts, computer programmers, database developers, systems administration and an additional 6 PhD students, with expertise in artificial intelligence, statistical genetics, mathematics, systems biology and text mining (Lead: Matthew Hotopf). The team developed a High Performance Computing infrastructure within the secure SLaM NHS environment for rapid text-mining of all patient records and linkage to -omics datasets. These data mining exercises have helped us develop a model of treatment response for anti-depressants (J Affective Dis, 2009) and our developmental work led to a current €7.6m EU grant (FP7 CRESTAR) and the IMI EU European Medical Information Framework (EMIF total: €48m) with Janssen as the industry lead.

The emphasis on "big data" includes consideration of **genetics and genomics** which are embedded within our NIHR BRC for Mental Health, the Molecular Genetic Laboratory and Clinical Neuroscience (see section d). Genetic analyses accompany phenotypic descriptions and environmental factors across clinical research groups to enable linkage discovery, such as that between cannabis and psychosis as well as clarifying risk behaviour and addictions. IoP geneticists (Al-Chalabi, Breen, Craig, Lewis, O'Reilly, McGuffin, Murray, Pal, Powell, Plomin, Shaw and Schumann) have contributed expertise and datasets to a dozen consortia (AGP, Alcogen, CHIC, EAGLE, EGG, ENIGMA, IMAGEN, PGC, SLIC, SSGAC, TGC, GENAROAD and WTCCC2) spanning disorders from language to psychosis with authorship on numerous papers including 4 in Nature and 42 in Nature Genetics.

Our renowned **Service User Research Enterprise** (SURE) undertakes evaluations of services and treatments from the perspective of people with mental health problems and their carers (co-leads: D. Rose, Wykes). SURE has increased service user involvement in all research at the IoP and developed specific participatory methods which have been adopted by numerous other research groups. These include assessments of inpatient care that have been used by more than 2000 staff and service users in the NHS since 2011.

Future plans: Our improved **neuroimaging** measures will inform diagnosis and prediction of treatment response using structure (e.g. myelin mapping and tractography: EU IMI grant £2M),

function (e.g. fMRI), metabolism (e.g. PET and MRS: MRC £4.9m) and physiology (e.g. ASL for cerebral perfusion: Roche £0.5m). On-going support for both research (Wellcome Trust £1.5m) and development (NIHR £2.5m) will ensure rapid translation to the clinic.

Our group continues interactions across research groups such as the planned collaborations with psychometricians, statisticians and health economists to develop a medication side effects measure using service user methods (£350k from the BRC and charity). When this measure is placed in the patient portal (**myhealthlocker**) clinicians will be able to monitor and respond to side-effects in near real-time.

Our **bioinformatics team** developed a mechanism for automatically emailing clinical teams about potentially eligible research participants and will roll this out across the entire Trust in the next two years. We will aid clinical decisions through work on Adverse Drug Events using multi-agent computer based systems (BRC/U, Maudsley and GSTT charities). **Biostatisticians** will extend methods in causal analysis for stratified medicine (Landau: MRC £432k), and cross-measure calibration (Pickles: MRC £411k), key for developmental research and epidemiology of pooled studies.

In **genetics** our established biobanking initiative (NIHR BRC £5m) will collect >50,000 participants' samples in the next 5 years which will underlie future genomic studies. We will increase the power of GWAS and polygenic risk prediction in conducting experimental medicine and clinical trial studies (NIHR BRC £200k). Proof-of-principle projects for pharmacogenetic prediction and stratified medicine are underway in depression (NEWMEDS), schizophrenia (MRC STRATA) and experimental medicine studies are in progress or planned for first episode psychosis (MRC, Wellcome Trust), bipolar disorder (NIH) and response to antipsychotic medication (clozapine: FP7 CRESTAR, NIHR IMPACT) and mood stabilisers (lithium, sodium valproate).

The potential application of these approaches as stratified medicine will be supported by the appointment of a new **health economist (Leonardo Koeser)** to develop cost-effectiveness and cost-utility analyses and health economists will also assess cost-effectiveness of using biomarkers of response to antipsychotic medication (MRC STRATA, EU CRESTAR) and develop mental health specific QALY measures (ESRC). We will investigate the benefit of combining health outcomes linked to social media data (EU funded post doc).

Addictions (Lead: John Strang: Awards £2.28m; 17 PIs)

Our research strategy spans three main areas - alcohol, drugs of abuse and smoking - enabled by access to special clinical services (e.g. smokers' clinic) as well as being integrated into substance abuse services across south London (5516 unique patients in 2013 in SLaM).

A key goal is the **identification of psychological and bio-markers for addiction** particularly for reinforcement-related/addiction disorders using large cohorts. For instance, Gunter Schumann leads the largest and most comprehensively characterized longitudinal gene x neuroimaging cohort worldwide - **IMAGEN**. This EU collaboration is EC and MRC-funded and allows testing of genetic influences such as the recent finding that Ras-GRF2 influences alcohol-induced reinforcement by controlling mesolimbic dopamine release (PNAS, 2012) and that greater risk-taking and deficient reward responses in the ventral striatum are associated with problematic substance abuse (Am J Psychiatry, 2012).

Environmental and socioeconomic factors are used in organisational and educational interventions that reduce harm and improve recovery. In this REF period Patricia Conrod tested interventions for at-risk adolescents and demonstrated, for the first time, markedly **reduced rates of initiation and persistence of substance use amongst adolescents** over 3 years, with a therapist-administered (PREVENTURE) and teacher-delivered (ADVENTURE) therapy. John Strang demonstrated the effectiveness (Lancet, 2010) and cost effectiveness (BJPsych, 2013) of novel supervised heroin treatment for severe chronic heroin addicts previously considered treatment unresponsive. He is clinical lead of the first RCT of family and peer provision of home-based emergency naloxone injection, measuring **reduced numbers of overdose death.** This has triggered government initiatives for wider naloxone availability (J.Urban Health 2013). Gay Sutherland and John Stapleton drew on expertise in our special smokers' clinic to identify **the benefit of varenicline** (Addiction, 2008). Our results feed through to policy with John Marsden's measures to quantify the benefit of addiction treatment now used by the National Treatment Drug Monitoring System (Lancet, 2009) and new data analytical tools (OD4 [Overdose Deaths per Daily Dispensed Dose]) to gauge lives saved from the policy initiatives (BMJ, 2010).

Future plans include a focussed effort to tackle smoking in the mentally ill (Ann McNeill and Jo Neale) and strengthening individual interventions through new analyses of gene-environment interactions supported by our new appointment of Michael Lynskey. Together with SURE we are extending work on user-valued measures of recovery - an area of much interest to service users and policy makers (BRC). Colin Drummond will carry out the first cluster RCT to test different screening and brief intervention strategies to reduce hazardous or harmful drinking (NIHR £2.0m). New large patient cohorts followed from drug-free treatment centres are being developed (e.g. TRACER: Public Health England) to improve the understanding of recovery processes.

Developmental Psychiatry (Lead: Emily Simonoff: Awards £50.7m: 48 PIs)
75% of adult mental illness starts before age 18 so effective child pharmacological and psychological interventions could reduce much of the disease burden. Our research is notable for national and international collaboration including leading EU collaborative projects, e.g. EU-COST and EU AIMS for autism and EU MATRICs for ADHD and impulsive disorders.

We combine **genetic strategies** such as genome-wide association and copy number variants with psychosocial measures to understand gene-environment interplay in developmental pathways affecting onset, change and lifelong course in phenotypes.The new science of 'therapygenetics' is spearheaded by Thalia Eley's studies on **genetic predictors of CBT treatment response for childhood anxiety** (Molecular Psychiatry, 2012).

