#### MRC COGNITION AND BRAIN SCIENCES UNIT

MRC COGNITION AND BRAIN SCIENCES UNIT: EXPLORING THE FRONTIERS OF HUMAN MIND AND BRAIN RESEARCH

MRC COGNITION AND BRAIN SCIENCES UNIT STANDS AS A BEACON OF PIONEERING RESEARCH IN THE INTRICATE FIELDS OF COGNITIVE NEUROSCIENCE, PSYCHOLOGY, AND BRAIN SCIENCES. NESTLED WITHIN THE UNIVERSITY OF CAMBRIDGE, THIS RENOWNED INSTITUTE IS DEDICATED TO UNRAVELING THE COMPLEXITIES OF HOW WE THINK, LEARN, PERCEIVE, AND REMEMBER. FOR ANYONE FASCINATED BY THE WORKINGS OF THE HUMAN MIND, THE MRC COGNITION AND BRAIN SCIENCES UNIT OFFERS A TREASURE TROVE OF INSIGHTS, INNOVATIVE STUDIES, AND CUTTING-EDGE METHODOLOGIES SHAPING CONTEMPORARY NEUROSCIENCE.

## WHAT IS THE MRC COGNITION AND BRAIN SCIENCES UNIT?

THE MRC COGNITION AND BRAIN SCIENCES UNIT (OFTEN ABBREVIATED AS MRC CBU) IS A LEADING RESEARCH CENTER FUNDED BY THE MEDICAL RESEARCH COUNCIL (MRC) IN THE UK. ESTABLISHED TO ADVANCE UNDERSTANDING OF HUMAN COGNITION AND BRAIN FUNCTION, THIS UNIT SPECIALIZES IN MULTIDISCIPLINARY APPROACHES THAT COMBINE PSYCHOLOGY, NEUROIMAGING, COMPUTATIONAL MODELING, AND EXPERIMENTAL NEUROSCIENCE.

Unlike traditional psychology departments, the MRC CBU integrates biological, psychological, and computational perspectives to study brain mechanisms underlying cognition. This holistic approach allows scientists to explore not only behavior but also the neural substrates and processes that give rise to complex mental functions.

### KEY AREAS OF RESEARCH

THE RESEARCH AT THE MRC COGNITION AND BRAIN SCIENCES UNIT COVERS A BROAD SPECTRUM OF TOPICS, INCLUDING BUT NOT LIMITED TO:

- MEMORY AND LEARNING: INVESTIGATING HOW MEMORIES FORM, CONSOLIDATE, AND DEGRADE, INCLUDING STUDIES ON AMNESIA AND NEURODEGENERATIVE DISEASES.
- **PERCEPTION AND ATTENTION:** Understanding how the brain processes sensory information and focuses cognitive resources.
- LANGUAGE AND COMMUNICATION: EXPLORING THE NEURAL BASIS OF LANGUAGE COMPREHENSION, PRODUCTION, AND DISORDERS LIKE APHASIA.
- DECISION MAKING AND SOCIAL COGNITION: EXAMINING HOW HUMANS MAKE CHOICES AND INTERPRET SOCIAL CUES.
- DEVELOPMENT AND AGING: STUDYING COGNITIVE CHANGES ACROSS THE LIFESPAN, FROM CHILDHOOD THROUGH OLD AGE.

THESE DIVERSE RESEARCH DOMAINS HIGHLIGHT THE UNIT'S COMMITMENT TO UNCOVERING THE FULL PICTURE OF BRAIN FUNCTION IN HEALTH AND DISEASE.

## ADVANCED NEUROIMAGING AND COMPUTATIONAL TECHNIQUES

One of the standout features of the MRC Cognition and Brain Sciences Unit is its use of state-of-the-art neuroimaging technologies. Functional magnetic resonance imaging (fMRI), magnetoencephalography (MEG), and electroencephalography (EEG) are routinely employed to capture brain activity with remarkable spatial and

### WHY NEUROIMAGING MATTERS

Neuroimaging allows researchers at the MRC CBU to visualize the brain in action, linking cognitive tasks to specific neural circuits. For example, by observing which areas light up during memory tasks, scientists can pinpoint regions critical for encoding and retrieval. This detailed mapping informs both basic science and clinical applications, such as developing interventions for stroke or dementia patients.

### COMPUTATIONAL MODELING IN BRAIN SCIENCES

BEYOND IMAGING, COMPUTATIONAL MODELING PLAYS A CRUCIAL ROLE IN THE MRC COGNITION AND BRAIN SCIENCES UNIT'S EFFORTS. BY BUILDING MATHEMATICAL MODELS THAT SIMULATE COGNITIVE PROCESSES, RESEARCHERS CAN TEST HYPOTHESES ABOUT HOW THE BRAIN FUNCTIONS AT A MECHANISTIC LEVEL. THESE MODELS ARE INVALUABLE FOR INTERPRETING COMPLEX DATA AND PREDICTING BEHAVIORAL OUTCOMES BASED ON NEURAL ACTIVITY PATTERNS.

