Introduction

The Trinity College Institute of Neuroscience (TCIN) was founded in 2002 with the objective of consolidating the strengths of PIs involved in neuroscience research from disciplines including genetics, biochemistry, psychology, pharmacology, physiology, neurology, gerontology, psychiatry, physics and computer science building a truly interdisciplinary research institute where world-class scientists collaborate to address a major challenge of our time – how to foster and maintain the best functioning of the human brain, particularly as we age. We aim to face this challenge by addressing basic scientific questions using a multidisciplinary approach and by building teams of researchers within specific areas of translational neuroscience.

TCIN occupies 3,300m² of state-of-the-art facilities in the city centre campus where 17 PIs are based; others are based at our nearby sister hospitals, St James Hospital and AMINCH. Since its official opening in 2005, TCIN has succeeded in substantially increasing the numbers of PIs, graduate students and post-doctoral fellows.

Neuroscience has been identified as an area of strategic strength in Trinity College Dublin reflecting the quality of existing research programmes, the international reputations of several PIs, the clustering of expertise in specific research areas and the track record of significant funding awards to individuals and interdisciplinary groups.

There are 5 research themes in TCIN, each comprising PIs in basic and clinical sciences, consistent with the objective of supporting Translational Research, a number of these are underpinned by collaborative projects with industrial partners. The 5 research themes are:

**Neurodegeneration, neuroprotection and neurorepair**
**Brain aging**
**Learning, memory and cognition**
**Psychiatric diseases and drug abuse**
**Neural development and plasticity**

The PIs associated with these themes are listed below.
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Name: Prof. Roger Anwyl
Position: Professor of Physiology
Contact details: Department of Physiology  
School of Medicine  
Trinity College Dublin  
Telephone: 353-01-896-1624  
Email: roger.anwyl@tcd.ie

RESEARCH INTERESTS:
My research area is neurophysiology, electrophysiology and neurological disease models. Our group studies the effects of natural and synthetic agents on neurological conditions with a particular focus on Alzheimer’s disease. We study long-term potentiation effects and synaptic transmission for various receptor sites, including Glutamate Metabotropic receptors. Our group also examines the effects of pharmacological therapeutic agents and neurotoxins and their effects on synaptic plasticity and neuronal repair.

RECENT PUBLICATIONS:


RESEARCH FUNDING:
Science Foundation Ireland, Wellcome Trust and European Union
Name: Dr. Arun Bokde

Position: SFI Stokes Lecturer in Neuroimaging

Contact details: Department of Psychiatry
School of Medicine
Trinity College Dublin
Telephone: 353-01-896-4104
Email: Arun.Bokde@tcd.ie

RESEARCH INTERESTS:

My research area is in neuroimaging and Alzheimer’s disease. I am interested in the early functional changes in the brain due to neurodegeneration and have investigated the changes in the visual and memory cognitive domains. I have investigated how brain networks are altered by brain neuropathology with the objective of developing neuroimaging based markers of Alzheimer’s disease. I have also been active in the use of machine learning methods for functional neuroimaging data to detect and discriminate between cognitive states. An area of active interest is the investigation of function-structure interaction using functional MRI, structural MRI, and diffusion tensor imaging.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland
Name: Prof. Ruth Byrne
Position: Professor of Cognitive Science
Contact details: School of Psychology, Trinity College Dublin
Telephone: 353-01-896-4054
Email: rmbyrne@tcd.ie

RESEARCH INTERESTS:

The human imagination remains one of the last uncharted terrains of the mind and a central aspect of the imagination is the creation of counterfactual alternatives to reality. My work examines the mental representations and cognitive processes that underlie deductive reasoning and counterfactual imagination, to test the theory that imaginative thoughts are guided by the same principles that underlie rational thoughts. Methods include behavioral studies using experimental measures, computational simulations, and fMRI studies. The research is carried out in collaboration with colleagues in Princeton University, IUAV Venice, and La Laguna University, Tenerife.

RECENT PUBLICATIONS:


Espino O, Santamaria C and Byrne RMJ. (2009). People think about what is true for conditionals, not what is false. Q. J. Exp. Psychol. 20: 1-7


RESEARCH FUNDING:

Irish Research Council for the Humanities and Social Sciences, Irish Research Council for Science, Engineering and Technology, Enterprise Ireland.
RESEARCH INTERESTS:

My research area is in cellular neuroscience and neuropharmacology. I am interested in the cell and molecular mechanisms that mediate neurotoxicity evoked by β-amyloid, the principal component of the senile plaque in Alzheimer's disease. Other projects are concerned with the influence of the cannabinoid system on (i) neural fate and (ii) adult stem cell differentiation. To address these research questions I employ a number of in vitro approaches including primary neuronal culture, siRNA technology, confocal laser scanning microscopy and a range of biochemical & molecular techniques. My research group comprises 1 post-doctoral researcher and 4 postgraduate students.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Enterprise Ireland, Health Research Board
**Name:** Prof. Thomas Connor  
**Position:** Associate Professor in Neuroscience  
**Contact details:** Department of Physiology,  
Trinity College Dublin  
Telephone: 353-01-896-8575  
E-mail: connort@tcd.ie

**RESEARCH INTERESTS:**

My research is focused on nervous system-immune system interactions, and can be divided into two interrelated themes:

1. The role of inflammation in precipitating depression and neurodegeneration, and the therapeutic utility of anti-inflammatory agents in treating depression and neurodegeneration.

2. The immunomodulatory effects of psychological stress, and the ability of antidepressants and anxiolytics to ameliorate stress-induced immunological dysfunction.

