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MA, D.Phil, FRSE, FMedSci, CBE, FRS

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Born: 27 June 1948; Worthing, England.
Nationality: British

CURRENT APPOINTMENTS

1993- Professor of Neuroscience, The University of Edinburgh, UK
2001- Adjunct Professor of Neuroscience, NTNU, Trondheim, Norway
2006- Director, Centre for Cognitive and Neural Systems, The University of Edinburgh
2011- Governing Council, Sainsbury-Wellcome Centre for Neural Circuits and Behaviour, London
2011- Trustee, MQ Mental Health Charity, London
2013- President, Federation of European Neurosciences Trust Fund
2013- Visiting Professor, Centre for Brain Development and Repair (CBDR), InSTEM, National Centre for Biological Sciences, Bangalore, India
2013- Caro Almela Professor of Neurobiology (Honorary), Institute for Neuroscience, Alicante, Spain

EDUCATION

1958-60 St. Albans School, Washington DC, USA
1960-66 Marlborough College, Wiltshire, UK
1966-69 Undergraduate at Trinity Hall, University of Cambridge, UK.
Natural Sciences Tripos, Part IB: Physics and Experimental Psychology; Part II: Experimental Psychology; College Scholarship 1968/69. MA (Hons), First Class in both parts of Tripos.
1969-73 D.Phil., Laboratory for Experimental Psychology, University of Sussex, UK (D.Phil., 1974).

PAST APPOINTMENTS

1973-75 Addison-Wheeler Fellow, University of Durham.
1975-77 Sen. Sci. Officer, British Museum (Natural History); Researcher, Science and Features, BBC TV, London.
1977-86 Lecturer in Physiological Psychology, The University of St.Andrews.
1982-86 MRC Neuroscience Grants Committee, London.
1987-93 Reader in Neuroscience, The University of Edinburgh.
1991 Visiting Professor, IAP Program, M.I.T. Cambridge USA.
1992-97 MRC Neuroscience and Mental Health Board, London.
1993-98 Director, Centre for Neuroscience, University of Edinburgh.
1996 Leverhulme Fellow (Royal Society).
1996 Co-organiser (with Alcino Silva), Mouse Behavioural Analysis, Cold Spring Harbor Laboratory, Long Island, NY, USA.
1998-2002 Chair, Department of Neuroscience, The University of Edinburgh.
1999-2003 Co-organiser (with Drs David Wolfer and Hans-Peter Lipp), Mouse Transgenics and Behaviour Course, Edinburgh and Zurich (EMBO and FENS).
2001-04 Strategy Development Group, Medical Research Council, London.
2006-11 Royal Society/Wolfson Professor of Neuroscience
2005-09 Founder and Co-Director, Edinburgh Neuroscience
2007-10 Head, Neuroscience and Mental Health, Wellcome Trust, London (part-time secondment)

MEMBERSHIP of SCIENTIFIC SOCIETIES, FELLOWSHIPS, PRESIDENCIES ETC

1975- Experimental Psychology Society. Executive Committee (1979-82); Hon. Secretary (1985-89).
1975- Brain Research Association (later British Neuroscience Association). Local Area Secretary (St. Andrews) from 1978-82; First Scottish Meeting (1983); National Committee (1980-84); President 1990-94.

- 1983- Society for Neuroscience (SfN), USA. Programme Cttee (2000-2003).
- 1983- International Neuropsychological Symposium (INS). Regional Secretary (2004-07).
- 1977- European Brain and Behaviour Society (EBBS). Executive Committee (1980-82).
- 1990 European Neuroscience Association (ENA). Member of Council (1993-98).
- 2006-08 President, Federation of European Neuroscience Societies (FENS). President-Elect (2006-08). President, FENS Trust (2013-).
- 2007- Commander of the British Empire (CBE).

ELECTED MEMBERSHIP OF ACADEMIES

- 1994 Fellow, Royal Society of Edinburgh (Council 2001-2004; Sectional Cttee, Member 1992-94 and 2010-12; Chair 1994-96).
- 1997 Fellow, Royal Society of London (Editorial Board, Phil. Trans. Roy. Soc. B. 1997-2002; Chair, URF Committee for Biology, 2011-2014; Sectional Cttee 8, 1998-2001; 2012-15; Chair, Hooke Committee (Discussion Meetings), 2013-5; Public Engagement Cttee, 2013-15).
- 1998 Founding Fellow, Academy of Medical Science, London.
- 2004 Fellow, American Academy of Arts and Sciences, Cambridge, MA, USA.
- 2005 Fellow, American Association for the Advancement of Science (AAAS), Washington DC, USA.
- 2007- Foreign Fellow, Norwegian Academy of Science and Letters, Trondheim, Norway.