## IMPACT ON CLINICAL NEUROSCIENCE AND MENTAL HEALTH

THE WORK AT THE MRC COGNITION AND BRAIN SCIENCES UNIT DOESN'T STOP AT THEORY—IT HAS PRACTICAL IMPLICATIONS FOR UNDERSTANDING AND TREATING NEUROLOGICAL AND PSYCHIATRIC CONDITIONS. INSIGHTS GAINED FROM BASIC RESEARCH FEED INTO TRANSLATIONAL PROJECTS AIMED AT IMPROVING DIAGNOSIS, THERAPY, AND REHABILITATION.

## CONTRIBUTIONS TO NEURODEGENERATIVE DISEASE RESEARCH

ALZHEIMER'S DISEASE, PARKINSON'S DISEASE, AND OTHER NEURODEGENERATIVE DISORDERS ARE A MAJOR FOCUS FOR THE UNIT'S CLINICAL RESEARCH. BY EXAMINING HOW COGNITIVE FUNCTIONS DETERIORATE AND IDENTIFYING EARLY BIOMARKERS, THE MRC CBU SUPPORTS THE DEVELOPMENT OF TREATMENTS THAT COULD SLOW OR PREVENT DISEASE PROGRESSION.

#### ADVANCING MENTAL HEALTH UNDERSTANDING

MENTAL HEALTH CONDITIONS SUCH AS DEPRESSION, ANXIETY, AND SCHIZOPHRENIA INVOLVE DISRUPTIONS IN COGNITIVE AND BRAIN FUNCTION. RESEARCHERS AT THE UNIT INVESTIGATE THESE ALTERATIONS USING ADVANCED BRAIN IMAGING AND COGNITIVE TESTING, STRIVING TO UNCOVER BIOLOGICAL SIGNATURES THAT COULD LEAD TO MORE PERSONALIZED MENTAL HEALTH CARE.

## COLLABORATIONS AND EDUCATIONAL INFLUENCE

THE MRC COGNITION AND BRAIN SCIENCES UNIT IS NOT AN ISOLATED ENTITY; IT THRIVES ON COLLABORATION AND KNOWLEDGE EXCHANGE. IT PARTNERS WITH HOSPITALS, UNIVERSITIES, AND INTERNATIONAL RESEARCH CONSORTIA TO BROADEN THE IMPACT OF ITS FINDINGS.

### TRAINING THE NEXT GENERATION OF NEUROSCIENTISTS

EDUCATION IS A KEY PILLAR AT THE MRC CBU. THE UNIT OFFERS TRAINING PROGRAMS, WORKSHOPS, AND PHD OPPORTUNITIES AIMED AT EQUIPPING STUDENTS AND EARLY-CAREER RESEARCHERS WITH SKILLS IN EXPERIMENTAL DESIGN, NEUROIMAGING, AND

#### INTERDISCIPLINARY PARTNERSHIPS

BECAUSE BRAIN SCIENCE IS INHERENTLY INTERDISCIPLINARY, THE MRC COGNITION AND BRAIN SCIENCES UNIT COLLABORATES WITH EXPERTS IN COMPUTER SCIENCE, ENGINEERING, PSYCHIATRY, AND NEUROLOGY. SUCH PARTNERSHIPS FACILITATE INNOVATIVE PROJECTS THAT PUSH THE BOUNDARIES OF WHAT WE KNOW ABOUT THE MIND AND BRAIN.

## WHY THE MRC COGNITION AND BRAIN SCIENCES UNIT MATTERS

In a world increasingly interested in how our brains shape behavior, decision-making, and identity, the research conducted at the MRC Cognition and Brain Sciences Unit is more relevant than ever. Their work offers hope for addressing cognitive disorders, enhancing learning methods, and understanding the fundamental nature of human thought.

WHETHER YOU'RE A STUDENT, RESEARCHER, OR SIMPLY A CURIOUS MIND, FOLLOWING THE DEVELOPMENTS FROM THE MRC CBU PROVIDES A WINDOW INTO THE LATEST BREAKTHROUGHS IN BRAIN SCIENCE. WITH ITS COMMITMENT TO RIGOROUS RESEARCH, INTERDISCIPLINARY COLLABORATION, AND PUBLIC ENGAGEMENT, THE UNIT PLAYS A VITAL ROLE IN ADVANCING NEUROSCIENCE BOTH IN THE UK AND GLOBALLY.