Large national, longitudinal population twin cohorts examine risk, resilience, coping and compensation factors and how they predict such different outcomes among people with the same disorder. For example, using the Twins Early Development Study (TEDS) Robert Plomin mapped for the first time geographic variation in genetic and environmental contributions to a wide range of traits - with **important implications for detecting environmental exposures that may interact with genetic influences** (Mol Psych, 2012). In a unique longitudinal population cohort with autism, Profs Simonoff, Pickles, Charman and Happe showed that 70% of young people with autism have additional, persistent, mental disorders (J Amer Acad Child Adol. Psychiatry 2008; J Child Psychol & Psych; 2013). In a longitudinal (general population) cohort Andrea Danese discovered that **maltreated children develop systemic inflammation** explaining, in part, the pathway connecting childhood stress to cardiovascular disease (Arch. Gen Psych 2008*,* Mol Psych, 2011). Pioneering work in epigenetics by Jonathan Mill showed that **schizophrenia and bipolar disorder are associated with changes in the methylation of DNA** (Am J Human Genetics, 2008)**, and conducted** the first systematic analysis of **epigenetic differences** between genetically-identical monozygotic twins discordant for psychosis (Human Mol Genetics, 2011).

We have assembled the largest international database on routine prescribing (and biomarkers) in autism and the world's largest child psychiatric structured-interview database linked to clinical records and this revealed a novel role for glutamate/GABA balance (Transl. Psych, 2013) and serotonin in neurodevelopmental disorders (autism and ADHD). This finding has been validated in animal models, stem cells and in the human, and is now used in drug discovery. We patented and are licensing our first tranche of biomarkers (US Patent Application US 13/981 "Method of Diagnosing Autism Spectrum Disorder").

Our **developmental neuroimaging** allows measurement of infant brain myelination and response to emotional cues. This helped Blasi, Simmons, Brammer, Ecker and Murphy to show that **abnormalities in brain function can be identified in infants at risk for developing autism** (J. Neuroscience, 2010; Current Biology 2011) and Eileen Daly to demonstrate that **some of these abnormalities can be reversed by reducing brain serotonin in adults (**Arch Gen Psychiatry, 2012**).**

Our **treatment** research spans early interventions (e.g. milder oppositional behaviour) to severe problems (anxiety disorders, deliberate self-harm) and treatment-resistance (e.g. OCD not responding to first-line interventions). Since 2008 we have developed, evaluated and disseminated internationally, novel forms of CBT that are developmentally appropriate and tailored to the varying anxiety disorders (e.g. J Abnl Child Psychol, 2008).

Over the next five years with Sackler Foundation funding we will establish the UK's largest translational research centre focused on bringing treatments for neurodevelopmental disorders from 'the bench to the bedside'. Through new links forged with Professor David Edwards (Director of the MRC-funded Centre for the Developing Brain) we initiated the first population-based longitudinal study of infants at risk for a variety of neurodevelopmental and neuropsychiatric

disorders (including autism, ADHD, conduct disorder, psychosis, and intellectual disability). These studies are the first of their kind to follow individuals from 22 weeks gestation to late childhood and adolescence using imaging to directly measure brain development. The aim is to identify disorder-specific (and shared) genetic and environmental factors, and brain mechanisms, that moderate individual risk of developing these disorders. In 2013 this initiative, led by Prof. Edwards, attracted large scale funding from the EU (€30 million), NIH ($12 million USD) and the Sackler Foundation (£5 million).

Clinical and Basic Neurosciences (Lead: Mark Richardson: Awards £28.9m: 36 PIs)
Our strategy focusses on common neurological, psychiatric and neurodevelopmental disorders with significant socioeconomic impact including stroke (Lalit Kalra, Michael O'Sullivan), epilepsy (Mark Richardson), headache (Peter Goadsby), neurodegeneration (particularly MND; Chris Shaw, Ammar Al-Chalabi, Chris Miller, Frank Hirth), Huntington's Disease (Noel Buckley), neurodevelopmental disorders (Nick Bray, Deepak Srivastava, Jack Price) and Parkinsonian Syndromes (Kallol Ray Chaudhuri, Richard Brown).

Many brain disorders share common mechanisms, including defects in neurogenesis, neuronal migration, organelle transport, synaptic function and miswiring. We deploy a diverse suite of experimental approaches to understand these key mechanisms at molecular, cellular, circuit and behavioural levels. Our group has the advantage of access to **large and well-phenotyped patient cohorts** including some of the largest UK clinics in stroke, epilepsy and MND, which directly feed our research activity, via clinical specimen collection, neuroimaging, invasive brain monitoring and neurosurgery. We host the **MRC London Neurodegenerative Diseases Brain Bank**, one of the largest Brain Banks in the UK with >2000 brains, which underpins our work in MND, Alzheimer's Disease and Frontotemporal Dementia (Brain, 2011). This same patient resource is an invaluable basis for deriving induced pluripotent stem cells (iPSCs) from specific disease backgrounds; these iPSC 'disease in a dish' models have immense potential for mechanistic understanding of disease aetiology, target and biomarker discovery and therapeutic targets in neurodevelopmental (Psychopharm, 2013) and neurodegenerative disorders (PNAS, 2013). We develop stem cell approaches to regenerative medicine (Cell Stem Cell. 2009) and carry out basic mechanistic understanding of molecular pathways in neural stem cells using a combination of transcriptomics and epigenomics to identify their potential for deployment in regenerative medicine. Many brain disorders are dysfunctions of neuronal circuits and we combine multi-photon microscopy with viral tracers to map the circuits involved, for example in sleep regulation in mice (Neuron, 2012).

Our cellular and animal work is a long term investment to identify novel treatment targets. This optimism was boosted when Chris Miller, Diane Hanger and Wendy Noble **identified novel potential targets for the treatment of neurodegenerative disorders,** and identified existing drugs (anti-cancer drugs and antibiotics) that could be re-purposed for the treatment of Alzheimer's disease (FASEB J., 2009; Front Psych, 2010; Oncogene, 2012). Noel Buckley also used gene delivery of a mutant transcriptional regulator to partially **reverse some of the symptoms of Huntington's Disease** in a mouse model (Gene Ther. 2013).

We use near-infrared spectroscopy in combination with MRI to allow greater temporal resolution of brain activity in neurological patients and are pioneering methods to identify dynamic pathways and networks (molecules to whole organ). This computational approach **revealed abnormalities of brain networks in epilepsy and how these change dynamically from seizure onset to offset** (O'Muircheartaigh, Richardson; Brain, 2012). Close clinical collaboration with the Evelina Children's Hospital neurology service helped Heinz Jungbluth **identify mutations in KIAA1632 in Vici syndrome** (Nature Genetics, 2013).

For Parkinson's Disease Ray Chaudhuri has revealed the critical importance of **non-motor (i.e. cognitive and affective) symptoms,** developed the scales to measure them and then demonstrated that rotigotine and intrajejunal levodopa infusion improved them (Mov Dis 2011). Our psychologists identify cognitive emotional processes as targets for treatment with Robin Morris detailing their effect on **awareness of cognitive impairment in Alzheimer's disease** (Neuropsychologia, 2012) and Richard Brown reporting the previously **unrecognised significance of cognitive impairment** in the largest study to date of Multiple Systems Atrophy (Brain, 2010). At the service-development end Leone Ridsdale's work on **the costs of headache in primary care** led to a GP-led service model that delivers high patient satisfaction at lower cost and is now recommended by the Royal College of Physicians and NICE (J Headache Pain, 2011).

Future plans: The new partnership in the **Francis Crick Institute** (see Section d) and consolidation of all KCL neuroscience in the **IoPPN, will be a major boost to our neuroscience research.** More specifically we are expanding stem cell research with Jack Price developing iPSC models of schizophrenia and autism spectrum disorders (funded by EU-AIMS and StemBANCC IMIs). We will combine patient data (DTI, fMRI, EEG) with computational dynamic modelling to create in silico models of brain dynamics giving rise to (i) epileptic seizures (MRC £2.5m) and (ii) molecular and cellular pathways in MND (FP7 Euro-MOTOR: Al-Chalabi, Shaw). Our clinical trials continue with NIHR funded RCTs of self-management in epilepsy (HTA £1.8m) and minocycline for Alzheimer's (MRC/EME £1.8m).