TEACHING

- 1977-86 Lecturing at the University of St. Andrews. Brain and Behaviour course (3rd Year – 150 students annually). Honours Course Module on Learning and Memory (typically 20+ students). Lab based project supervision.
- 1986- Inaugural course organiser for Hons. Neuroscience degree (Biomedical Sciences). Began with 5 students (AY1986/87) and now with 85 students (AY2012/13). Course organiser for 9 years; then as Chair of the Honours Examinations Board. Organiser of Learning and Memory module (1986-2002; Cognitive Neuroscience module (2002-2007); Neurobiology of Cognition module (2007-current)
- 1986- Lab-based project supervision – varying from 2-6 students per year.
- 1986-2003 Occasional lectures on cognitive neuroscience to MBChM class (medical students).
- 1986-2007 Brain and Behaviour 3rd Year course (jointly with Zoology Department; team-teaching with Professor Aubrey Manning). Numbers varying between 90 (initially) and up to 180 students.
- 1986- M.Sc teaching – in Neuroscience M.Sc course - joint course with School of Informatics (EPSRC Doctoral Training Centre for computer scientists, physicists and mathematicians interested in the brain).

NAMED LECTURES, PLENARY LECTURES, AWARDS AND PRIZES

- 1987 Organiser and speaker, Experimental Psychology Symposium on “Parallel Distributed Processing: Implications for Psychology and Neurobiology” (Oxford University).
- 1988 *Nature* magazine symposium “How the Brain works”, Cambridge, MA, USA.
- 1988 Plenary speaker at meeting on Excitatory Amino Acids, Manaus, Brazil.
- 1989 BAYS Lecture, British Association (Section J, Psychology).
- 1990 Lecture at Academia de Lincei, Rome, Italy.
- 1990 Plenary Lecture, IUPHAR, Role of NMDA receptors in learning, Amsterdam, Holland.
- 1991 Segerfalk Lecture, Lund University, Lund, Sweden.
- 1992 Cold Spring Harbor Laboratory, Annual Symposium on Quantitative Aspects of Biology.
- 1993 Dahlem Conference, Synaptic Plasticity and Memory, Berlin, Germany.
- 1993 Novo-Nordisk Foundation Symposium on “Memory Concepts”, Copenhagen, Denmark.
- 1993 Lecturer, Woods Hole Advanced Course on Neurobiology and Behaviour, MA, USA.
- 1993 Plenary and Symposium speaker, European Brain and Behaviour Society, and European Neuroscience Association, Madrid.
- 1994 Lansdowne Lecturer, Univ. Victoria, BC, Canada.
- 1994 Nobel Symposium on Higher Cognitive Function, Stockholm, Sweden.
- 1995 Plenary speaker, German Neurobiology Meeting, Gottingen.
- 1996 Swammerdam Lecturer, Netherlands Royal Academy (KNAW), Amsterdam.
- 1996 Visiting Research Fellow, Dept. Neurophysiology, University of Oslo, Norway.
- 1997 Speaker, NIH Neuroscience Series, Bethesda, Washington DC, USA.
- 1997 Speaker, Opening of the RIKEN Brain Sciences Institute, Tokyo, Japan.

- 1998 Decade of the Brain Lecture, BNA, London.
- 1998 Feigen Lecture, Stanford University, Palo Alto, USA.
- 1998 Henry Dryerre Prize of the Royal Society of Edinburgh.
- 1999 Speaker at Howard Hughes Symposium on "The Synapse", Washington DC, USA.
- 1999 Jerzy Konorski Lecturer, 4th Annual Polish Neuroscience Society, Gdansk, Poland.
- 1999 Zotterman Lecture, Swedish Physiological Society, Karoilnska Institute, Stockholm, Sweden.
- 2000 Crisp Lecture, University of Leeds, UK.
- 2000 Plenary Lecture, Society for Neuroscience, Portugal.
- 2001 Opening Lecturer, Centre for Cognitive Neuroscience, Peking University and Chinese National Academy of Science, Beijing, PRC.
- 2002 Invited Lecturer, Peking University and Chinese National Academy of Science, Beijing, PRC.
- 2002 Outstanding Achievement in Neuroscience, British Neuroscience Association.
- 2002 Charles E. Smith Lecture, Psychobiology Institute, Hebrew University of Jerusalem, Israel.
- 2003 American Medical Alumnus Lectures, University of St Andrews, UK.
- 2004 Frijda Lecture, Netherlands Royal Academy, Amsterdam.
- 2004 Craik Lecture, Physiology Laboratory and St. Johns College, Univ. Cambridge
- 2004 European Journal of Neuroscience Award for Achievement in Neuroscience, with Plenary Lecture in Lisbon, Portugal.
- 2006 Plenary Lecture, Swedish Physiological Society.
- 2007 Santiago-Grisolia Award and Lectures (jointly with Erwin Neher), Valencia, Spain.
- 2006 Feldberg Prize, Germany (given in Martinsried and Magdeburg).
- 2006 Plenary Lecture, Turkish Neuroscience Society.
- 2009 Presidential Lecture, Society for Neuroscience, Chicago, USA
- 2011 Public Lecture on Memory, Carl Friedrich von Siemens Stiftung, Munich, Germany (lecture printed and translated into German)
- 2012 Invited Lecture, 75th Anniversary of Albert Szent-Györgyi's Nobel Prize Award
- 2012 Joint meeting between Royal Society of Edinburgh and INSERM (co-organised with J-P Changeux)
- 2013 Fondation IPSEN Neuronal Plasticity Prize, Lyon, France.
- 2014 Royal Medal, Royal Society of Edinburgh, for services to biomedical science; Edinburgh, Scotland.