**RECENT PUBLICATIONS:**


**RESEARCH FUNDING:**

Science Foundation Ireland, Irish Research Council for Science, Engineering and Technology, Health Research Board, European Union FP7.
RESEARCH INTERESTS:

The goal of the Psychosis Research Group is to identify and investigate the genetic architecture of schizophrenia (SZ; OMIM 181500) and related disorders. SZ is a complex brain disorder characterized by psychotic symptoms (e.g., delusions and hallucinations), negative symptoms (affecting mood and motivation) and cognitive deficits. This work is important because ~1% of the adult population are affected, representing about 24 million people worldwide. Current therapies are only partially effective. Because SZ is substantial heritability (h2~0.8) and of uncertain aetiology, identifying risk genes will be key to understanding pathophysiological mechanism(s), for molecular subtyping and in developing novel pharmacotherapies.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Health Research Board, Wellcome Trust
Name: Dr. Colm Cunningham
Position: Research Lecturer
Contact details: School of Biochemistry and Immunology
Trinity College, Dublin
Telephone: 353-01-896-8528
Email: colm.cunningham@tcd.ie

RESEARCH INTERESTS:

My principal research interests lie at the point of intersection between neurodegeneration, inflammation and behaviour. I am studying the interaction between systemic and central nervous system inflammation. Much of my research in recent years has focused on a mouse model of prion disease. This model has been extremely useful in characterising the atypical inflammatory response to chronic neurodegeneration. CNS responses to peripheral insults are exaggerated during chronic neurodegenerative disease and microglial priming appears to play a key role in this. My laboratory currently uses bacterial lipopolysaccharide (LPS) and synthetic double stranded RNA (poly I:C) to study the impact of antibacterial and anti-viral acute phase responses on CNS function in physiological and pathological situations. This interaction between peripheral and CNS compartments plays a key role in exacerbations of disease such as episodes of delirium in Alzheimer’s disease & relapse in Multiple Sclerosis. The development of a model of inflammation-induced delirium is an ongoing initiative.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

The Wellcome Trust
Name: Dr. Gavin Davey

Position: Senior Lecturer in Neuroscience

Contact details: School of Biochemistry & Immunology Trinity College Dublin Telephone: 353-01-896-8408 Email: gdavey@tcd.ie

RESEARCH INTERESTS:

My research focuses on the molecular and cellular mechanisms that underlie neurodegeneration in the brain, in particular, the role that energy metabolism and bioenergetics play in controlling neuronal function and dysfunction. We use a range of in vitro, in vivo and in silico experimental systems to achieve these goals. For example, we utilise cell reprogramming technologies to generate induced pluripotent stem (iPS) cell lines from mouse and human dermal fibroblasts. Typically, fibroblasts are taken from patients with Parkinson’s disease, Alzheimer’s disease, Amyotrophic Lateral Sclerosis, Huntington’s disease, Epilepsy and Schizophrenia, and are exposed to a mixture of reprogramming factors. Once stable iPS cell lines have been generated, they are differentiated into neurons for biochemical characterization. These neurons are also used for elucidating mechanisms that underlie neurodegeneration, drug discovery and toxicity screening.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Enterprise Ireland, Health Research Board, European Union, Industrial Development Authority
Name: Conor Houghton
Position: Lecturer in Mathematics
Contact details: School of Mathematics
Trinity College, Dublin
Telephone: 353-01-896-3542
Email: houghton@maths.tcd.ie

RESEARCH INTERESTS:

The principal interest of my laboratory is the mathematical description of neuronal signaling: the unifying theme of our research is the idea that the important features of spike trains, their information content and temporal structure, will be easy to calculate and study when a natural mathematical framework has been constructed. Our research involves pen-and-paper and computer calculations, often using electrophysiological data from experimental collaborators or from data repositories.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Irish Research Council for Science, Engineering and Technology and the James S. McDonnell Foundation
Research Interests:
The Molecular Neuropharmacology group focuses on understanding the mechanisms underlying early events of Multiple Sclerosis, Parkinson’s Disease and Alzheimer’s Disease. We aim to identify novel drug targets for these diseases by utilising a range of functional genomic screens, biochemical and cellular assays, siRNA/lentiviral gene therapy and in vivo approaches. Our aim is to characterise novel proteins involved in the trafficking of sphingosine-1-phosphate and glutamate receptors. By controlling the surface expression of these proteins in a spatial and temporal manner, we aim to correct glial cell dysfunction and promote early events of neuronal survival. The eventual goal is to develop drugs that regulate receptor trafficking and thereby alter their function in a cell-specific and use-dependent fashion. Our ultimate objective is to identify new molecular pathways and targets, biomarkers and lead compounds for drug discovery purposes. The research activities draw upon collaborations in the academic, medical and industrial arenas.