Mood, Anxiety & Personality Disorder (Allan Young, Andre Tylee: Awards £16.5m; 23 PIs) Our research group focusses on understanding and developing treatments for mood, anxiety and personality disorders. To identify the **predictors** of psychological and drug treatment response, we combine different clinical, brain-imaging and laboratory methods such as the prednisone suppression test (BJPsych, 2009); inflammatory markers (J Affect Disord, 2013), the expression of a stress-related genes (Neuropsychopharmacology, 2013) and psycho-social factors (such as childhood trauma; (JAMA Psychiatry, 2008). In molecular psychiatry research Carmine Pariante described the neuronal mechanisms underlying the effects of depression and of antidepressants on human neurogenesis (Mol Psychiatry et al., 2011; PNAS, 2013). We direct a major programme of experimental medicine and have shown that **mifepristone** (a progesterone receptor antagonist) **benefits cognition in Bipolar Disorder** (Biol Psychiatry, 2012) and that Bipolar Disorder is associated with the rs6971 polymorphism in the gene encoding 18kDa Translocator Protein (TSPO), thus setting the scene for future translational studies (Psychoneuroendocrinology, 2013). In the largest pharmaco-genetic study of any psychotropic medication to date (NEWMEDS), we identified **the strongest and most robust known predictor of outcome of antidepressant treatment** was not a gene but a psychological measure - the interest-activity symptom dimension (Uher: Biol. Psychiatry, 2011; Psychol Med, 2012). We need common assessment standards to identify the “clinical significance” of a biomarker for depression outcomes so we developed an online calculator, now **the assessment gold standard** (www.depressiontools.org).

Our cognitive therapy research for a range of anxiety disorders led in part to the **establishment of the national Improving Access to Psychological Treatment (IAPT) programme**. (David Clark; 2009) and we now have access to local IAPT services treating over 12,000 patients each year (Clark has since moved to Oxford). We developed, tested and showed generalisation to everyday practice of trauma focussed treatments for PTSD (BehRes & Ther, 2013). For the next generation of treatments, Colette Hirsch developed a new model to understand how cognitive processes maintain pathological worry with treatment implications for a range of emotional disorders (BehRes &Therapy, 2012).

Cleare and Pariante demonstrated that for the most treatment-resistant patients with depression in tertiary care, a lack of therapeutic benefit of antidepressants is associated with overall activation of the inflammatory system (Affective Dis., 2013) They also demonstrated the benefit of the novel prednisolone suppression test over existing tests as it may offer specific biological and clinical information related to its action at both glucocorticoid and mineralocorticoid receptors (Psychoneuroendocrinology, 2010). Using these advances Tony Cleare also developed an inpatient programme with **70% effectiveness for people with severe treatment resistant mood disorders** (Wooderson, J Affective Dis, 2011).

In **the next five years** we will focus on a better understanding of non-response to treatment. For first line psychological treatments Andre Tylee will identify predictors of response to IAPT treatments (NIHR BRC PROMPT programme: £0.5m). Our experimental medicine research will be boosted with our access to the new Clinical Research Facilities with the recent recruitment of Allan Young to form the new Centre for Affective Disorders. Our approach will include identifying the neuro-cognitive basis for, and treatment of, self blaming bias and recurrence risk in depressive disorders (Zahn, MRC Clinician Scientist) and studies that target inflammation for novel therapeutic discoveries (funded by: MRC, Janssen, European Commission; approximately £5m). We will continue to work closely with GPs as Andre Tylee will investigate cardiac prognosis and death in people with concurrent anxiety disorder and exertional chest pain (NIHR programme grant UPBEAT: £2.0m).

Dementia & Mental Health of Older Adults (Lead: Robert Howard: Awards £11.5m: 11 PIs)
Our strategy is based upon three interlinked strands: (1) an Alzheimer's disease translational programme to develop biomarkers and putative treatments from basic molecular and cellular biology; (2) large scale Phase II and III clinical trials of novel and established drug, non-drug and medical device interventions; and (3) clinical informatics and epidemiologically-based studies. We are one of few units globally to conduct research into refinement of treatments for psychoses arising in later life with imaging studies of D2 receptor occupancy during successful treatment of functional psychosis and psychosis in Alzheimer's disease (Suzanne Reeves NIHR £1.4m Clinician Scientist Award), as well as studies for visual hallucinations and pharmacological treatments for very late-onset schizophrenia-like psychosis (NIHR, £1.4m ATLAS Trial: £1.9m Applied programme). Our work is supported through the NIHR **Biomedical Research Unit for Dementia** which has a number of research strands including dementia in ethnically diverse groups directly related to our local ethnically mixed population.

Within our translational programme we focus on the A-beta and tau-based mechanisms for neuronal death and use this to identify both drugs for development, and prodromal and companion biomarkers for Alzheimer's disease (AD). Our expertise in blood-based multivariate predictive models for Alzheimer's Disease (lead on 6 papers in 2012/13 including Alz & Dementia 2013) resulted in multiple industrial collaborations (J&J/Janssen, GE, Lilly, SomaLogic) and academic collaborators/consortia (including VUMC, UCSF, EU IMI EMIF, WASHU, GENAROAD, TWINSUK) and funding from both non/commercial sources including (but not limited to) Alzheimer's Society, ARUK, Janssen Pharma and the BRC for Mental Health. These markers are being tested in clinical trials. We develop and lead several of UK's dementia RCTs with important results for dementia care including completion of CALM (study of cholinesterase inhibitor treatment for agitation), SADD (SSRI and mirtazapine treatment of depression in AD) and DOMINO (cholinesterase inhibitor and memantine treatment in moderate to severe AD). This strategy results in clinical change, for example clinical trials led by Rob Howard showed the **benefits of continuing dementia drugs beyond moderate Alzheimer's disease** (New England J Med., 2012), the harms of long term treatment of AD patients with antipsychotic drugs and the **value of educational and behavioural interventions**– findings that are changing clinical practice now (Department of Health Best Practice Guide, lead author Clive Ballard). Our partnerships with external public organisations have also led to scientific advancement (e.g. our study in collaboration with the BBC (Nature, 2010) which showed the lack of benefit to cognition of brain training) and the widely used and influential Best Practice Guide for the management of Behavioural and Psychological Symptoms of Dementia in partnership with the Alzheimer's Society.

Future plans focus on completing the major ongoing RCTs and deriving insights from the largest-in-the-world database on routine dementia care through CRIS. We will capitalise on this with further external data linkages to increase data depth on symptoms and environment. We will develop our existing SOUL-D and SABRE-COG cohorts and evaluate the effects of targeted interventions to improve cognition through modification of vascular risk factors in vascular dementia (£1.7m BHF, Alz Soc, Waterloo Foundation: lead for neuroimaging and bioresource) and have a new initiative for a drug discovery programme for Parkinson's Disease Dementia supported by the Safra Foundation (£1m). Twin studies to further quantify the state vs trait nature of blood-based biomarkers will be carried out in collaboration with GE Healthcare and TWINSUK. We have on-going trials (ATTILA, NIHR HTA £1.8m: MADE, EME £1.9m: NILVAD EU €7.0m) with a focus on disease-modification in AD. These ambitions will be facilitated by a £7.9M donation by the VanGeest Foundation to advance Alzheimer's and Dementia research.