PUBLIC AWARENESS OF SCIENCE, ADMINISTRATION AND SCIENCE POLICY

- 1981 "The Burt Scandal", BBC Radio 4 (Documentary).
- 1983 "Spatial Learning and the Hippocampus" The Open University, BBCTV. Programme created by Dr Fred Toates and Professor D S Olton (Johns Hopkins University).
- 1988 Consultant for "The Mind Machine" BBC TV, presented by Professor Colin Blakemore (Oxford University). Participated in Programme 3 entitled "Remembering".
- 1991 Edinburgh Science Festival ("Unmasking the mysterious mechanisms of memory").
- 1993 Consultant and participant in Channel 4 documentary on Memory, presented by Dr David Cohen.
- 1995 & 03 Produced Schools Booklet on 'Neuroscience' that was distributed *gratis* to every Secondary School Science Department in the UK. 2nd edition 2003. Now translated into several languages, under the auspices of IBRO, including Mandarin (right image) for distribution in Chinese Schools by Ministry of Education (PRC)
- 1999- Executive Council, European Dana Alliance for the Brain.
- 2000 Forum Fellow at World Economic Forum, Davos.
- 2000 Public Lecture (Brain Awareness Week) on 'Memory and Brain' at the Museum of Scotland, Edinburgh.
- 2005-10 Public events associated with RS/Wolfson Award, in collaboration with and largely under the direction of Dr Jane Haley (www.edinburghneuroscience.ac.uk)
- 2006-12 Membership of Branco Weiss "Society in Science" Fellowships Panel, ETH, Zurich.
- 2012 Public Lecture on Memory, Indian Institute of Science, Bangalore, India.



SCIENTIFIC ADVISORY BOARDS

- 1998-2011 Dean's Advisory Group for the Picower Centre, MIT, Cambridge, USA.
2000-2005 Max-Planck Institute for Neurobiology, Martinsried-Munich, Germany.
2002-2008 RIKEN-Brain Sciences Institute, Tokyo, Japan.
2003- Guarantor of Brain (UK)
2004-08 Alzheimer's Research Trust (UK)
2005-2011 Branco Weiss Science and Society Fellowships (Switzerland)
2009-2013 Shanghai Institute for Neuroscience (China)
2009- Gladstone Institute San Francisco (USA).
2013- Max-Planck Institute for Cybernetics, Tuebingen, Germany.

SERVICE TO THE UK GOVERNMENT, NATIONAL and INTERNATIONAL ORGANISATIONS

- 2002-05 Life Sciences Coordinator, Foresight Cognitive Systems, Office of Science and Technology, Department of Trade and Industry, London, UK.
2003-2008 Scottish Science Advisory Council
2006 President's Advisory Group, Weizmann Institute (Israel)
2013- FENS Trust (President of Trustees Group of FENS)

KNOWLEDGE TRANSFER AND CONSULTANCY

- 1985- Merck, Sharp and Dohme Ltd, UK (Advice on setting up of watermaze).
1987 Sandoz, Basel Switzerland; Ferrosan, Copenhagen, Denmark; Roussel, Swindon, UK;
2000- Creation of the Watermaze Partnership, and development of software for (initially) Acorn Computers, and later PCs. Development of video frame-grabbing, jointly with Patrick Spooner and David Ferster, and marketing of Watermaze©.
2013- SAB, Dart Neuroscience, San Diego, USA