## FREQUENTLY ASKED QUESTIONS

### WHAT IS THE MRC COGNITION AND BRAIN SCIENCES UNIT?

THE MRC COGNITION AND BRAIN SCIENCES UNIT IS A LEADING RESEARCH INSTITUTE BASED IN CAMBRIDGE, UK, FOCUSED ON UNDERSTANDING THE COGNITIVE AND NEURAL MECHANISMS UNDERLYING HUMAN BEHAVIOUR AND BRAIN FUNCTION.

## WHAT RESEARCH AREAS DOES THE MRC COGNITION AND BRAIN SCIENCES UNIT SPECIALIZE IN?

THE UNIT SPECIALIZES IN AREAS SUCH AS COGNITIVE NEUROSCIENCE, NEUROPSYCHOLOGY, DEVELOPMENTAL PSYCHOLOGY, NEUROIMAGING, COMPUTATIONAL MODELING, AND NEURODEGENERATIVE DISEASES.

## WHERE IS THE MRC COGNITION AND BRAIN SCIENCES UNIT LOCATED?

IT IS LOCATED IN CAMBRIDGE, UNITED KINGDOM, AND IS PART OF THE MEDICAL RESEARCH COUNCIL (MRC) NETWORK OF RESEARCH INSTITUTIONS.

# HOW DOES THE MRC COGNITION AND BRAIN SCIENCES UNIT CONTRIBUTE TO BRAIN SCIENCE RESEARCH?

THE UNIT CONTRIBUTES BY CONDUCTING CUTTING-EDGE RESEARCH USING TECHNIQUES LIKE MRI, MEG, EEG, AND COMPUTATIONAL MODELING TO UNDERSTAND BRAIN FUNCTION, COGNITION, AND DISORDERS.

# CAN STUDENTS OR RESEARCHERS COLLABORATE WITH THE MRC COGNITION AND BRAIN SCIENCES UNIT?

YES, THE UNIT OFTEN COLLABORATES WITH UNIVERSITIES AND RESEARCH INSTITUTIONS WORLDWIDE AND OFFERS

# WHAT FACILITIES AND TECHNOLOGIES ARE AVAILABLE AT THE MRC COGNITION AND BRAIN SCIENCES UNIT?

THE UNIT HOUSES ADVANCED NEUROIMAGING FACILITIES INCLUDING MRI SCANNERS, MEG, EEG LABS, EYE-TRACKING SYSTEMS, AND COMPUTATIONAL RESOURCES FOR BRAIN DATA ANALYSIS.

# HAS THE MRC COGNITION AND BRAIN SCIENCES UNIT CONTRIBUTED TO ANY SIGNIFICANT SCIENTIFIC DISCOVERIES?

YES, THE UNIT HAS MADE IMPORTANT CONTRIBUTIONS TO UNDERSTANDING MEMORY, PERCEPTION, LANGUAGE PROCESSING, BRAIN PLASTICITY, AND NEUROLOGICAL DISORDERS SUCH AS ALZHEIMER'S DISEASE.

# HOW CAN ONE APPLY FOR A RESEARCH POSITION OR INTERNSHIP AT THE MRC COGNITION AND BRAIN SCIENCES UNIT?

APPLICATIONS FOR RESEARCH POSITIONS OR INTERNSHIPS CAN BE MADE THROUGH THE UNIT'S OFFICIAL WEBSITE, WHERE THEY POST CURRENT VACANCIES AND OPPORTUNITIES FOR STUDENTS AND RESEARCHERS.

### ADDITIONAL RESOURCES

MRC COGNITION AND BRAIN SCIENCES UNIT: ADVANCING NEUROSCIENCE THROUGH INNOVATIVE RESEARCH

MRC COGNITION AND BRAIN SCIENCES UNIT STANDS AS A CORNERSTONE INSTITUTION IN THE LANDSCAPE OF COGNITIVE NEUROSCIENCE AND PSYCHOLOGY RESEARCH. SITUATED WITHIN THE UNIVERSITY OF CAMBRIDGE, THIS UNIT HAS GARNERED INTERNATIONAL RECOGNITION FOR ITS GROUNDBREAKING INVESTIGATIONS INTO BRAIN FUNCTION, COGNITION, AND BEHAVIOR. ITS MULTIDISCIPLINARY APPROACH INTEGRATES PSYCHOLOGY, NEUROSCIENCE, AND COMPUTATIONAL MODELING, MAKING IT A PIVOTAL PLAYER IN UNDERSTANDING THE COMPLEXITIES OF HUMAN COGNITION AND NEUROLOGICAL DISORDERS.