Psychosis (Lead: Philip McGuire: Awards £45.5m: 44 PIs)
Our overall research strategy is to understand the biopsychosocial mechanisms underlying psychosis, and use this information to develop new treatments and improve clinical care. We combine psychiatric and psychological approaches with expertise in health services research. Our psychiatric studies are focussed on the neurobiology of psychosis, particularly in studies on the early phase (high risk and first episode) of psychosis, the psychopharmacology of psychosis, and on treatment resistance. Our psychological efforts are focused on altered cognitive processing, especially in relation to the development of therapeutic interventions: the application of CBT and cognitive remediation therapy (CRT) were pioneered at IoP. We also lead on the understanding of psychosocial factors in psychosis, stigmatisation and the organisation of clinical services for

psychosis. This wide breadth of expertise facilitates the direct integration of findings from different research modalities. To support this strategy, we have appointed several new staff to work on the early phase of psychosis (Paolo Fusar-Poli, Matthew Taylor, Lucia Valmaggia, Matthew Kempton, Gemma Modinos), the basis of the antipsychotic response (Sukhi Shergill, Rocio Perez-Iglesias), the effects of cannabis on psychosis (Sagnik Bhattacharyya, Matthijs Bossong), the evaluation of novel treatments for psychosis (Alice Egerton, Paul Morrison, James Stone, Matteo Cella, Clare Reeder), and the development of methods for multi-modal data analysis (Andrea Mechelli, Nicolas Crossley).

In this REF period, we have demonstrated that **the onset of psychosis is predated by changes** in brain dopamine function (Howes; Arch Gen Psych 2009), glutamate function (Stone; Biol Psych, 2009), neurophysiology (Allen, Scz Bull 2012) and structure (Mechelli, 2011), and that the transition from a high risk to a clinically psychotic state is associated with **progressive changes in these neuroimaging measures** (Howes Mol Psych, 2011). Dr Bhattacharyya demonstrated that **cannabis acts on the human brain to induce psychosis by altering striatal function** (Arch Gen Psych, 2009), with its effect moderated by genes that regulate neurotransmitter second messenger systems (Mol Psych, 2011). We also used neuroimaging to provide the first evidence that the response to antipsychotic treatment **depends on the levels of both brain dopamine and brain glutamate function** (Demjaha, 2012; Egerton, 2012, 2013) – leading to new possibilities in stratified medicine (MRC STRATA, £3.9m).

At a psychological level we have clarified the separate components of abnormal reasoning that lead to psychosis - limited data gathering and poor belief flexibility (J Abn Psychology, 2012) and provided new data on how these processes differ by delusion type (Schiz Bulletin, 2012). We demonstrated that **the therapeutic effect of CBT is dose dependent** (Psych Med 2012, Garety, Kuipers). Graham Thornicroft led an international effort to define and measure stigmatisation (Lancet, 2009), and has demonstrated that **anti-stigma campaigns can reduce stigma and discrimination against patients with psychosis** (BJPsychiatry 2013).

Future plans: We lead a series of large-scale multi-centre EC- and MRC-funded research programmes designed to combine neuroimaging, genetic and cognitive measures to produce tools that can be used by clinicians to **predict the subsequent onset of psychosis** in people at high risk (EU-GEI €11m, PSYSCAN €6m), and the **response to treatment** in patients with psychosis (OPTIMISE €12m, PSYSCAN €6m, STRATA £3.9m) **and to facilitate the development of new treatments** (NEWMEDS, KCL component €5m**)**. These studies are being conducted in partnership with SMEs that have developed clinical tools for other CNS disorders (CamCog; Ixico), and with the pharmaceutical industry (Roche, Lilly, Lundbeck, Janssen, Novartis, Pfizer, Abbott). Our findings have led to a range of experimental medicine studies and clinical trials of novel drugs (Glycine reuptake inhibitors, Minocycline, CBD, THCv, Oxytocin) and cognitive interventions for psychosis, including combinations of pharmacological and cognitive treatments (Modafinil & CRT, EU funded). Our work on cannabis has extended to a prospective study of the effects of cannabis use on the risk of relapse and violence in patients with psychosis (Bhattacharyya: NIHR Senior Fellowship £800k). Philippa Garety will develop and test new CBT programmes for people with persecutory delusions (NIHR and Charity, £450k). AVATAR therapy will be trialled with Wellcome Trust funding (£1.0m: Lead Tom Craig) and a new NIHR programme grant (Wykes; £2.0m) will allow us to investigate how cognitive remediation can be rolled out into first episode services across the UK.

Psychological Medicine (Lead: Simon Wessely: Awards £24.4m: 26 PIs)

Psychological Medicine focuses on mental health in diverse settings, particularly general hospitals, the community and specific occupational groups, bridges physical and mental health and uses a range of methods (record linkage, experimental medicine, nested case control studies and RCTs). The strategy **builds on our key cohort studies** which provide potential markers and associations. For instance our cohort of nearly 2000 newly diagnosed **type 2 diabetes** patients in south London is the largest multi-ethnic cohort of its type in the UK (SOUL-D) and will test the effect of depression (and health inequalities) on diabetes outcomes over 2 years (NIHR, £1.93m). Our **military** personnel database contains physical and mental health data as well as social factors before and after deployment to Iraq and Afghanistan and the transition to civilian life (MOD, £5.7m). Our public health agenda is aided by **links with the Thames Cancer Register, Hospital Episode Statistics, and ONS mortality data, primary care and the entire education record**.

Our studies have already shown important, but sometimes surprising, results. For instance the mental health of veterans was generally robust following the Iraq and Afghanistan wars, that poor leadership was as strongly associated with PTSD as exposure to traumatic events (Jones, Psychiatry, 2010), that alcohol was more of a problem than PTSD (Fear: Lancet, 2010) and that those at risk for adverse social outcomes had the shortest service (Woodhead, Psych Med. 2011).

Our public health interests include uncovering influences on the mental health of the public in novel areas such as James Rubin's report that exposure to the **UK's new police radio system does not trigger symptoms of 'electrosensitivity',** but exposure to sensationalist media about electromagnetic fields does and that 1 in 6 'chemical incidents' causing symptoms reported to the Health Protection Agency are actually **instances of mass psychogenic illness** (Epidemiology, 2010). We were the first in the world to show that **XMRV was not associated with Chronic Fatigue Syndrome**, following the sensational 2009 Science paper (Erlwein, PlosOne 2011).

Our translational research tests **the efficacy of a range of interventions** including the reporting in this REF period of results from the large RCT of psychological and exercise treatment for **chronic fatigue**, the PACE trial. We have the largest **eating disorders** treatment group which allows development of neuroscience-based treatments, such as Attention-Bias Modification Training, novel medications (e.g. naloxone; oxytocin), repetitive transcranial magnetic stimulation (Biol Psych, 2010) and real time neurofeedback leading to large trials focussing on technology-based, easily disseminated interventions (e.g. Psych Med. 2011, BrJ Psych, 2011, 2013). In our world-renowned Military Health Unit we delivered the first mental health RCTs in our armed forces (Fear, Wessely, Greenberg: TRiM and Battlemind: Occup Med. 2010; AJ Prevent Med, 2008).

Our close association with clinical services ensures that **results are disseminated into practice** quickly. Following our finding of increased mortality in people with diabetic foot ulcer and depression by Winkley (Diabetologia, 2012) we developed an innovative service that won three “Quality in Care” awards.

In the next five years we will test the impact of mental disorders on physical health and physical disorders on mental health throughout King’s Health Partners and monitor it in real time (GSTT Charity £2.5m). We will complete the world’s largest RCT of post-deployment mental health screening (POST; DoD £1.8m) and the largest ever study of deployment effects on military families (DoD, £1.1m). We will monitor the Armed Forces health in the Afghanistan deployment and beyond (MOD, £2.3m). We will use the British Social Attitudes survey (ESRC 350k) to assess public views of serving and ex serving military personnel and by adding relevant questions in the Adult Psychiatric Morbidity Survey will answer important questions on lifetime risks of military service. Our NIHR HTA funded evaluations include high and low intensity CBT for Irritable Bowel Syndrome (£1.6m), pseudoseizures treatment (£1.9m) and reducing weight and increasing activity in those at high risk of cardiovascular disease (£2m).

c. People, including:

i. Staffing strategy and staff development

Building capacity - our Early Career Researchers: Given our historical role as UK’s leading centre for training post-graduate researchers amongst psychiatrists and psychologists we pay particular attention to training the next generation of research leaders who will lead at the IoP and elsewhere. IoP's ability to attract, provide mentorship, and develop young researchers is illustrated by the fact that a quarter of individuals in our REF submission under UoA4 are ECRs.