EDITORIAL WORK

- 1988 Editorial Committee, with Professor E R Kandel and L R Squire, of "Special Issue" of *Trends in Neurosciences* concerned with Learning and Memory.
1988-91 Executive Board, *Network*, Institute of Physics, UK.
1990- Editorial Board, *Hippocampus*, (Wiley, USA).
1991- Editorial Board, *Trends in Neurosciences*, (Elsevier, UK).
1991-2006 Editorial Board, *European Journal of Neuroscience*, (Oxford University Press, UK).
1992- Associate Editor, *Behavioural and Neural Biology*, now *Neurobiology of Learning and Memory*, Academic Press (USA).
1993-96 Associate Editor, *Quarterly Journal of Experimental Psychology*, (EPS,UK).
1994-96 Founding Co-Editor, *Learning and Memory*, (Cold Spring Harbor Laboratory Press, USA), now on Editorial Board after rotation.
1994- Associate Editor, *Current Opinion in Neurobiology*, Current Biology Ltd. Guest Editor (with D Amaral and M Mishkin) of 1995 Issue of *Current Opinion in Neurobiology* on Cognitive Neuroscience; also 2000 issue (with the late Pat Goldman-Rakic).
1994-2003 Associate Editor, *Neuropharmacology*, Elsevier Press, UK.
1997-2001 Editorial Board, *Journal of Neuroscience*, USA.
1997-2001 Editorial Board, *Philosophical Transactions of the Royal Society*.
2002-06 Advisory Board, *Public Library of Science Biology* (USA).
2006- Editor, Faculty 1000, Cognitive Neuroscience.
2007- Board of Reviewing Editors, *Science*, Washington DC, USA.

Ongoing... Occasional reviewing for Nature, Science, Proceedings of the National Academy of Sciences, Cell, Neuron, Nature Neuroscience, Public Library of Science Biology, European Journal of Neuroscience, Neuropsychologia, Journal of Neuroscience Methods, Experimental Brain Research and several other journals.

RESEARCH INTERESTS AND ACHIEVEMENTS

One of the “grand challenges” of contemporary neuroscience is the question of how we learn and remember. This challenge has long been the subject of analysis by philosophers (e.g. Locke’s “associationism”), anatomists (Ramon y Cajal “growth of connections”), psychologists (Hebb’s “cell-assemblies”) and many others in biomedical disciplines. In the contemporary era of neuroscience, the scope of investigation has expanded to include diverse scientists – including virtually all of the sub-disciplines that have coalesced into “neuroscience”, and including computational neuroscientists, mathematicians and physicists.

My primary research interest is the neurobiology of learning and memory. I seek an understanding of the functions of memory and of how it works at the level of neurons, brain systems, physiological events and transmitter receptor action. I also have an active interest in the application of concepts and techniques from this fundamental work to develop new therapeutics targeted at the cognitive disorders associated with Alzheimer’s Disease. Key scientific achievements include:

- the development of the *watermaze* (now used worldwide);
- discovery of the role of the *NMDA receptor* in learning and memory;
- joint development of the *synaptic tagging and capture* hypothesis;
- the *neurobiology of prior knowledge (schemas)*.
- the development of age- and disease-related paradigms for investigating changes in memory in *animal models of Alzheimer’s Disease*.

The origins of the *watermaze* lay in addressing whether the ‘place cells’ (discovered by O’Keefe) serve a causal role in navigation and spatial memory. Our experiments using the watermaze established definitively that the integrity of the hippocampal formation was essential for these functions – both at the time of memory encoding and during retrieval. A subsequent series of behavioural studies established optimal parameters for the watermaze and these helped its widespread adoption by other academic groups and by the pharmaceutical industry. It has come to be used as a rapid behavioural assay for investigating diverse issues ranging from neural protection in experimental models of ischaemia, models of Alzheimer’s Disease, and the development of ‘cognitive enhancers’. The watermaze played a significant role in the discovery of the effectiveness of ‘memantine’ (Merz) in Alzheimer’s Disease - now in clinical use. Software for the use of the watermaze is now marketed by a number of companies in the USA, Europe and the Pacific-Rim, with our own software developed jointly with Dr David Ferster (Northwestern University) now marketed via both his own company (Actimetrics USA) and Harvard Instruments (USA). We have also devised modified behavioural protocols for the watermaze for transgenic mice and used these extensively in our translational research (with Elan and Janssen) on the impact of immunization on cognition in Alzheimer’s Disease.

The *NMDA receptor work* includes the initial discovery of the role of this receptor in memory encoding. This has been followed up others, with my own work over 20 years including numerous studies examining the behavioural, pharmacological and molecular-biological aspects of the role of the NMDA receptor in long-term potentiation and memory. We established that NMDA receptors in hippocampus are essential for memory encoding but not for retrieval using thorough pharmacological dose-response analyses. We now have a secure understanding, supported by molecular-genetic studies, of the critical role of hippocampal NMDA receptors for ‘episodic-like’ memory encoding.