Recent Publications:


Research Funding:
Science Foundation Ireland, Health Research Board, Enterprise Ireland, Wellcome Trust, Egyptian Government Travel Awards, Novartis Pharma Basel.
RESEARCH INTERESTS:

My research group focuses on understanding cognitive dysfunction following Traumatic Brain Injury (TBI) and developing new methods for cognitive rehabilitation. In collaboration with the National Rehabilitation Hospital, we are conducting a program of neuropsychological testing and electrophysiological recordings that is uniquely well placed to help disentangle the clinical heterogeneity of TBI. The program aims to identify separable symptom-clusters in patients, paving the way for different treatment trajectories. In partnership with Headway, we are beginning a cognitive rehabilitation program to address a clinical problem that TBI patients commonly report: difficulty concentrating in the context of background noise or concurrent interference. This is known as impaired sensory gating and often means the patient is less able to attend, encode or recall the details of an episode clearly. We employ a multi-disciplinary approach combining and applying the expertise of cognitive neuroscientists, biomedical engineers, clinical psychologists and psychiatrists.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Health Research Board
Name: Dr. Gary Donohoe
Position: Senior Lecturer in Clinical Psychology
Contact details: Department of Psychiatry, School of Medicine, Trinity College Dublin
Telephone: 353-01-896-8408
Email: donoghug@tcd.ie

RESEARCH INTERESTS:

My interest is in the genetic, cognitive, and clinical aspects of schizophrenia and the related psychosis. Within the Neuropsychiatric Genetics Research Group at TCD, my work focuses on understanding cognitive measures and how they inter-relate, and using these to elucidate the role of candidate risk genes for schizophrenia. By combining clinical, behavioural, neurophysiological, and neuroimaging techniques, we can explore in vivo the impact of these variants on brain structure and function.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

National Alliance for Research on Schizophrenia and Depression, Science Foundation Ireland, Higher Education Authority, Wellcome Trust.
Name: Prof. G Jane Farrar

Position: Associate Professor of Genetics

Contact details: Smurfit Institute of Genetics, Trinity College Dublin
Telephone: 353-01-896-3695
Email: gjfarrar@tcd.ie

RESEARCH INTERESTS:

My research interests include the elucidation of the molecular pathogenesis of neurodegenerative disorders and in particular neurodegenerative disorders involving photoreceptor cell loss such as Retinitis Pigmentosa (RP) amongst others. In addition, I’ve been involved in the utilisation of genetic tools to simulate such disorders in model systems and to explore potential therapeutic approaches for such disorders. My research group comprises 6 post-doctoral scientists and 4 postgraduate students.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Enterprise Ireland, Health Research Board, Fighting Blindness, Wellcome Trust, European Union Framework programmes, Debra Ireland.
Name: Prof. Thomas Frodl
Position: Professor of Integrated Neuroimaging
Contact details: Department of Psychiatry, School of Medicine, Trinity College Dublin
Telephone: 353-01-896-4181
Email: frodlt@tcd.

RESEARCH INTERESTS:

My research areas are in clinical neuroimaging and imaging genetics. Using multimodal imaging techniques and genetics I examine, how stress or other environmental factors interact with genetic polymorphisms on the structural and functional integrity of the brain. Research focus is in Affective Disorders like major depression or bipolar disorders, but also in personality disorders and adult attention deficit disorders, in order to understand the underlying neurobiological processes and to find markers for prediction of disease progression or for response to antidepressant treatment. Other projects deal with early detection of psychiatric diseases using these imaging methods like structural and functional MRI, diffusion tensor imaging and MR spectroscopy.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Eli Lilly International Foundation, Research Foundation-University Munich, Fridrich Baur Foundation
Name: Prof. Hugh Garavan
Position: Associate Professor in Psychology
Contact details: Trinity College Institute of Neuroscience, Trinity College Dublin. Telephone: 353-01-896-8448 Email: Hugh.Garavan@tcd.ie

RESEARCH INTERESTS:

My group studies cognitive and affective processes in healthy controls and various clinical groups using experimental psychological and brain imaging techniques. The primary cognitive interest is on control functions (inhibition, attention, error detection) but interests include working and long-term memory, emotion regulation, and the neurobiology underpinning practice, learning and plasticity. The primary clinical interests include drug abuse with ongoing studies in cannabis, ecstasy, cocaine, opiates and alcohol users. Additional clinical interests are in schizophrenia and ADHD. Miscellaneous interests include individual differences and methodological issues in neuroimaging. All of these projects are conducted using functional and structural MRI with the latter including both volumetric analysis and diffusion-tensor imaging.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

National Institute on Drug Abuse, National Institute of Health (USA), European Union Health Research Board
**Name:** Prof. Michael Gill  
**Position:** Professor of Psychiatry  
**Contact details:**  
Department of Psychiatry,  
School of Medicine  
Trinity College Dublin  
Telephone: 353-01-896-2241  
Email: mgill@tcd.ie

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**RESEARCH INTERESTS:**

The overall strategy of Prof. Gill’s research is to study the relationships between phenotype and genotype in three key neuropsychiatric disorders; Psychoses, Autism and ADHD. Step one, gene hunting, is highly multidisciplinary and involves ascertaining large family and individual case samples and measuring clinical, neuropsychological, neurophysiological and neuroimaging phenotypes, and relating these to genotype at candidate genes and regions. We have developed a series of large and highly valuable family and individual case resources over the last ten years. Whole genome association approaches are underway or are planned. Step two, functional genomics, involves the focused examination of the function of demonstrated candidate genes, and their specific involvement in disease aetiology.