After the 2008 RAE we perceived a gap in the career “pipeline” from post-doctoral fellow to successful independent careers in mental health research. To bridge this we developed IoP Excellence Fellowships which provide three year support for outstanding candidates to develop their niche and get external Fellowships. Our research training programmes now stretch from a portfolio of MScs in psychiatry, psychology and neuroscience, doctoral training in Clinical Psychology (66 in 2013) and PhDs (320 students in 2013) through to prestigious research fellowships. We introduced a Research Excellence Travel Fellowship scheme to allow exceptional young scientists to visit IoP to develop research proposals with our academic mentors allowing them to seek prestigious personal fellowships from key research funders.

We have the first evidence of our fellowship programmes bearing fruit as one of our IoP Research Excellence Travel Fellows gained a Royal Society Newton International Fellowship (Ryu Takizawa) and our IoP Research Excellence Fellows are beginning to gain independent research positions elsewhere (e.g. Michael Pluess joined St Mary’s in 2013). We also have evidence of

building the next generation of research leaders as we track our staff and fellows through their careers. For instance Ed Watkins (PhD and then research Fellow to 2003) and Jonathan Mill (PhD 2003) both now hold chairs in Exeter, and Daniel Freeman (DClinPsy, 2000) gained a Senior Wellcome Trust Fellowship with us and has now moved to Oxford, and both Essi Viding (PhD 2004, now Director of the Developmental Risk and Resilience Unit, UCL) and Angelica Ronald (PhD 2005, now senior lecturer at Birkbeck) won the British Psychological Society Spearman Medal in the last 2 years. They are just a few of our successful ECR academics who have gained from our research mentorship.

This year we are expanding our post-doctoral researcher training through KCL's membership of the Bloomsbury Postgraduate Skills Network. We will provide courses for other network members as well as giving our students new opportunities. The **KCL-wide programme is shortlisted in the 2013 Times Higher Education Award for Outstanding Support for Early Career Researchers**; just as the IoP-wide programme was in 2012.

We provide research experience worldwide by offering visiting research positions (761 registered in 2012-13). Our famous annual Maudsley conferences update mental health research leaders in developing countries, as well as across Europe. We offer a successful set of summer schools. For example the SGDP Centre summer school in molecular genetics and bioinformatics for geneticists, has run for over 10 years and trained more than 1,000 scientists worldwide. We also provide advanced statistical training for software in STATA for complex modelling (gllamm) developed by our Biostatisticians. The 3 to 5 day courses in five countries attracted >200 researchers and gllamm has been used in more than 600 research papers in the REF period.

Improving diversity: In building the research workforce we appreciate the need to support all our research academics and improve diversity. Three years ago we chose to invest more in women academics and ran and evaluated a **successful mentoring programme** (BMC Medical Education, 2011). In 2013 we launched our **'Inspiring Women' campaign** using multi-media resources to encourage women to enter and sustain research careers. In particular KCL researchers highlight inspiring women on Ada Lovelace Day each year. This follows the key research finding (Lovelock, 2006) that young women are more inspired by stories about outstanding scientists who overcame gender stereotypes (see for example http://www.kcl.ac.uk/iop/news/podcasts/celebrating-women-in-science.aspx). This year we took part in updating and expanding Wikipedia entries for women scientists nationally and locally. We consider women for nomination for prestigious awards and on November 14th 2013 Professor Elizabeth Kuipers was awarded the lifetime achievement award from WISE (Women in Science). This award is for a woman who has had a truly outstanding career in science, engineering, technology or the built environment in the UK. Another part of our active programme is **support to aid return to work** following maternity, paternity or adoption leave as well as our recently launched Parenting Leave Fund for staff in science disciplines (£20,000 per person to support their research over 12 months following leave). IoP has a comprehensive multi-strand **action plan to support equality and diversity,** in addition to the KCL-wide Equality & Diversity Action Plan 2012-2016.

We are actively engaged in a '**Women in Science Initiative'**, with an 18 month programme of work towards our application for an Athena SWAN Silver award in 2014 spearheaded by Profs. Elizabeth Kuipers and Ann McNeill. This work is underpinned by completion of a best practice checklist, a School-wide opinion survey, focus groups and gathering of management data – and most importantly interventions to improve IoP women researchers' ability to reach their potential. We now have more balanced committees (including the promotions committee), appointment panels and career development support and workplace flexibility. In addition to the work we are carrying out with women we specifically and explicitly support the **employment of individuals with a history of mental ill health** in our research workforce and embed them in our governance structures for research e.g. within the BRC/U.

Recruiting for Excellence: We continue to recruit to both mid-career and senior researchers to ensure a critical mass of talented researchers to lead and support our priority research strategy areas, as well as recruiting experts with proven success in other areas so they can bring these technologies and approaches into the mental health research arena. We have recruited Professorial leaders for the Maurice Wohl Institute for Neuroscience (Annalisa Pastore), for the Clinical Trials Unit (Andrew Pickles), for the Clinical Research Facility (Peter Goadsby), for the

Centre for Affective Disorders (Allan Young), for the Health Psychology Unit (Rona Moss-Morris and Lance McCracken) and in Addictions (Ann McNeill and Michael Lynskey). Other key appointments that enhance our infrastructure include expertise in neuroimaging analysis and statistics (Federico Turkheimer). These new recruits increase capacity for training and mentoring of new researchers.

Developing clinical academics are needed for a thriving research community. Our clinical psychology training has always encouraged research awareness as well as research excellence, highlighted by the number of trainees whose projects are published (e.g. Ross: Schizophrenia Bulletin, 2011). Psychiatry, however, faces a major challenge with few medical students wanting to enter the profession and fewer still seeking academic careers. To turn this around we launched the first UK summer school for medical students contemplating a career in psychiatry, now planning its fifth year and widely imitated. This year we hosted the first ever UK conference of all the Psychiatry Societies across all UK medical schools, attracting over 400 students. In 2010 we began a new programme to give medical students early exposure to psychiatric research, which has in turn led to 48 students publishing papers or giving presentations at national and international meetings. We host the largest UK programme of **NIHR Academic Clinical Fellows and Clinical Lecturers in psychiatry** (25 and 8 in this REF period). All ACFs have individual academic support and supervision and are provided with a credit-bearing Research Methods training programme. We hope to see this initiative bear fruit with more students choosing academic psychiatry.

The NIHR BRC/U provide **secondments for non-medical NHS staff** to undertake research projects in their own clinical setting, to undergo specialist research training at the IoP or prepare a personal fellowship application. This ensures further integration of research into the NHS. We manage our staff balance to promote synergy between the clinical and academic agendas. Currently **21% of the IoP's research staff** (mainly psychiatrists, psychologists and neurologists) contribute to NHS service delivery; and many NHS staff hold honorary academic contracts at IoP. We also host over 200 visiting clinical academics employed by local NHS organisations.

Staff development and career support: All new academic staff (Lecturer and above) are invited to a '**New Faculty Retreat**' where they are introduced to key senior staff and issues pertinent to an academic career. New junior faculty (Lecturers and Senior Lecturers) are also invited to attend the innovative '**Junior Faculty Development Series'**- (a half a day, once a month, over eight months) designed to support the professional, personal and career development of junior academic IoP staff (led by Amy Iversen).