## A HISTORICAL PERSPECTIVE AND INSTITUTIONAL OVERVIEW

FOUNDED IN 1947, THE MRC COGNITION AND BRAIN SCIENCES UNIT (MRC CBU) HAS EVOLVED INTO ONE OF THE FOREMOST RESEARCH CENTERS DEDICATED TO THE SCIENTIFIC EXPLORATION OF THE HUMAN BRAIN. INITIALLY FOCUSED ON EXPERIMENTAL PSYCHOLOGY, THE UNIT RAPIDLY EXPANDED ITS PURVIEW TO INCLUDE NEUROIMAGING, NEUROPSYCHOLOGY, AND COGNITIVE NEUROSCIENCE. THIS EVOLUTION WAS CATALYZED BY ADVANCES IN BRAIN SCANNING TECHNOLOGIES SUCH AS FUNCTIONAL MAGNETIC RESONANCE IMAGING (FMRI) AND ELECTROENCEPHALOGRAPHY (EEG), WHICH THE UNIT SKILLFULLY INCORPORATED INTO ITS RESEARCH METHODOLOGIES.

TODAY, THE MRC CBU OPERATES WITH A MISSION TO UNRAVEL THE NEURAL UNDERPINNINGS OF COGNITIVE FUNCTIONS SUCH AS PERCEPTION, MEMORY, LANGUAGE, AND DECISION-MAKING. IT BENEFITS FROM SUBSTANTIAL FUNDING FROM THE MEDICAL RESEARCH COUNCIL (MRC), WHICH SUPPORTS ITS CUTTING-EDGE PROJECTS AND STATE-OF-THE-ART FACILITIES.

## RESEARCH FOCUS AND METHODOLOGIES

THE CORE STRENGTH OF THE MRC COGNITION AND BRAIN SCIENCES UNIT LIES IN ITS INTEGRATIVE RESEARCH FRAMEWORK. BY COMBINING BEHAVIORAL EXPERIMENTS, NEUROIMAGING, COMPUTATIONAL MODELS, AND CLINICAL STUDIES, THE UNIT ADDRESSES FUNDAMENTAL QUESTIONS ABOUT HOW THE BRAIN SUPPORTS COGNITIVE PROCESSES.

#### NEUROIMAGING AND BRAIN MAPPING

One of the unit's hallmark features is its leadership in neuroimaging research. Utilizing technologies such as fMRI, magnetoencephalography (MEG), and transcranial magnetic stimulation (TMS), researchers at the MRC CBU explore activity patterns across various brain regions during cognitive tasks. This enables detailed brain mapping, highlighting not just localized brain functions but also network interactions.

FOR EXAMPLE, STUDIES ON MEMORY RETRIEVAL HAVE DELINEATED THE ROLES OF THE HIPPOCAMPUS AND PREFRONTAL CORTEX, WHILE INVESTIGATIONS INTO LANGUAGE PROCESSING HAVE SHED LIGHT ON THE DYNAMIC INTERPLAY BETWEEN BROCA'S AND WERNICKE'S AREAS. THESE INSIGHTS HAVE PROFOUND IMPLICATIONS FOR UNDERSTANDING NEUROLOGICAL CONDITIONS LIKE ALZHEIMER'S DISEASE, APHASIA, AND STROKE-INDUCED COGNITIVE IMPAIRMENTS.

### COMPUTATIONAL MODELING AND COGNITIVE THEORIES

BEYOND EMPIRICAL STUDIES, THE MRC COGNITION AND BRAIN SCIENCES UNIT IS RENOWNED FOR ITS COMPUTATIONAL NEUROSCIENCE EFFORTS. BY DEVELOPING AND TESTING MATHEMATICAL MODELS OF COGNITIVE PROCESSES, RESEARCHERS SIMULATE BRAIN FUNCTIONS TO PREDICT BEHAVIORAL OUTCOMES AND NEURAL RESPONSES. THIS QUANTITATIVE APPROACH ALLOWS FOR HYPOTHESIS TESTING THAT IS BOTH RIGOROUS AND REPLICABLE.

MODELS ADDRESSING DECISION-MAKING, FOR INSTANCE, HAVE UTILIZED REINFORCEMENT LEARNING FRAMEWORKS TO EXPLAIN HOW HUMANS ADAPT BEHAVIOR BASED ON REWARDS AND PUNISHMENTS. SUCH MODELS ARE INVALUABLE NOT ONLY IN BASIC NEUROSCIENCE BUT ALSO IN ARTIFICIAL INTELLIGENCE APPLICATIONS AND CLINICAL DIAGNOSTICS.