**RECENT PUBLICATIONS:**


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**RESEARCH FUNDING:**

National Institute of Mental Health
Name: Prof. Harald Hampel

Position: Professor and Chair of Psychiatry, Trinity College
Consultant in General Adult and Psychiatry of Old Age
Head of the Alzheimer Memorial Center, Univ Munich

Contact details: Discipline of Psychiatry, School of Medicine
Trinity College Dublin
Telephone: 353-01-896-3706
Email: Harald.Hampel@tcd.ie

RESEARCH INTERESTS:
Discovery and qualification of biological markers in blood and cerebrospinal fluid. Here he contributed seminal findings regarding phosphorylated tau, abeta-antibodies and BACE 1 functional proteins as core biological markers of AD. Currently he is developing a panel of hypothesis driven biomarkers in blood. Development and qualification of structural & functional neuroimaging markers in neurodegenerative disorders with focus on Alzheimer's disease (AD). His group has introduced new MR-markers of basal forebrain changes validated against post-mortem obtained brain scans. Multivariate analysis tools were developed to track white matter changes, voxel-based DTI analysis and tractography of neuronal networks, demonstrating a region-specific pattern of progressive fiber tract disintegration in the AD brain. Voxel- and deformation-based morphometry and cortical thickness measurement. For functional MRI assessment, he developed a connectivity related approach that showed brain changes in subjects at risk of AD even before the onset of the dementia syndrome. His current neuroimaging research focuses on understanding how the brain constructs networks of interacting regions to perform cognitive tasks, especially those associated with memory and attention, and how these networks are altered in brain disorders.

RECENT PUBLICATIONS:

Blood-Based Microcirculation Markers in Alzheimer's Disease: Diagnostic Value of Midregional Pro-atrial Natriuretic Peptide/C-terminal Endothelin-1 Precursor Fragment Ratio.


RESEARCH FUNDING:

Science Foundation Ireland, Enterprise Ireland, Health Research Board (HRB), Wellcome Trust, European Commission, National Institute of Health, Alzheimer Association.
RESEARCH INTERESTS:

My primary research interests include the epidemiology and pathogenesis of amyotrophic lateral sclerosis (ALS) with particular reference to the identification of genetic and environmental susceptibility factors. My internationally-recognized group recently identified an important new susceptibility gene for ALS, which occurs with higher frequency in populations of Celtic extraction. The group is in active collaboration with many of the major ALS centres in Europe and the USA, and is a member of the US based Genome Wide Association Consortium for ALS. Recent work has also focused on the clinical and genetic overlap between ALS and frontotemporal dementia, for which I have received one of only eight prestigious Health Research Board (HRB) Clinician Scientist Awards.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Health Research Board, Muscular Dystrophy USA, Amyotrophic Lateral Sclerosis Association, Irish Motor Neurone Disease Association, Irish Register of Amyotrophic Lateral Sclerosis.
RESEARCH INTERESTS:

My research is primarily focused in the thematic areas of depression and drug abuse. Current work is focused on the role of the glutamate N-methyl-D-aspartic acid receptor (NMDA-R) and the NMDA-nitric oxide (NO)-cGMP intra-neuronal signalling pathway in antidepressant treatment. We are testing agents which influence this pathway for the development of more effective and faster acting antidepressants. Inhibitors of the NMDA-R have shown promise as rapid acting antidepressants. Neuronal NO synthase (nNOS) is a down stream target of NMDA-R and we have reported that inhibition of nNOS produces antidepressant activity in preclinical models. Other research in the group is concerned with the toxicity of recreational drugs including MDMA ("Ecstasy"), cocaine and caffeine, their interactions and the health consequences associated with their use.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Health Research Board, European Union, Irish Research Council for Science, Engineering and Technology, Science Foundation Ireland
RESEARCH INTERESTS:

My research investigates the molecular genetics of degenerative diseases of the retina. Milestones have included the localization of the first and second genes to be implicated in autosomal dominant RP (these genes encode the photoreactive pigment rhodopsin and the structural component of photoreceptor neurones, peripherin), the localization and functional characterization of a gene causing the RP10 form of RP, encoding the rate limiting enzyme of the de novo pathway of GTP biosynthesis, and the identification of mutations within the MTTS2 gene in sensorineuronal deafness and RP. Current research involves ongoing studies of the molecular genetics of RP and related conditions and the development of novel therapeutics based upon such knowledge (see also Drs. Farrar and Kenna). Future projects will include quantitative analysis of retinal transcripts in respect to therapeutic approaches targeting transcripts from retinopathy genes and assessment of techniques for delivery to ocular tissue of potentially therapeutic materials, including use of iontophoresis and electroporation.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Enterprise Ireland
Name: Dr. Áine Kelly
Position: Senior Lecturer in Physiology
Contact details: Department of Physiology, Trinity College Dublin
Telephone: 353-01-896-3794
Email: aikelly@tcd.ie

RESEARCH INTERESTS:

My research interests centre on the roles of the neurotrophic factors in cognitive function, particularly hippocampal-dependent learning. In my laboratory, we use a combination of in vivo and in vitro techniques, including animal learning and behaviour, immunocytochemistry and a range of biochemical and molecular techniques. We are particularly interested in the cellular mechanisms by which interventions such as environmental enrichment and physical exercise can improve cognition in young, healthy laboratory animals and protect against degenerative changes caused by ageing and by experimentally-induced neuronal cell damage.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Health Research Board, Irish Research Council for Science, Engineering and Technology
Name: Dr. Julie Kelly
Position: Senior Research Lecturer
Contact details: School of Biochemistry and Immunology, Trinity College Dublin
Telephone: 353-01-896-8449
Email: kellyja@tcd.ie

RESEARCH INTERESTS:

Dr. Kelly has broad research interests in understanding the roles of neuropeptides in the central nervous system (CNS). Currently, a key focus of her research relates to investigating the functions of thyrotropin-releasing hormone (TRH) in the CNS and to the development of TRH-based neurotherapeutics. Critically, clinical use of native TRH is hindered due to its rapid degradation. Dr. Kelly's research has led to the discovery of novel compounds that provide a means to reduce TRH degradation and realize a longstanding pharmaceutical industry goal. These patent-protected compounds represent a unique opportunity to unlock the clinical potential of the actions of TRH and thereby, offer an innovative platform technology for the treatment of a wide range of CNS disorders with unmet clinical need. Preclinical development of the lead compound, as well as multidisciplinary research to gain a greater understanding of the therapeutic actions of TRH and to advance the development of other TRH-related neurotherapeutics, is ongoing in collaboration with several other research groups located internationally and nationally and, in particular, within TCIN.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Wellcome Trust, Science Foundation Ireland, Enterprise Ireland, Health Research Board
Name: Dr. Paul Kenna
Position: Senior Clinical Research Fellow in Genetics
Contact details: Department of Genetics, Trinity College Dublin
Telephone: 353-01-896-1000
Email: paul.kenna@tcd.ie

RESEARCH INTERESTS:

Dr. Paul Kenna is a Senior Clinical Research Fellow in the Ocular Genetics Unit at the Smurfit Institute in Trinity College and has collaborated with Prof. Peter Humphries and Dr. Jane Farrar for over 15 years in investigations into the molecular genetic causes of inherited blindness, blistering skin disease and brittle bone disease. This work has resulted in the identification of a number of novel disease-causing genes in these conditions, including the first gene to be implicated as causative in any form of autosomal dominantly inherited RP. A fully trained clinical ophthalmologist, in recent years he has focused on the delivery of potentially therapeutic gene constructs to the degenerating retina in murine models of inherited retinopathies and in the analysis of the effects on retinal function. Dr. Kenna has developed considerable expertise in the electrophysiological assessment of retinal function in animals and humans. Together with Dr. Jane Farrar and Prof. Peter Humphries he holds three patents on strategies designed to overcome genetic heterogeneity in autosomal dominant diseases and is a founder of Optigen Technologies, a Trinity College campus company established to exploit these patents.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Enterprise Ireland
Name: Prof. Rose-Anne Kenny

Position: Professor of Medical Gerontology

Contact details: Department of Medical Gerontology
Trinity Health Sciences Centre
St. James's Hospital Dublin 8.
Telephone: 353-01-428-4182
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RESEARCH INTERESTS:
Professor Rose Anne Kenny's research interests are in neurocardiovascular function in ageing. The overarching aims of the research programmes are to unpick the mechanisms for cardiovascular and cerebral dysfunction in the context of falls, blackouts, cognitive impairment and dementia. The research involves collaborative partnership with disciplines from basic science (developing animal modules of cardiovascular and cerebral dysfunction) through to health service development and implementation. She has conducted longitudinal cohort studies of vascular factors in cognitive impairment and stroke and is now lead PI for the Irish Longitudinal Study of Ageing (TILDA). Other major extant research programs include assistive technologies in ageing in collaboration with INTEL and IDA-TRIL; Health Research Board (HRB)-translational program of cardiovascular risk factors for conversion of cognitive impairment to dementia and new treatment strategies for dementia sub types.

RECENT PUBLICATIONS:


RESEARCH FUNDING:
Name: Dr. Christian Kerskens
Position: Lead physicist
Contact details: Trinity College Institute of Neuroscience, Trinity College Dublin
Telephone: 353-01-896-8470
Email: christian.kerskens@tcd.ie

RESEARCH INTERESTS:
My current research interests include an investigation of NMR contrast mechanism of functional brain activations and the underlying neurovascular coupling, mechanisms of diffusion contrast in NMR, modeling of flow and diffusion in biological systems, and physiological noise. Current work is also focused on direct detection of cell activation with NMR and the development of NMR methods for methodological improvements and in utilization to provide information of value in medical diagnosis and cognitive neuroscience.

RECENT PUBLICATIONS:


RESEARCH FUNDING:
Irish Research Council for Science, Engineering and Technology, Enterprise Ireland, Health Research Board


**Name:**  Prof. Khurshid Ahmad  
**Position:**  Professor of Computer Science  
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Trinity College Dublin  
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Email: kahmad@tcd.ie

**RESEARCH INTERESTS:**

My theoretical interests are in neural computing, in terminology and ontology, and in natural language processing, especially information extraction. I am motivated by the way humans deal with information transmitted in different modalities – texts, images, numbers, diagrams. My research in neural computing has led to multi-net neural systems that can mimic the evolution of language and numerosity. Multi-net systems were used in co-locating images and their textual descriptions. My work in terminology and ontology relates to the automatic extraction and deployment of terminology of specialist disciplines in applications as diverse as translation and information extraction; work in ontology has helped develop systems that can track growth of knowledge from early theoretical stages onto patenting and into the market place. The practical objective is to create information systems that can not only deal with information in a number of different modalities but can also learn to deal with different modalities. I teach courses on AI, Neural Networks and Knowledge Management.