The work on *synaptic tagging and capture* addresses the issue of how the products of protein synthesis associated with synaptic plasticity are directed at synaptic sites where change has been triggered. The idea, developed with Julie Frey (in Germany) is that long-term potentiation alters synaptic strength on a temporary basis but also sets ‘tags’ at sites where longer-lasting change may be possible. In circumstances where the availability of plasticity-related proteins (PRPs) will be or has been upregulated, the relevant proteins are captured by tags at the sub-set of synapses at which change is then allosterically stabilised. We are investigating this idea in physiological, molecular, optogenetic and behavioural studies.

The last strand concerns *schemas*. There is a further step to consolidation that Dudai (Israel) and I have called ‘systems consolidation’ in which interactions occur between distinct brain areas – e.g. between allocortical regions such as the hippocampus and specific sub-regions of the neocortex (e.g. retrosplenial cortex, medial prefrontal cortex). Psychological and computational neuroscience work on systems consolidation is extensive, but our neurobiological understanding is limited. We are now investigating the classic psychological idea of ‘schemas’ at the neurobiological level – endeavouring to bring the whole issue of activated prior knowledge into sharp focus.

Finally, a monograph (with Andersen, Bliss, O'Keefe and Amaral) called "*The Hippocampus Book*" is the definitive text on the hippocampus. I also have interests in Research Administration that developed through my time as Chairman of the Brain Research Association, and latterly as President of the Federation of European Neuroscience Societies. During a part-time secondment to the Wellcome Trust, I helped develop a new £140 million research centre for the study of "Neural Circuits and Behaviour" jointly with the Gatsby Charitable Trust. This Sainsbury-Wellcome Centre, of which I am a Trustee, will open in 2014 (Director: Professor John O'Keefe).

The work of my research group has been recognised through widespread citation (circa 22,000+ citations; ISI Highly Cited List; 26,000 Google Scholar).

SCIENCE and RESEARCH ADMINISTRATION

In addition to my research and teaching in the University, I have been privileged to serve in a variety of support roles during my career. These include a period as President of the British Neuroscience Association and later, from 2006-2008, as the elected President of the Federation of European Neuroscience Associations. I have recently taken on the Presidency of the FENS Trust - which looks after the capital assets of FENS in a manner that is semi-independent of the Governing Council. I have served on the Neuroscience Grants Committee and later the Neuroscience and Mental Health Board of the Medical Research Council. And, from 2007 to 2010, I was seconded to serve as Head of Neuroscience and Mental Health at the Wellcome Trust where I played a particular role in the Dividend Release component of the Trust's then funding (under Sir Mark Walport). I have served on a number of Scientific Advisory Boards, in Germany (Max-Planck), the USA (Gladstone Institute) and in China (Shanghai). I also had a fascinating period seconded to the Foresight Office of the then Department of Trade and Industry where I served as the co-coordinator of the "Cognitive Systems" project (2001-2004), and was later a member of an influential report on the use of non-human primates in research (the Weatherall Report).

I have served on Sectional Committees at the Royal Society (SC8 – twice) and am presently the chair of the University Research Fellowships Panel for Biology and of the Hooke Committee (for Discussion Meetings). I have served in a similar capacity at the Royal Society of Edinburgh where I also had a period on Council.

Within the University of Edinburgh, I created the Centre for Neuroscience, an initial 'umbrella' group to bring diverse neuroscientists together; this was later re-organised to create "Edinburgh Neuroscience" of which I was the first co-Director (the other was a clinician, Professor Charles Warlow). Following our start and period in charge (5 years), successive directors have taken Edinburgh Neuroscience to new heights and it now has around 500+ on the mailing list and around 350 attendees at our annual neuroscience day.

RESEARCH GRANTS

1980-83	MRC (£28,065) G979/265/n "Hippocampal electrical activity and behaviour.
1981-83	ETPBBR (European Science Foundation) (FF12,180) "Entorhinal hippocampal information transfer during spatial learning" (with Dr Françoise Schenk, Université de Lausanne, Switzerland).
1983-86	SERC (£28,639) GR/C/39071 "Dissociation of memory subsystems impaired by hippocampal lesions and an analysis of functional recovery".
1983	The Royal Society (£2,106) "Does leupeptin block long-term potentiation and aspects of memory?" (Equipment grant).
1983-86	MRC (£81,261) G83/1497N "Does long-term potentiation/synaptic enhancement have anything to do with learning or memory?" (Personal MRC Fellowship providing own salary under RFAS scheme).
1983-88	MRC (£172,847) RG/400012 "Cognitive Neuroscience Research Group" (Director: Professor M A Jeeves).
1986-88	ETPBBR (European Science Foundation) (FF 15,000) "Neurotoxic lesions of the hippocampus, subiculum and entorhinal cortex" (Renewal of ESF grant with Dr Schenk).
1986-90	Wellcome Trust (£29,457) W86/16142 "The role of N-methyl-D-aspartate receptors in learning and memory".
1986-87	MRC (£9,669) G86/17071N "Do hippocampal synaptic plasticity and NMDA receptors play a causal role in certain kinds of learning?".
1988-92	MRC (£424,836) PG85/14914 "The relationship between the function and structure of the hippocampal system" (Held jointly with Dr David Willshaw - MRC External Scientific Staff, Centre for Cognitive Science, University of Edinburgh).