## COLLABORATIVE AND MULTIDISCIPLINARY ENVIRONMENT

THE MRC CBU FOSTERS AN ENVIRONMENT WHERE INTERDISCIPLINARY COLLABORATION THRIVES. COGNITIVE PSYCHOLOGISTS, NEUROSCIENTISTS, CLINICIANS, AND COMPUTATIONAL EXPERTS WORK ALONGSIDE EACH OTHER, BLENDING EXPERTISE TO TACKLE COMPLEX QUESTIONS. THIS COLLABORATIVE ETHOS IS REFLECTED IN THE UNIT'S PARTNERSHIPS WITH OTHER RESEARCH INSTITUTIONS, HOSPITALS, AND INDUSTRY STAKEHOLDERS.

### CLINICAL AND TRANSLATIONAL RESEARCH

IMPORTANTLY, THE UNIT BRIDGES THE GAP BETWEEN FUNDAMENTAL NEUROSCIENCE AND CLINICAL APPLICATION. ITS RESEARCH INTO BRAIN DISORDERS COMPLEMENTS CLINICAL TRIALS AND THERAPEUTIC INNOVATIONS. PROJECTS RANGE FROM STUDYING COGNITIVE DECLINE IN AGING POPULATIONS TO DEVELOPING NEUROREHABILITATION PROTOCOLS FOR PATIENTS RECOVERING FROM BRAIN INJURY.

THROUGH COLLABORATIONS WITH THE NATIONAL HEALTH SERVICE (NHS) AND OTHER MEDICAL BODIES, THE MRC COGNITION AND BRAIN SCIENCES UNIT CONTRIBUTES TO EVIDENCE-BASED MEDICINE, INFORMING TREATMENT STRATEGIES AND IMPROVING PATIENT OUTCOMES.

#### TRAINING AND ACADEMIC CONTRIBUTIONS

As part of the University of Cambridge, the MRC CBU plays a vital role in training the next generation of neuroscientists and psychologists. It offers PhD programs and postdoctoral fellowships that emphasize rigorous scientific inquiry and methodological innovation. The unit's researchers frequently publish in high-impact journals, advancing the global discourse on cognition and brain science.

## FACILITIES AND TECHNOLOGICAL INNOVATIONS

MAINTAINING CUTTING-EDGE INFRASTRUCTURE IS ESSENTIAL FOR THE MRC CBU'S PIONEERING WORK. THE UNIT BOASTS ADVANCED NEUROIMAGING SUITES, INCLUDING ULTRA-HIGH-FIELD MRI SCANNERS AND MEG SYSTEMS CAPABLE OF CAPTURING BRAIN ACTIVITY WITH MILLISECOND PRECISION. THESE TECHNOLOGIES ENABLE RESEARCHERS TO INTERROGATE THE TEMPORAL AND SPATIAL DYNAMICS OF NEURAL PROCESSING WITH UNPRECEDENTED CLARITY.

FURTHERMORE, THE UNIT INVESTS IN COMPUTATIONAL RESOURCES AND SOFTWARE DEVELOPMENT TO SUPPORT DATA ANALYSIS, MACHINE LEARNING APPLICATIONS, AND SIMULATION STUDIES. THIS TECHNOLOGICAL BACKBONE IS FUNDAMENTAL TO SUSTAINING ITS COMPETITIVE EDGE IN THE FAST-EVOLVING FIELD OF COGNITIVE NEUROSCIENCE.

## IMPACT AND GLOBAL STANDING

THE MRC COGNITION AND BRAIN SCIENCES UNIT'S CONTRIBUTIONS HAVE RESONATED WORLDWIDE, INFLUENCING BOTH ACADEMIC RESEARCH AND PRACTICAL APPLICATIONS. ITS FINDINGS HAVE ENHANCED UNDERSTANDING OF CORE COGNITIVE FUNCTIONS AND THEIR NEURAL BASES, SHAPING EDUCATIONAL STRATEGIES, MENTAL HEALTH INTERVENTIONS, AND NEUROTECHNOLOGY DEVELOPMENT.

When compared to other leading neuroscience institutions, the MRC CBU's distinctive blend of experimental rigor, computational sophistication, and clinical relevance places it among the elite. Its open science initiatives and data-sharing policies further amplify its impact, fostering transparency and reproducibility in research.

### STRENGTHS AND CHALLENGES

Among the unit's key strengths are its multidisciplinary expertise, state-of-the-art facilities, and the strong institutional backing provided by the Medical Research Council. These assets enable it to pursue ambitious projects that address pressing scientific and societal questions.