The **Researcher Development Unit** in the KCL Graduate School provides and co-ordinates training and development opportunities for postgraduate research students and early career researchers, both clinical and non-clinical. An IoP-wide **Research Development Programme** provides a comprehensive training and development programme from short courses to personal support on careers, writing and work-life balance and coaching. In addition there are **grant writing workshops** (led by Thalia Eley, Gareth Barker, Richard Brown and Jack Price), and **promotion seminars** (Robert Plomin). Researchers are encouraged to use Vitae's Personal Development Planner to identify skills and plan their professional development. We fulfil and go beyond the expectations for support for our staff and students (QAA Code of Practice, Concordat to Support the Career Development of Researchers and the Roberts recommendations).

The new (2012-13) **KCL Performance and Development Review** process for all staff facilitates year round discussion of development needs with a mixture of formal annual appraisal and informal meetings, and completion is monitored. Our **Academic Performance Framework** gives clear guidelines for expectations at each academic level for four Domains of Academic Achievement: Education, Research, Administration & Academic Leadership and Impact. To ensure that this framework is implemented we hold IoP-specific training on how to have a "difficult" performance management conversation for all senior academic line managers.

We also support our staff to take part in further external career development even at the highest levels. For instance, our staff have been nominated and accepted on the NIHR Leader Development courses run by Ashridge Business which offer individual mentoring and workshops. Five professors were invited to the Senior Leaders meetings, six of our mid-career staff to the development leaders group and six of our junior staff to the NIHR trainees leadership programme.

ii. Research students

IoP provided postgraduate research training to over **370 full- and part-time students** in 2013 through its PhD, MD(Res) and DClinPsy (specialist doctorate in Clinical Psychology). The MD(Res) route for medically qualified researchers includes a new innovative programme in Medical Humanities combining the strengths of IoP and KCL Centre for Medical Humanities.

For years 2008-2013, **89% of all full time PhD/MD(Res) students submitted their postgraduate research degrees within 4 years** which is second in Russell Group universities and compares favourably with the national average (72.9% completion in 7 years in England: source: HEFCE). We think this reflects the quality of the students and supervision but also rigorous formal procedures for student monitoring through target setting and problem solving.

We recognise that **pastoral support** is essential for maintaining academic progress and ensuring quality learning experiences. IoP is unique in KCL in running a personal tutor scheme with departmental co-ordinators who match new students with a personal tutor. This scheme is highly regarded by students. We ensure **effective doctoral research training** with all PGR students being required to complete 30 days of closely monitored transferable skills training during their degree. All **supervisors receive specific training** in up-to-date support strategies provided by KCL Graduate School or the IoP's Postgraduate Skills Training Co-ordinator prior to supervising a PhD student. PGR students contribute positively to IoP PGR organisation and governance with representation on all monitoring sub-committees and PGR-specific activities including student-led seminar groups and an annual PGR Showcase designed explicitly to develop science communication skills. There are separate representatives for Home/EU versus overseas students on the main School level Committee, as we recognise that different issues arise for these two groups.

PGR training is undertaken in close partnership with others from outside the HEI sector. The NHS is a major partner through support of research training for clinicians including clinical psychologists, psychiatrists, neurologists, nurses and other health professions. The IoP, with its NHS partner SLaM, is a major recipient of Department of Health funding for research training through its BRC/U and the NIHR Integrated Academic Training Programme. Further PGR training opportunities are offered through individual industry partnerships including MRC CASE awards and through wider academic-industry partnership in our FP7 IMI programmes.

Our five year plan includes increasing the number of PhD students in areas of our research excellence and emerging disciplines. We will therefore increase the number of individuals trained in 'Informatics' with the support of our Bioinformatics team. Investment in specialist statistical methodologies will be needed for trials developing personalised medicine and so is also a priority. We will continue to provide multi-disciplinary perspectives with the psychological, social and biological perspective collaboration fostered through co-supervision of our interdisciplinary 1+3 PhD programme students.

d. Income, infrastructure and facilities

Research Infrastructures

Our multidisciplinary environment is enriched by biological, social, psychological and health service research perspectives. Specialist approaches include clinical trials expertise (UKCRC-registered **King's Clinical Trials Unit**), health economics (**Centre for the Economics of Mental and Physical Health**) and service user research (**Service User Research Enterprise**). Our **image analysts, bioinformaticians and statisticians** use, critically assess, and refine statistical learning methods, principally as a diagnostic aid, and for biomarkers for potential early screening for pathology. Notable examples are in dementia, where neuroimaging now provides near immediate-clinical feedback quantifying diagnostic probabilities. In life-course epidemiology we are a recognised centre both in design, e.g. 2-phase and cross-cohort methodology (Maughan, Pickles), and statistical models for human development (Barker, Bedford, Pickles).

We house the **MRC London Neurodegenerative Diseases Brain Bank** providing well-characterised human brain tissue to the neuroscience community (>2000 brains). We have an extensive DNA bank for cohort studies as well as patient samples. The NIHR-Wellcome **Clinical Research Facility (CRF)** is the only UK facility providing a specifically-designed mental health environment for experimental medicine and clinical trials (virtual reality rooms, one-way observation, ligature-free space etc.).

The **NIHR Biomedical Research Centre Nucleus** provides an internationally leading position in terms of clinical informatics infrastructure with the realisation of the potential of electronic patient records for research through the **BRC's Case Register Interactive Search (CRIS)** with 220,000 records and 20,000 added each year and a high-performance computing cluster of >1000 cores allowing data retrieval for 173 current project. We are building on this to develop a **BioResource for mental health** with links to our electronic medical records and biological datasets with the ambition of >50,000 participant samples in the next 5 years to underlie future genomic studies.

Brain imaging is advanced through our array of MRI and PET imaging facilities. The **Centre for Neuroimaging Sciences** houses three MRI systems capable of performing contemporary functional, spectroscopic, anatomical and physiological mapping techniques with NIRS added. The centre also operates a recently commissioned 3T MR system in the newly opened Clinical Research Facility and this system is focused on increasing the utility of imaging in the field of experimental medicine. We manage an open access pre-clinical 7T MR imaging system to assess animal models of brain disorders and pathological tissue examination for validation of our clinical imaging investigations. Our formal links and investment in both IMANOVA and St Thomas' PET centres (2 PET-CTs with co-located MRs) is where we conduct a broad array of molecular imaging investigations.

Genetics and genomics have advanced with investments by our NIHR BRC, Clinical Neuroscience and the Molecular Genetic Laboratory at MRC SGDP Centre. We established an efficient Illumina core facility with microarray processing capabilities for >1152 samples per week and an Illumina MiSEQ "desk-top" sequencer to enable target resequencing of genes. In the first 8 months of 2013 this enabled the completion of genomewide association studies using the OmniExpress GWAS array and the "Exome-chip" in motor neurone disease, first episode psychosis, response to psychological therapy (CBT), antidepressant drug response and neuroimaging studies of autism, ADHD and depression, totalling over 10,000 participants.

The **MRC Social, Genetic and Developmental Psychiatry Centre** undertakes research on the impact and interplay between genetic, environmental and developmental factors, and their causal roles in the origin and course of mental disorders. The focus is on common psychiatric disorders emerging in childhood such as mood disorders, 'externalising' disorders (disruptive behaviour including hyperactivity and addictions), and cognitive disorders. The Centre's multi-disciplinary expertise mirrors that available across the IoP.

Our neuroscience is expanding further. Firstly, the **Maurice Wohl Clinical Neuroscience Institute,** opening early 2014, is set to be one of Europe's leading centres for interdisciplinary neuroscience research. Its 70,000 sqft will bring together basic and translational neuroscientists working at all levels of complexity from the neuron, through neural circuits to behaviour in order to fast-track new treatments for neurodegenerative diseases such as Alzheimer's, Parkinson's, Motor Neurone Disease and neurodevelopmental disorders such as schizophrenia and Autism Spectrum Disorders. The Wohl will house state-of-the-art facilities including super-resolution imaging (as a satellite of the Nikon Imaging Centre), animal MRI, stem cell and iPSC facilities, as well as rodent behavioural suites. A major strategic goal is to provide a hub to foster links outside the traditional boundaries of neuroscience, such as computational and mathematical biology, stem cell biology, materials science and nanotechnology.