- 1989-92 EEC Grant under BRAIN programme (£98,500) A Twinning Grant on Neural Computing, jointly with colleagues in Oxford (Dr Edmund Rolls) and Edinburgh (Professor David Wallace, Department of Physics and Dr David Willshaw) providing funds for joint projects between Edinburgh University and several other European Institutions.
- 1990-93 MRC (£68,225) G88/26018N "The firing of hippocampal complex-spike cells during place-navigation.
1990 Wolfson Trust (£119,000) "Laboratory for Neuroscience, University of Edinburgh". A 'bricks and mortar' grant to construct a new laboratory (Jointly with Professor I M L Donaldson and Professor M J Morgan).
- 1990-93 Human Frontiers Science Panel (\$900,000; own share \$75,000) "The mechanisms and functions of long-term potentiation and depression". Joint grant with 10 others in other parts of Europe, USA, Canada, Japan and New Zealand (Director: Dr T V P Bliss, NIMR, London).
- 1991-92 Wellcome Trust (£21,154) W91/034541/1.5 "Do the psychological processes underlying spatial learning and memory differ from those involved in other forms of learning?"
- 1992-97 Medical Research Council (£651,026) PG9200370 "The functions and mechanisms of the hippocampal formation".
- 1992 Medical Research Council (£163,945) "Molecular characterisation of region-specific genes in the brain: transgenic animals, the hippocampus and the study of cognitive function". Project Grant jointly with Professor R Lathe (AFRC Centre for Genome Research, Edinburgh).
- 1992 Wellcome Trust (£10,422) Extension of Grant W91/034541/1.5 above for 6 months only.
- 1993-96 Wellcome Trust (£78,779) "The psychological processes and neuro-anatomical basis of spatial learning and memory".
- 1994 Human Frontiers Science Program (US\$894,000) "The role of hippocampal synaptic plasticity in learning and memory" Joint project with colleagues in several countries of which I am the convenor (other colleagues in Britain, Norway, Switzerland, France and USA).
- 1995 The Gatsby Foundation (UK£128,000) "The molecular engineering of memory function" (Joint grant with Professor Rick Lathe, Dr Seth Grant and Dr Bill Skarnes).
- 1996 Leverhulme Fellowship, Royal Society (UK£21,000). Support for Temporary Lecturer to enable full-time involvement in research.
- 1997 MRC Programme Grant (£1.15 million). "The functions and neural mechanisms of the hippocampal formation". Programme Grant, renewed October 1997 - September 2002. End Date 30 September 2002.
- 1998 The Cunningham Trust (£27,443). "Does overexpression of mutant APP cause an age-related change in cognitive function?" End date March 2002.
- 1999 Joint Infrastructure Fund (£3,338,029.00). "Refurbishment of the Department of Neuroscience: development of molecular genetic facilities at the University of Edinburgh". End Date February 2005.
- 1999 E.U. Framework V (£126,000). Edinburgh component of multicentre FV grant involving several European laboratories led by Prof. E Moser (University of Trondheim). End date 31 July 2003.
- 2000 MRC Innovation Grant (£41,386) "An animal model of episodic-like memory". End date February 2002.
- 2000 MRC Cooperative Group Grant (£290,764) "Synaptic Plasticity and Memory". Jointly held grant led by Morris involving colleagues at the University of Edinburgh and Stirling. End Date 31 August 2005.
- 2001-04 HFSP Grant (£93,750.00) "The consolidation and reconsolidation of memory". Joint grant led by Professor J LeDoux (New York University) involving Bonhoeffer (MPI-Martinsreid), Dudai (Rehovot), Morris (Edinburgh) and Nader (McGill).
- 2002-05 Volkswagen Foundation (£114,724) "The synaptic tagging hypothesis of memory trace formation, exploring implications with respect to behaviourally expressed memory".
- 2002-07 MRC Programme Grant (£1,586,632). "The functions and neural mechanisms of the hippocampal formation in memory. Jointly held with Dr Bruno Fringuelli, University of Dundee.
- 2002-06 Alzheimer's Research Trust (£147,101) "Functional assessment of mouse models of Alzheimer's Disease".
- 2005 Help the Aged (£11.5 million) "The Disconnected Mind" Application led by Professor Ian Deary, Humanities and Social Sciences, Univ. Edinburgh and with 10 others.
- 2005 Human Frontiers Science Program (US\$ 1,350,000). "The synaptic tagging and capture hypothesis". Application led from Edinburgh and with 3 others (Bito - Japan, Bonhoeffer - Germany, Van Rossum - Edinburgh).
- 2007-12 Medical Research Council (£2.56 million for 4 years). "*Hippocampal, Subcortical and Cortical Interactions in Memory and Plasticity.*" With Dr Bruno Fringuelli.