HOWEVER, LIKE MANY RESEARCH INSTITUTIONS, THE MRC CBU FACES CHALLENGES RELATED TO FUNDING FLUCTUATIONS, TECHNOLOGICAL OBSOLESCENCE, AND THE NEED TO CONTINUOUSLY ATTRACT TOP TALENT IN AN INCREASINGLY COMPETITIVE ENVIRONMENT. BALANCING BASIC SCIENCE WITH TRANSLATIONAL GOALS ALSO REQUIRES STRATEGIC PRIORITIZATION TO MAXIMIZE BOTH KNOWLEDGE GENERATION AND REAL-WORLD IMPACT.

## FUTURE DIRECTIONS IN COGNITIVE AND BRAIN SCIENCES

LOOKING AHEAD, THE MRC COGNITION AND BRAIN SCIENCES UNIT IS POISED TO LEVERAGE EMERGING TECHNOLOGIES SUCH AS ARTIFICIAL INTELLIGENCE, ADVANCED NEUROINFORMATICS, AND PRECISION MEDICINE APPROACHES. THE INTEGRATION OF GENETIC DATA WITH NEUROIMAGING AND BEHAVIORAL ASSESSMENTS PROMISES TO UNLOCK PERSONALIZED INSIGHTS INTO BRAIN FUNCTION AND DYSFUNCTION.

Moreover, expanding virtual and augmented reality methodologies could open new avenues for studying cognition in ecologically valid settings. The unit's commitment to interdisciplinary collaboration and innovation suggests a dynamic trajectory that will continue to influence neuroscience research globally.

THROUGH ITS COMPREHENSIVE, MULTIFACETED RESEARCH AGENDA, THE MRC COGNITION AND BRAIN SCIENCES UNIT EXEMPLIFIES HOW A FOCUSED SCIENTIFIC COMMUNITY CAN DRIVE FORWARD OUR UNDERSTANDING OF THE BRAIN, ULTIMATELY IMPROVING HEALTH AND ENRICHING HUMAN POTENTIAL.

## **Mrc Cognition And Brain Sciences Unit**

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mrc cognition and brain sciences unit: Cognitive Systems - Information Processing Meets

Brain Science Richard G.M. Morris, Lionel Tarassenko, Michael Kenward, 2005-08-16 Cognitive

Systems - Information Processing Meets Brain Science presents an overview of the exciting, truly
multidisciplinary research by neuroscientists and systems engineers in the emerging field of
cognitive systems, providing a cross-disciplinary examination of this cutting-edge area of scientific
research. This is a great example of where research in very different disciplines touches to create a
new emerging area of research. The book illustrates some of the technical developments that could
arise from our growing understanding of how living cognitive systems behave, and the ability to use
that knowledge in the design of artificial systems. This unique book is of considerable interest to
researchers and students in information science, neuroscience, psychology, engineering and
adjacent fields. - Represents a remarkable collection of relevant experts from both the life sciences
and computer science - Includes state-of-the-art reviews of topics in cognitive systems from both a
life sciences and a computer science perspective - Discusses the impact of this research on our lives
in the near future

mrc cognition and brain sciences unit: The role of body and environment in cognition Dermot Lynott, Judith Holler, Louise Connell, 2014-08-25 Recent evidence has shown many ways in which our bodies and the environment influence cognition. In this Research Topic we aim to develop our understanding of cognition by considering the diverse and dynamic relationship between the language we use, our bodily perceptions, and our actions and interactions in the broader environment. There are already many empirical effects illustrating the continuity of mindbody-environment: manipulating body posture influences diverse areas such as mood, hormonal responses, and perception of risk; directing attention to a particular sensory modality can affect language processing, signal detection, and memory performance; placing implicit cues in the environment can impact upon social behaviours, moral judgements, and economic decision making. This Research Topic includes papers that explore the question of how our bodies and the environment influence cognition, such as how we mentally represent the world around us, understand language, reason about abstract concepts, make judgements and decisions, and interact with objects and other people. Contributions focus on empirical, theoretical, methodological or modelling issues as well as opinion pieces or contrasting perspectives. Topic areas include, perception and action, social cognition, emotion, language processing, modality-specific representations, spatial representations, gesture, atypical embodiment, perceptual simulation, cognitive modelling and perspectives on the future of embodiment.