The **Francis Crick Institute** (FCI) is a £650m unique partnership funded by MRC, CRUK, Wellcome Trust and three universities: KCL, UCL, Imperial. This world-class research centre, hosting 1,250 basic biomedical scientists with an operating budget of over £100 million is a significant development in UK biomedical science. The Universities will contribute talent to specific strategic themes and KCL expects to be a key contributor to the "Neuroscience and Cognition" theme. As part of the partnership, KCL will second 80 -100 scientists to FCI, with about 20 from neurosciences. We will use this partnership to build strong bidirectional links between the new IoPPN and FCI, bringing the basic science at FCI (such as super-resolution microscopy, rapid sequencing, or transgenic technologies) together with our clinical and translational research perspectives. It will embrace movement of basic scientists from FCI to develop translational

opportunities, and secondments from IoP to develop new technologies and disease models.

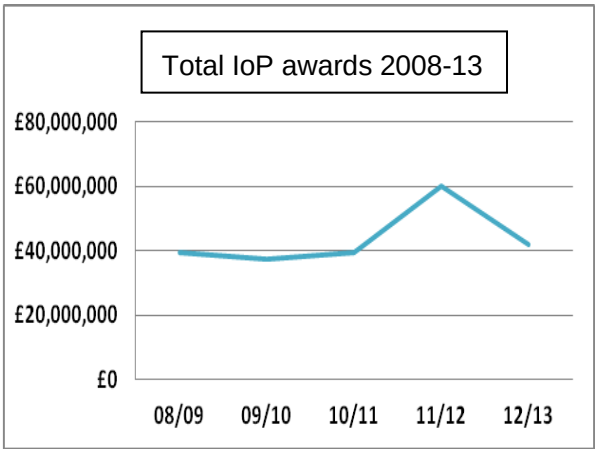
Research within IoP involves close collaboration with other King's Schools to enhance cross-school research platforms and expertise. As well as hosting the **College Proteomics Facility** we use or contribute to the developing cross-schools initiatives in bioinformatics, systems biology, genomics, statistical genetics and chemical biology.

Library resources

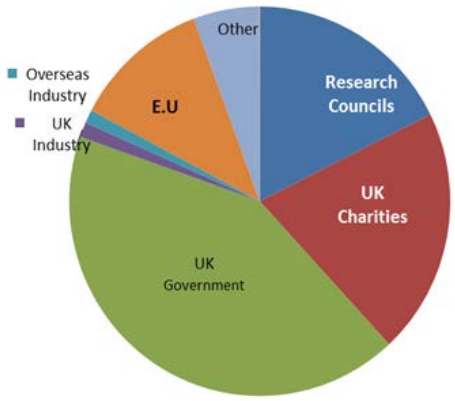
The **IoP Library** is the largest psychiatric library in Europe. Renovation in 2013 provided flexible study space, a new silent study area and a new assistive technology room to create a 21st century learning space. It provides high quality, essential support for our researchers which includes over 700 electronic journals in Psychiatry, Psychology and Neurology, over 35,000 books/multimedia items, as well as rare and unique archives. In 2013 we provided training in making use of these resources to more than 550 people. KCL provides support for open access publication, through our institutional repository and King's open access publishing fund.

Research Income

IoP researchers were awarded grants across the spectrum of research from experimental medicine supported by our NIHR BRC and industry through MRC Developmental Pathway grants, NIHR Research for Patient Benefit to large RCTs and programmes supported often by NIHR. For instance in 2013 alone: Shitij Kapur was awarded £3.9M to lead a UK-wide project in Stratified Medicine, the MRC awarded Mark Richardson £2.52m to build a computational model of brain networks involved in epilepsy, Rona Moss-Morris received £1.2m from NIHR HTA for a trial of CBT for IBS and Emily Simonoff and Til Wykes both received £2.0m NIHR programme grants to fund research vital for NHS roll out of interventions in autism and early intervention services for psychosis. In addition to direct research income to KCL, some NIHR research funding remains in our partner NHS Trusts and is reflected as "income in kind" including the NIHR/Wellcome Clinical Trials Facility and our NIHR BRC. The graph below shows our of £40M research awards for each year during the REF period, with a special year (11/12) which includes the BRC Award. The pie chart indicates the sources of our funding over the REF period.



Research Income Type '08 -13



Research Governance, Policy and practice

KCL has a comprehensive policy regarding the conduct of research and research ethics that follows the UK Research Integrity Office Code of practice for research: Promoting good practice and preventing misconduct (UKRIO, 2009), the Singapore Statement on Research Integrity (2010), and the RCUK code and policy (see http://www.kcl.ac.uk/innovation/research/support/index.aspx). We recognise that the proper conduct of research requires the maintenance of high standards of integrity, based upon principles and professional responsibilities that are central to the protection of the research community, participants in research, and the broader community that considers research evidence in the adoption of new policies and practices. Researchers are required to be aware of regulations and policies related to research (e.g. GCP, data protection, data archiving policy, health & safety, COSSH), keep clear and accurate records, employ appropriate research methods, take responsibility for the trustworthiness of their research, and be aware of the ethical

obligation to weigh societal benefits against the risks inherent in their research. They need to follow guidance criteria for authorship and acknowledgement of contributions to their research, be fair in their evaluations of other's work, respect confidentiality and disclose any conflicts of interest. KCL procedures for investigating and resolving allegations of research misconduct and the policy on information disclosure (whistleblowing) are the overall responsibility of the Head of Administration and College Secretary and are openly publicised.

We have joint research management and governance within our joint R&D Office to ensure that research is conducted according to the Department of Health's Research Governance Framework for Health & Social Care and relevant legislation such as the Human Tissue Act and the Mental Capacity Act. All research conducted by the IoP has a sponsor, ethical approval (either from KCL or NHS ethics committee), is peer reviewed and R&D approval if taking place within the NHS. We provide tutorials on research ethics and governance to students and to research teams, as well as one-to-one training for new trial managers and research assistants. The KHP Clinical Trials Office provides sponsor responsibilities for clinical trials on investigational medicinal products including monitoring of all studies. Both the Joint R&D Office and the College ethics committee provide guidance on best research practice, assisting researchers to navigate the requirements and ensure that KCL researchers adhere to high ethical standards.

e. Collaboration or contribution to the discipline or research base

A hub for research at home and abroad: We actively seek research collaborations with investigators in universities and NHS Trusts nationally – this shows in our research outputs: we publish with 54 Universities in the UK and 448 across the world (source: Thompson Reuter).

We host (with Manchester) the Coordinating Centre for the **NIHR Mental Health Research Network** (Director: Til Wykes). This network supports all NHS mental health research through eight linked major English research centres. In 2012-13 it enabled 40,000 people to participate in mental health studies across England.

We lead and take part in multi-centre studies of psychological treatments (e.g. COMMAND trial with Birmingham and Manchester), neuroscience investigations (e.g. LiCALS trial of lithium in Amyotrophic Lateral Sclerosis with 10 UK centres), medical interventions (DOMINO trial with 18 centres) and service evaluation (e.g. RIOTT trial of opioid treatment with clinics in SLaM, Darlington and Brighton) in the UK and abroad. We lead EU research consortia including three under the Innovative Medicines Initiative, multimillion programmes that include both academic and industry partners. We play a key role in developing a research strategy for Europe - **Roadmap for Mental Health Research in Europe** (IoP Leads: Schumann, Thornicroft, Wykes).

We also take a world view with active contacts with 84 countries from our hub for a global health initiative **Centre for Global Mental Health**, collaborating with the London School of Hygiene and Tropical Medicine to foster research and capacity in policy, prevention, treatment and care to close the treatment gap for people living with mental, neurological and substance use disorders.