Current Grants

- 2007-13 E.U. Framework 7. MEMOLOAD. (£364,000). "MEMOLOAD". Joint grant in an international team led by Prof. Heikki Tanila (Kuopio, Finland).

- 2011-16 European Research Council Advanced Investigator Grant (Euro 3.1 million). *“NEUROSCHEMA”*. Jointly with Prof. Dr. Guillen Fernandez (Donders Institute, Nijmegen).
- 2013-16 European Union Framework VI (ICT-FCT Grant – Euro 2.3 million over 3 years). *“GRIDMAP”* Led by Professor Edvard Moser (Trondheim) with 4 PIs.
- 2012-13 Janssen Alzheimer Immunotherapy, San Francisco. Research Grant for research on early diagnosis and treatment in an animal model of Alzheimer’s Disease.
- 2013-14 Mitsubishi Tanabe Pharmaceutical Company, Yokohama, Japan (£35,000 over 1 year).
- 2013-14 Dart Neuroscience, San Diego (US\$206,000 over 1 year).

RESEARCH COLLEAGUES (GRADUATE ASSISTANTS AND POSTDOCS)

- 1980-85 J J Hagan (Research Assistant 1B, later 1A). Dr Hagan became Vice-President for Research at Glaxo-SmithKline in Harlow, Essex.
- 1983-85 E Anderson (Research Assistant 1B). After further research at the Institute of Psychiatry in London, Liz Anderson trained as a Clinical Psychologist and now lives in York.
- 1984-86 R G Halliwell (Research Assistant 1B). Moved to the University of Sunderland.
- 1986-90 S Davis (PhD student). Dr Davis is now a C.N.R.S. tenured scientist at Orsay near Paris.
- 1986-95 E Forrest (Histology Technician). Now retired.
- 1987-91 Dr I C Reid (PhD student). Dr Reid is now Professor of Psychiatry at the University of Aberdeen.
- 1988-89 Mr R Hendry (Research Assistant 1B). Now in senior management of a Clinical Trials Company in East Kilbride.
- 1989-91 Dr C Stewart (Research Assistant 1B). PhD completed at the University of Aberdeen and is now a Senior Lecturer at the University of Dundee.
- 1989-95 Dr D Bannerman (Research Assistant 1B and PhD student), now a Wellcome Trust Principal Research Fellow at the University of Oxford (with Professor J N P Rawlins).
- 1990-96 Dr R Spooner (Computing Assistant). Completed a PhD in Computer Science at the University of York and now in private business in Glasgow.
- 1990-93 Dr H Nakada (PhD student, Fujisawa Pharmaceutical Company), continuing as a scientist with Astellas in Japan.
- 1990-97 Dr R Biegler (Research Assistant 1A and PhD student) now a Lecturer at the Norwegian Technical University (Trondheim, Norway).
- 1990-94 Dr K J Jeffery (Research Assistant 1A and PhD student). Now Professor of Psychology and Head of Department at University College London.
- 1990-94 Dr M A Good (Postdoctoral Research Fellow, 1A). Now Professor of Psychology at the University of Cardiff.
- 1992- Mr P Spooner (Electronics and Computing Assistant). Still working in my group.
- 1993-94 I Brockbank (Computing Assistant). Became a computer programmer at the Digital Equipment Corporation, Livingston, Scotland.
- 1993-2013 Dr S J Martin (PhD Student, MRC). Later a Postdoctoral Fellow in my MRC funded research group, now with a tenure-track post at the University of Dundee.
- 1994- Dr M A Ramsay (Research Assistant and M.Sc student, Ph.D from the University of Cardiff).
- 1994-96 Professor E Moser (HFSP Postdoctoral Fellow, from the University of Oslo, now Director of the Kavli Centre for Systems Neuroscience at the Norwegian Technical University of Trondheim.)
- 1994-96 Professor M-B Moser (HFSP Postdoctoral Fellow, from the University of Oslo; now Professor of Psychobiology, Norwegian Technical University of Trondheim).
- 1995-98 Dr R Steele (Postdoctoral Research Fellow, 1A; now a schoolteacher)
- 1995- Dr D Foster (Faculty of Medicine, Ph.D student; later a postdoc at the Picower Institute at M.I.T. and now an Associate Professor, Department of Neuroscience, The Johns Hopkins University).
- 1995- Dr L de Hoz (Research Student, European Science Foundation; then a postdoc with Dr Emma Wood, a “Young Group Leader” at the Charité in Berlin and now an independent postdoc in Tel-Aviv.
- 1995-96 Ms T Anthony (Research Assistant).
- 1996- Mrs Jane Tulloch (Histology Technician). Still in my group.
- 1996-98 Dr Gernot Riedel (Postdoctoral Research Fellow, 1A; now Professor of Neuroscience, University of Aberdeen).
- 1998- Dr C O’Carroll (Research Assistant and part-time Ph.D student, MRC; Ph.D 2003), now a Research Scientist at Dart Neuroscience.
- 1998- Ms Beatrice Poeschel (Visiting scientific worker from Germany).