**RECENT PUBLICATIONS:**


**RESEARCH FUNDING:**

European Union's Strategic Programme for Research in IT (Information Society Technologies and Framework V/ESPRIT), the UK Engineering and Physical Sciences Research Council, and the UK National Rivers Authority.
RESEARCH INTERESTS:

It is estimated that in an adult human there are of the order of hundreds of billions of neurons, each of which establishes specific connections. Surface molecules expressed by each neuron will largely determine how these connections take place. Many transcription factors that control neuronal subtype specification have been identified. However, how do they ultimately control the specification of the vast array of different neurons, and how the expression of surface molecules is regulated in them is unknown. My lab is trying to understand how transcriptional codes specify neuronal identity and regulate the expression of membrane molecules. I employ a number of in vitro and in vivo approaches including high-throughput mRNA profiling, ChIP-chip, ChIP-Seq, primary neuronal culture, confocal laser scanning microscopy and a range of biochemical & molecular techniques. My research group comprises 2 post-doctoral researchers and 2 postgraduate students.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Enterprise Ireland, Deutsche-Forschungsgemeinschaft, Irish Research Council for Science, Engineering and Technology.
Name: Prof. Brian Lawlor

Position: Conolly Norman Professor of Old Age Psychiatry
Consultant Psychiatrist at St James’s Hospital
Director of the Memory Disorders Clinic at M.I.R.A., St James’s Hospital
Clinical Director of Psychiatry, St James’s Hospital

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RESEARCH INTERESTS:

My research interests are in the early detection, diagnosis and treatment of Alzheimer’s disease, the neurobiology and treatment of behavioural and psychological symptoms in dementia and mental disorders in the community dwelling elderly. The overarching aims of the research programmes are to develop clinical, neuropsychological and biological markers of Alzheimer’s disease at the earliest possible stage and to test promising new interventions in clinical populations. This research involves collaborative partnership with disciplines from basic science (developing animal models of Alzheimer’s disease) through to health service development, clinical trials and implementation. I have conducted longitudinal cohort studies of Alzheimer’s disease in clinic settings and cross sectional and longitudinal studies of community dwelling healthy older people and those with mental disorders.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Health Research Board, Intel/Industrial Development Authority,
Glaxo SmithKline/Industrial Development Authority
Name: Dr. Aileen Lynch

Position: Lecturer in Biological Sciences

Contact details: School of Nursing and Midwifery, 24 D’Olier Street, Trinity College Dublin Telephone: 353-01-896-8571 Email: amlynch@tcd.ie

RESEARCH INTERESTS:

My research area is in neuroimmunology with an emphasis on the inflammatory events that occur during the ageing process. In this context, I am particularly interested in the interplay between cells of the nervous system. In vivo (aged rats) and in vitro methods are used to assess neuronal-glial interactions and glial-endothelial interactions, and to determine how the signalling and molecular mechanisms between these cell types are modified by neuroinflammation in the aged brain.

RECENT PUBLICATIONS:


**Name:** Prof. Marina Lynch  
**Position:** Professor of Cellular Neuroscience  
**Contact details:**  
Department of Physiology,  
Trinity College Institute of Neuroscience  
Trinity College Dublin  
Telephone: 353-01-896-8531  
Email: lynchma@tcd.ie

**RESEARCH INTERESTS:**

My research focuses on investigating the contribution of neuroinflammatory changes in the age-related and amyloid β-induced deterioration in synaptic function in the brain, especially in the hippocampus. A key component of neuroinflammation is activation of microglia and astrocytes and therefore a particular objective is to understand the factors which trigger activation of these cells, with the aim of modulating these changes and restoring synaptic function. Current work includes an evaluation of the role of cell-cell interaction in modulating microglial activation with a special focus on assessing the interaction between CD200 and its receptor. Among the factors which upregulates CD200 expression is the anti-inflammatory cytokine, IL-4 and recent studies have provided evidence that some novel anti-inflammatory agents attenuate age- and amyloid β-induced changes in hippocampus because they exert an effect on IL-4 and CD200 expression. My current research group consists of 6 postdoctoral fellows and 9 PhD students.

**RECENT PUBLICATIONS:**


**RESEARCH FUNDING:**

Science Foundation Ireland, Health Research Board, Glaxo SmithKline/Industrial Development Authority, European Union, Amarin
Name: Dr. Connall McCrory

Position: Medical Director Pain Medicine, St. James Hospital and Senior Lecturer School of Medicine, TCD.

Contact details: Phase 1 H, St. James Hospital
Email: dr.mccrory@painclinic.ie
or St. James Hospital: cmccrory@stjames.ie
Tel: 4103952 (Secretary: Anne) FAX: 4284069

RESEARCH INTERESTS:


RECENT PUBLICATIONS:


RESEARCH INTERESTS:

I am interested in the development of connectivity in the brain, specifically in how this process is controlled by genes and how mutations in such genes affect the connectivity of neuronal circuits, influence behaviour and perception and contribute to disease. My research group uses genetic approaches in the mouse to address these questions, and we are also involved in collaborative research looking at the genetics and phenotypic manifestations of synaesthesia and schizophrenia in humans.

RECENT PUBLICATIONS:


Mitchell KJ (2007). The genetics of brain wiring; from molecule to mind. PLoS Biology 5: e113


RESEARCH FUNDING:

Science Foundation Ireland, Health Research Board, Wellcome Trust
NAME: Prof. Kingston Mills

POSITION: Professor of Experimental Immunology

CONTACT DETAILS: School of Biochemistry and Immunology, Trinity College Dublin
Telephone: 353-01-896-3573
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RESEARCH INTERESTS:
My research interests include innate and acquired resistance to infection; pathogen immune modulation and immunomodulatory molecules as anti-inflammatory therapeutics for autoimmunity; role of dendritic cells in driving T cell responses; immune regulation and manipulating regulatory versus effector or pathogenic T cells and its application in the development of immunotherapeutics/vaccines against cancer, autoimmunity and Alzheimer’s disease.