Our staff are **represented on funding councils** across the world (e.g. Steve Williams led the REF equivalent Expert Panel for Belgium) and are members of research peer review boards (e.g. MRC (Kapur), Wellcome Trust (Buckley, Wessely); Marie Curie (Hotopf); Alzheimer's Society (Hanger, Powell), NIHR (Wessely, Craig)). We provide **evidence to national and international government committees** on mental health issues. For example in 2013 to NICE, Advisory Council on the Misuse of Drugs and Law Reform Committees in the UK (e.g. Committee on the Mental Capacity Act, Gareth Owen) and international committees (e.g. George Szmukler to Norway, Zambia and Australia on mental capacity). Six staff members are editors of research journals and 25 serve on the editorial boards of prestigious publications (above JIF 5) and we cover all aspects of our science e.g. JAMA Psychiatry, J. Am Acad Child and Adolescent Psychiatry, B.J. Psychiatry, Schizophrenia Bulletin, Psychological Medicine, Stem Cells, B.J. Clinical Psychology.

KCL researchers are also represented on key research professional bodies. For instance Allan Young is Chair of the Psychopharmacology Group in the Royal College of Psychiatrists, Shitij Kapur is on board of the Schizophrenia International Research Society, Robin Murray is a past president and Til Wykes chaired the Ethics committee. Trudie Chalder is president of BABCP and Dinesh Bhugra of the World Psychiatric Association after being president of the Royal College of Psychiatrists. Francesca Happe is President (2013) of International Society for Autism Research.

We **support collaboration** through our long-standing exchange programme with Johns

Hopkins University resulting in many ongoing shared translational projects with NIH/NIA from autism to Alzheimer's disease. We have a strategic relationship with UCSF and Duke University, involving exchange of staff and students. With the Broad institute (MIT) we are developing translational informatics to deliver a CNS connectivity map. Through the EC's Marie Curie International Research Staff Exchange Scheme we collaborate with colleagues in China, the Netherlands and USA to share cutting edge research methods to develop new treatments and diagnostic tools for psychiatric disorders, including schizophrenia and autism.

Our **industry** portfolio includes large and small pharma, biotech, and increasingly, technology companies at all stages of research (experimental medicine, observational studies and RCTs). We lead scientific partnerships with private-sector partners including the **Innovative Medicines Initiative** (IMI) projects in Dementia (InnoMed/AddNeuroMed: Lovestone), Schizophrenia and Depression (NEWMEDS: Kapur), autism (EU-AIMS: Murphy), as well as leading a work package of Stem BANCC, which aims to generate 1,500 human stem cell lines for drug discovery and disease modelling studies (Price). Our EU-AIMS for Autism (€ 31m) is the largest ever research academic-industry collaboration for autism research in the world and the largest for the study of any mental health disorder in Europe. This international consortium, led by Roche and IoP, seeks to find new methods for drug development for autism spectrum disorder. We have forged a pre-competitive collaboration that brings Pfizer, Lundbeck and Johnson & Johnson together to work on projects of critical interest to NICE using our medical records database. We also co-lead a **European Medical Information Framework** (Lovestone) of more than 57 partners including academia and industry to improve access to patient level data for research and clinical care. In partnership with the MRC, UCL and Imperial we are the shareholders of Imanova, a pioneering public-private collaboration, which has taken over the GSK-Imaging facility on the Hammersmith Campus to develop it into a world-leading molecular imaging facility.

Our excellence and esteem

Academic esteem: Amongst our staff we have: **21 Academy of Medical Sciences Fellows** (McGuffin and Rutter (founding members), Brown, Caspi, David, Dunn, Goldberg, Kapur, Lader, Kopelman, Lovestone, McGuire, Moffitt, Murray, Pickles, Plomin, Shaw, Taylor, Thornicroft, Wessely, Williams); **2 Fellows of the Royal Society** (Murray, Rutter); **5 British Academy Fellows** (Caspi, Dunn, Moffitt, Plomin, Rutter); **11 NIHR Senior Investigators** (Thornicroft, Bolton, Wessely, David, Tarrier, Knapp, Lovestone, Murray, Kuipers, Wykes, Garety) and **6 Academy of Social Sciences Academicians** (Wykes, Eisler, Kuipers, Morris, Moss-Morris, Weinman).

Personal recognition for research: Our staff are recipients of prestigious personal awards for their research. Our translational work recently demonstrated that direct access to specialist outpatient Eating Disorders services doubles the number of young people identified as needing treatment at lower costs by reducing inpatient treatment by 50-60% (Schmidt, Craig, Landau, Eisler) and was awarded the **IJED-Wiley prize for Outstanding Scientific Contribution for 2012.** Through their work on imaging biomarkers, Christine Ecker and Declan Murphy were awarded the **NHS Health Innovation (HEAL) of the Year Award** and their paper voted as one of the top 10 autism research findings in the world by a leading autism charity. It also led the European Medicines Agency to consider novel trial endpoints (J.Neuroscience, 2010). Chris Shaw won the **Forbes Norris Award for ALS Care and Research** in 2009 and the strategic analysis of supervised heroin services won the **GODORT award** of significant government document 2013 (Strang).

Our staff received scientific awards such as prestigious lectures and fellowships. In 2012 we were awarded the first ever **Regius Chair in Psychiatry** in the UK, as part of the celebrations for the Queen's Diamond Jubilee. Our Health Services Research Department was also awarded the **Queen's Anniversary Prize in 2009** for its excellent research.

Contemporary scientific prizes have also been awarded to our staff. Louise Howard is the first woman/psychiatrist to be awarded an **NIHR professorship (2013)** which supports early research leaders, in her case for work on mental health problems in pregnancy. Martin Prince was awarded a prestigious **European Research Council Advanced Grant in 2013** (also Robert Plomin in 2011). Michael Kopelman received a **Distinguished Career Award in 2013** from the International Neuropsychological Society in recognition of his major and sustained contributions to neuropsychology. Shitij Kapur, Dean of School received an **Honorary Doctorate in 2012** from the

University of Copenhagen. Til Wykes received the **US NIMH Directors Award in 2013**. Francesca Happe received the **Royal Society's Rosalind Franklin award in 2011.** Patricia Howlin was awarded the 2013 INSAR **Lifetime Achievement Award** for her outstanding contribution to Autism Spectrum Disorder research and services. Robin Morris was awarded the **Barbara Wilson Award in 2013** from the BPS Division of Neuropsychology for his outstanding contributions to neuropsychology and Gisli Gudjonsson and Elizabeth Kuipers both received **Lifetime Achievement** awards from the BPS. Additionally in this REF period Til Wykes and Elizabeth Kuipers both received the **BPS Shapiro award** for mid career researchers (2009, 2010) for contributions to clinical psychology. Carmine Pariante was named **Psychiatric academic/researcher of the year 2012** by the Royal College of Psychiatrists. These are just a few of our prestigious awards.

Our prestige is embellished by our junior staff who are similarly accomplished: For instance, Helen Fisher won the 2013 **BPS PhD prize**; 2012 **BMA Margaret Temple Award** and the **MRC Centenary award**. Andrea Danese received the 2013 **Klerman Award Honourable Mention**, 2010 RSM Mental Health Foundation Research Prize and 2009 **NARSAD Young Investigator** award. Ryu Takizawa, a psychiatrist and post-doctoral researcher was awarded a **Newton International Fellowship** and Claire Cheetham the NIH **Human Frontiers Science Program Postdoctoral Fellowship**. Paolo Fusar Poli received the SIRS Rising Star award. Most recently, in October 2013, Joseph Chilcot, a lecturer, received the **BPS Early Career Researcher Award** in recognition of his work on improving outcomes for dialysis patients.

We are proud that our scientists have received honours for service to the nation through their science: During this REF **Knighthoods** were awarded to Robin Murray (2011) and Simon Wessely (2013), **CBE**s to Dinesh Bhugra (2012) and Gisli Gudjohnson (2011) and an **OBE** to Janet Treasure (2013).