mrc cognition and brain sciences unit: The Boundaries of Consciousness: Neurobiology and Neuropathology Steven Laureys, 2006-06-09 Consciousness is one of the most significant scientific problems today. Renewed interest in the nature of consciousness - a phenomenon long considered not to be scientifically explorable, as well as increasingly widespread availability of multimodal functional brain imaging techniques (EEG, ERP, MEG, fMRI and PET), now offer the possibility of detailed, integrated exploration of the neural, behavioral, and computational correlates of consciousness. The present volume aims to confront the latest theoretical insights in the scientific study of human consciousness with the most recent behavioral, neuroimaging, electrophysiological, pharmacological and neuropathological data on brain function in altered states of consciousness such as: brain death, coma, vegetative state, minimally conscious state, locked-in syndrome,

dementia, epilepsy, schizophrenia, hysteria, general anesthesia, sleep, hypnosis, and hallucinations. The interest of this is threefold. First, patients with altered states of consciousness continue to represent a major clinical problem in terms of clinical assessment of consciousness and daily management. Second, the exploration of brain function in altered states of consciousness represents a unique lesional approach to the scientific study of consciousness and adds to the worldwide effort to identify the neural correlate of consciousness. Third, new scientific insights in this field have major ethical and social implications regarding our care for these patients.

mrc cognition and brain sciences unit: The Paradoxical Brain Narinder Kapur, 2011-07-21 The Paradoxical Brain focuses on a range of phenomena in clinical and cognitive neuroscience that are counterintuitive and go against the grain of established thinking. The book covers a wide range of topics by leading researchers, including: • Superior performance after brain lesions or sensory loss • Return to normal function after a second brain lesion in neurological conditions • Paradoxical phenomena associated with human development • Examples where having one disease appears to prevent the occurrence of another disease • Situations where drugs with adverse effects on brain functioning may have beneficial effects in certain situations A better understanding of these interactions will lead to a better understanding of brain function and to the introduction of new therapeutic strategies. The book will be of interest to those working at the interface of brain and behaviour, including neuropsychologists, neurologists, psychiatrists and neuroscientists.

**mrc cognition and brain sciences unit:** The Routledge International Handbook of Psycholinguistic and Cognitive Processes Jackie Guendouzi, Filip Loncke, Mandy J. Williams, 2023-06-02 This handbook provides a comprehensive overview of the theories of cognition and language processing relevant to the field of communication disorders. Thoroughly updated in its second edition, the book explores a range of topics and issues that illustrate the relevance of a dynamic interaction between both theoretical and applied clinical work. Beginning with the origins of language evolution, the authors explore a range of both developmental and acquired communication disorders, reflecting the variety and complexity of psycholinguistics and its role in extending our knowledge of communication disorders. The first section outlines some of the major theoretical approaches from psycholinguistics and cognitive neuroscience that have been influential in research focusing on clinical populations, while Section II features examples from researchers who have applied this body of knowledge to developmental disorders of communication. Section III features examples focusing on acquired language disorders, and finally, Section IV considers psycholinguistic approaches to gesture, sign language, and alternative and augmentative communication (AAC). The new edition features new chapters offering fresh perspectives, further reading recommendations and a new epilogue from Jackie Guendouzi. This valuable text serves as a single interdisciplinary resource for graduate and upper-level undergraduate students in cognitive neurosciences, psychology, communication sciences and disorders, as well as researchers new to the field of communication disorders or to psycholinguistic theory.

mrc cognition and brain sciences unit: Research Progress in Alzheimer's Disease and Dementia Miao-Kun Sun, 2007 Alzheimer's disease (AD) is the most common type of neurodegenerative disorder in the ageing population, with dementia as a common consequence. AD is defined pathologically by the appearance of extracellular senile plaques and intracellular neurofibrillary tangles, as described by Alois Alzheimer about a century ago. The causes for AD include genetic predisposition in a small population, ageing and environmental stresses in majority cases. The underlying pathogenic cascades, increases in expression of amyloid precursor protein and accumulation of Aß and reactive oxidant activity and inflammation, have the features of both adaptive, at least initially, and harmful when becoming excessive. Dementia, on the other hand, is a clinical diagnosis and is defined as globally, persistently impaired cognitive skills including memory. Alzheimer dementia refers to clinical dementia in patients who also have Alzheimer neuropathology. Alzheimer dementia is what brings the patients to seek medical treatments. An extraordinary inability to form new memory, especially of those episodic type, and executive dysfunction are among the earliest symptoms in AD patients. In end-stage AD, cognitive degeneration extends far

beyond memory loss. The underlying causes include decreases in impaired brain metabolism, which results in impaired synaptic functions and capacities, thus impaired information processing, and eventually leads to neuronal injury and death. This book presents leading-edge research in this dynamic field.