RECENT PUBLICATIONS:


RESEARCH FUNDING:
Science Foundation Ireland, Enterprise Ireland, Health Research Board, The Wellcome Trust.
Name: Prof. Declan McLoughlin

Position: Research Professor of Psychiatry

Contact details:
Department of Psychiatry
Trinity College Dublin
St. Patrick’s Hospital
James’s Street Dublin 8
Telephone: 353-01-249-3343
Email: mclougde@tcd.ie

RESEARCH INTERESTS:

Current research activities include projects on: the molecular pathogenesis of Alzheimer’s disease; molecular neurobiology of depression; randomised controlled trials of therapeutic neuromodulation in severe depression and plasma biomarkers for depression, treatment response and relapse.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Health Research Board, The Wellcome Trust, Alzheimer’s Society and Alzheimer’s Research Trust
Name: Prof. Fiona Newell
Position: Associate Professor of Psychology
Contact details: School of Psychology, Trinity College Dublin
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Email: fiona.newell@tcd.ie

RESEARCH INTERESTS:
Our research aim is to elucidate the behavioural and cortical correlates of multisensory perception in humans for the purpose of texture, object, face and scene recognition. This research is mainly conducted with normal adult populations but also involves investigations of multisensory perception in ageing, in persons who are sensory deprived and in synaesthesia. We use standard behavioural methodologies, EEG and fMRI in our studies.

RECENT PUBLICATIONS:


RESEARCH FUNDING:
Science Foundation Ireland, Health Research Board, European Union, Intel/Industrial Development Authority
RESEARCH INTERESTS:

The goal of my research is to unravel the neural computations underlying the ability to make decisions under uncertainty. A deeper understanding of “how” the brain does this will not only inspire new theories of decision making, it will also contribute to the development of genuine “artificial intelligence”, and it will enable us to understand why some humans are better than others at making decisions, why humans with certain psychiatric disorders or brain lesions are less capable of doing so, and why under some circumstances humans systematically fail to make “rational” decisions. A cornerstone of our approach is the adoption of a new method known as “model-based fMRI”, in which one takes a precise quantitative computational model for a particular cognitive process and applies this model to fMRI data in order to identify brain regions with response profiles consistent with a specific computational signal. This method allows one to begin to characterize how a particular cognitive function is implemented in the brain, as opposed to merely identifying where in the brain such functions are located, as is done in more traditional fMRI studies. We are now also involved in using other techniques alongside and in combination with fMRI, such as studying the effects of discrete lesions in specific brain regions on decision making behaviour, as well as using transcranial magnetic stimulation (TMS) to induce temporary lesions in healthy subjects. Other interests include the functional neuroanatomy of human emotions, neural structures involved in social cognition, and the functional neuroanatomy of the gustatory system.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Dana Foundation, National Institute of Mental Health, National Science Foundation (USA), Kinship Searle Foundation Scholarship, Gordon and Betty Moore Foundation, Science Foundation Ireland
RESEARCH INTERESTS:

I investigate the relations between synaptic plasticity (the mechanisms by which the brain changes as a result of experience), cognition (the abstract psychological processes by which we know, represent and understand the external world), and changes in learned behaviour. I have concentrated my research on two particular and inter-related areas: 1. the neurobiology and neuropsychology of learning and memory, and 2. the neurobiology and neuropsychology of stress and depression. These two seemingly diverse areas overlap to a very considerable degree. The synaptic plasticity that allows for memories to be encoded is disordered to a very considerable degree in depression, and treatments reducing the effects of depression (exercise, drugs, social interaction) enhance synaptic plasticity and hence memory function. In turn, these treatments also form the basis of therapy for age-related decline in memory and cognitive function. We use a combination of in vivo multi-electrode neurophysiology, behavioural analysis, molecular biology and pharmacological intervention to investigate the function of brain systems implicated in memory function and dysfunction and in psychiatric disease (particularly major depressive disorder).

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Glaxo SmithKline / Industrial Development Authority Science Foundation Ireland, The Wellcome Trust, Health Research Board
RESEARCH INTERESTS:

Professor Desmond O’Neill’s work on Neurosciences and Ageing focuses on stroke, in particular recovery following stroke as well as prediction of fitness to drive following stroke and dementia. Current studies involve assessment of the effects of prism adaptation on postural stability following stroke and the use of assistive robotic devices in guided rehabilitation in hemiplegia, models of adaptation after stroke and factors affecting higher order complex functions such as driving. Identifying behavioural and cognitive factors which underlie preserved driving skills in neurodegenerative disease is one major focus. The Medical Gerontology Department at Tallaght Hospital runs the only comprehensive driving screening project in the Republic of Ireland and potential research projects include modelling both behavioural and neurocognitive factors determining preserved driving abilities in degenerative disease. Areas of interest include the characterization of oesophageal motility after stroke and determinants of successful recovery after stroke.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Health Research Board, Department of Health and Children, Irish Heart Foundation
Name: Prof. Mani Ramaswami
Position: Research Professor of Neuroscience

Contact details:
Department of Genetics,
Trinity College Dublin
Telephone: 353-01-896 8400
Email: mani.ramaswami@tcd.ie

RESEARCH INTERESTS:

My research is in genetic, molecular, cellular and behavioral neuroscience. I am interested in linking molecular and circuit mechanisms of simple learned behaviors. We work in primarily in the genetic model organism Drosophila melanogaster studying synaptic mechanisms, miRNA mediated translational control in neurons, and mechanisms of simple memory. An obvious extension of these studies to ask how these mechanisms are affected in disease and we currently study disease models for fragile-X mental retardation and spinocerebellar ataxia. A wide range of collaborations, particularly with top research groups in Biosciences in India, expands our work into other fields including natural products, peptide neurotoxins and stem cell biology. My research group comprises 6 post-doctoral researchers and 4 postgraduate students. They use a number of in vivo approaches including Drosophila behavior, electrophysiology, optical and electron microscopy and a range of biochemical & molecular techniques.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Wellcome Trust, Department of Biotechnology (India)
RESEARCH INTERESTS:

Biomedical engineering with a particular focus on particularly neural engineering and multimodal signal processing, both at a theoretical and applied level. The principal research areas include; neural engineering focusing on modelling of human multisensory integration process and the human visual attention system using high density electrophysiological analysis, Diffusion Tensor Imaging, Deep Brain Stimulation and multimodal fusion (EEG, ECG, EMG, EGG and EOG) for neurological diagnosis. This neural engineering research is targeted at better understanding of the underlying physiology, identifying non-invasive electrophysiological cognitive biomarkers for cognitive ageing, schizophrenia, depression and the detection of seizure in neonatal infants. The Neural Engineering group comprises 4 post-doctoral researchers and 7 postgraduate students.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Enterprise Ireland, Irish Council for Science, Engineering and Technology, Higher Educatiaon Authority.
RESEARCH INTERESTS:

I and my group study attention, in particular vigilant and spatial attention, and its relationship to awareness and insight; we study these in people with traumatic brain injury, the dementias, normal ageing, schizophrenia, attention deficit hyperactivity disorder, autism and other conditions using EEG, fMRI and behavioural methods. We also work on trying to enhance brain function in the impaired and normal human brain. I am one of the PI’s on a major programme of research with Intel on developing new technologies for maintaining cognitive and other independence in the elderly (http://www.trilcentre.org). Finally, we research the linkage between particular cognitive functions and underlying genotypes in normal and clinical populations.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Health Research Board, Intel/Industrial Development Authority, Glaxo SmithKline/Industrial Development Authority, Irish Research Council for the Humanities and Social Sciences, European Science Foundation, Irish Research Council for Science, Engineering and Technology.
RESEARCH INTERESTS:

My research addresses the questions: What mechanisms underlie the different forms of synaptic plasticity in the hippocampus, in particular long-term potentiation (LTP), long-term depression (LTD) and their reversal? Which forms of synaptic plasticity are behaviourally relevant and how are they regulated by extra-hippocampal inputs? How does inescapable behavioural stress affect synaptic plasticity? How do misfolded proteins affect synaptic plasticity, in particular the Alzheimer’s disease-related amyloid β protein (Aβ)? Recent research achievements include: (a) the discovery of the potent effects on LTP of different species of amyloid β protein, especially low-n oligomers, (b) the discovery of the role of dopaminergic transmission in attentional control of LTP induction. Current research also investigates metabotropic glutamate, cholinergic, estrogen and serotonin receptors and their downstream signalling mediators in synaptic plasticity.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Science Foundation Ireland, Enterprise Ireland, European Union Framework 6, Industrial partnerships.
Name: Dr Daniela Tropea

Position: Lecturer in Functional Genomics

Contact details:
Department of Psychiatry
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Trinity Center for Health Sciences
St James hospital
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Email: tropead@tcd.ie

RESEARCH INTERESTS:
I study the biological function of susceptibility genes for neurodevelopmental disorders. These genes can be studied in vitro and in vivo using transgenic animals. These models play a critical role in understanding the neurobiology of neurodevelopmental disorders, and therefore improving diagnostic tools and exploring new treatments.

RECENT PUBLICATIONS:


RESEARCH FUNDING:
International Reintegration Grant (IRG), Marie Curie Actions
RESEARCH INTERESTS:

My research focuses on the mechanisms and function of thalamocortical rhythms. There is accumulating evidence that particular types of brain rhythms are involved in the decoding of sensory information and the formation of memory. Individual nerve cells are endowed with intrinsic electrical properties that allow them to transform synaptic input into action potential output. We are studying the response properties of different cell types to oscillatory input to elucidate their potential role as pacemakers/resonators. Synaptic connections between neurons have complex dynamic properties that are influencing the functional coupling between cells. We are studying the pharmacology and dynamical properties of different synaptic connections to understand the functional coupling between cells. How do different discharge patterns affect synaptic plasticity? We are assessing the influence of in vivo like discharge patterns on the strength of synaptic connections. We are also investigating the influence of changes at individual synapses on the behaviour of network activity. Ultimately, our goal is to elucidate the basic principles of brain functions and to contribute to a better understanding of pathological processes such as absence epilepsy, sleep disorders, pain sensation, and memory impairment.

RECENT PUBLICATIONS:


RESEARCH FUNDING:

Health Research Board, Higher Education Authority
**Name:** Dr Alice Witney  
**Position:** Lecturer of Physiology  
**Contact details:** Department of Physiology  
School of Medicine  
Trinity College Dublin  
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**RESEARCH INTERESTS:**

My research uses experimental approaches to understand the control of movement and how sensory input influences motor output. I am interested in the control of the human hand, and how we are able to skillfully manipulate objects. I am also interested in whole body postural control, studying both unaffected and patient populations. My work has also addressed the impact of motor dysfunction on patients through the concept of ‘health utility’. Current focus uses insect model systems to understand sensory motor control. I film insects using high-speed videography, sometimes combined with muscle recordings, during controlled behavioural tasks. My long term aim is to make use of the better understood nervous system of insects, through combined electrophysiology and behavioural studies, as these model systems have the potential to provide a more complete way of examining theoretical models of sensory-motor integration and how they may be implemented at a neural level.

**RECENT PUBLICATIONS:**


**RESEARCH FUNDING:**

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