mrc cognition and brain sciences unit: The Handbook of Memory Disorders Alan D. Baddeley, Michael D. Kopelman, Barbara A. Wilson, 2003-04-11 The eagerly awaited 2nd edition of this classic handbook is a critical, thorough account of memory disorders relating to neurological processes and to developmental and acquired brain damage and presents comprehensive sections on theory, assessment, treatment and management of memory disorders. Written by a truly international team of experts, this completely updated edition offers an authoritative review of the key areas of research and development in this field. ? Completely updated and expanded ? New sections and chapters reflect many of the biggest growth areas in the field in recent years, such as confabulation, false memory and the frontal lobes ? Written by an international team of experts

mrc cognition and brain sciences unit: Non-Invasive Brain Stimulation: New Prospects in Cognitive Neurorehabilitation Carlo Professor Miniussi, Giuseppe Professor Vallar, 2012-12-06 Cognitive deficits are a common consequence of neurological disease, and there is evidence that specific cognitive training may be effective in rehabilitation. Behavioural dysfunction following neurological disease constitutes one of the major causes of disability worldwide, exerts a major impact on the daily life of affected individuals, and their families, also with a financial burden both for patients, and the society in general. Therefore, the adequate treatment of cognitive dysfunction is a much relevant issue, with social and economical implications, over and above the neuropsychological problem per se. Several investigations emphasise the fact that interacting with neural activity, by means of cortical stimulation, can affect cognitive performance. A number of studies have reported enhanced performance in specific cognitive tasks in patients with several types of neurological disease, after receiving Non Invasive Brain Stimulation (NIBS) to specific cortical areas, namely: Transcranial Magnetic Stimulation, and transcranial Electrical Stimulation. In general, the evidence highlights the possibility of inducing changes in cortical excitability, which, in turn, may lead to a plastic reorganization of dysfunctional networks, responsible for the impaired cognitive functions. Despite these advances, a number of important questions remain open, regarding the use of stimulation techniques in cognitive rehabilitation. This special issue puts together international leading experts in the field, to review and discuss recent advances as to whether NIBS techniques alone, or combined with behavioural cognitive rehabilitation, can lead to performance enhancements, and why. The issue is timely and promises to have a huge impact across many domains of clinical and basic neuroscience.

mrc cognition and brain sciences unit: Cambridge Textbook of Neuroscience for Psychiatrists Mary-Ellen Lynall, Peter B. Jones, Stephen M. Stahl, 2023-11-16 A comprehensive, practical and highly illustrated resource on neuroscience relating to clinical psychiatric practice. The book will appeal to trainee and consultant psychiatrists, lecturers, mental health nurses, prescribing nurses and nurse practitioners, clinical psychologists, neuroscientists and postgraduate students studying neuroscience.

mrc cognition and brain sciences unit: The Neurophysiological Bases of Auditory Perception Enrique Lopez-Poveda, Alan R. Palmer, Ray Meddis, 2010-03-23 This volume contains the papers presented at the 15th International Symposium on Hearing (ISH), which was held at the Hotel Regio, Santa Marta de Tormes, Salamanca, Spain, between 1st and 5th June 2009. Since its inception in 1969, this Symposium has been a forum of excellence for debating the neurophysiological basis of auditory perception, with computational models as tools to test and unify physiological and perceptual theories. Every paper in this symposium includes two of the following: auditory physiology, psychoph- ics or modeling. The topics range from cochlear physiology to auditory attention and learning. While the symposium is always hosted by European countries, pticipants come from all over the world and are among the leaders in their fields. The result is an outstanding symposium, which has been described by some as a "world summit of auditory research."

"The current volume has a bottom-up structure from "simpler" physiological to more "complex" perceptual phenomena and follows the order of presentations at the meeting. Parts I to III are dedicated to information processing in the peripheral au- tory system and its implications for auditory masking, spectral processing, and c- ing. Part IV focuses on the physiological bases of pitch and timbre perception. Part V is dedicated to binaural hearing. Parts VI and VII cover recent advances in und- standing speech processing and perception and auditory scene analysis. Part VIII focuses on the neurophysiological bases of novelty detection, attention, and learning.

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which details of the features of the disorder, methods used for testing, and theoretical accounts are illustrated. Controversies are explained, theories evaluated and anomalies pointed out. From this emerges a picture of the central properties of each disorder and the contribution of each to our understanding of the reading system as a whole. However, the picture is not complete: loose threads tantalise, some findings are hard to explain, and some newly controversial theories are put forward. The intention is to provide information that will help to equip the reader with the knowledge and expertise necessary to take the study of these reading disorders forward.

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practitioners working with clinical populations, chapters relating to bilingual populations are also included. The volume book provides a single interdisciplinary source where researchers and students can access information on psycholinguistic and cognitive processing theories relevant to clinical populations. A range of theories, models, and perspectives are provided. The range of topics and issues illustrate the relevance of a dynamic interaction between theoretical and applied work, and retains the complexity of psycholinguistic and cognitive theory for readers (both researchers and graduate students) whose primary interest is the field of communication disorders.

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