- 1998- Dr Paul Grimwood (Wellcome Trust International Travelling Fellow; now an independent consultant in computer science).
- 1998- Dr Jennifer Inglis (Postdoctoral Research Fellow, 1A; MRC), now a schoolteacher in New Zealand.
- 1999- Dr Chen Guiquan (Research Assistant, 1B and part-time Ph.D student; Ph.D 2004), became a postdoctoral fellow at Harvard Medical School, returned to Edinburgh, now in a tenure-track post in China (PRC).
- 1999 Mr Masahiro Tanji (Visiting scientific worker from Japan).
- 2000 Dr Mark Day (Postdoctoral Research Fellow, 1A; MRC, then a Research Scientist at GSK, then at Wyeth).
- 2001 Dr Johan Sandin (Postdoctoral Research Fellow from Karolinska Institut, Stockholm).
- 2002-03 Ms Rosamund Langston (AR1B, Research Assistant; became a Ph.D student with Dr Emma Wood, a postdoc at NTNU, and now a Lecturer at the University of Dundee).
- 2002-09 Dr Tobias Bast (AR1A, Postdoctoral Research Fellow, became a Caledonian Research Fellow and now a Lecturer at the University of Nottingham).
- 2003-10 Mr Roger Redondo (AR1B and Ph.D student, later postdoc in my group); moved to second postdoc with Susumu Tonegawa at the Picower Institute in MIT.
- 2004-09 Mr Bruno da Silva (Ph.D student). Moved to medical training in his native Portugal.
- 2005-11 Dr Stephanie Daumas (Research Fellow, Fondation Fyssen, France); now a Lecturer in Paris.
- 2005- Ms Dorothy Tse (Research Assistant, later transferring to U of E supported Ph.D student). Is now a postdoc in my group.
- 2006-10 Dr Ingrid Bethus (Research Fellow, Fondation Fyssen, France). Now a lecturer at the University of Nice, France.
- 2006-08 Dr Iain Wilson (Postdoctoral Research Fellow, MRC Programme Grant; formerly in Finland). Dr Wilson sadly died in a bicycle accident in Edinburgh.
- 2006-09 Dr Marie Pezze (Lloyds TSB Research Fellow in Ageing, Edinburgh).
- 2008- Dr Tomonori Takeuchi (Research Fellow of the Uehara Memorial Foundation, Japan). Currently working on my ERC Advanced Researcher Grant.
- 2009-2013 Dr Vassilios Beglopoulos, (Postdoctoral Research Fellow, MEMOLOAD EC grant)
- 2011- Dr Lisa Genzel, currently working on my ERC Advanced Researcher Grant.
- 2012- Dr Mio Nonaka (Sponsored Research Fellow, JSPS Fellowship, Japan)
- 2013- Dr Janine Rossato (Sponsored Research Fellow, Brazil).
- 2013- Mr Richard Fitzpatrick (Graduate Research Assistant)

POSTGRADUATE SUPERVISION

- 1982-85 M D Baker (PhD student). Dr Baker worked as a postdoc at UCL and then transferred to Pfizer (UK).
- 1985-88 K Garvey (PhD student). Now a Clinical Psychologist in Coventry.
- 1986-1990 Sabrina Davis (PhD Thesis: *The role of the NMDA receptor in the hippocampus in certain forms of learning*)
- 1987-1988 Fiona Tweedie (MSc Dissertation: *The effects of neurotoxic lesions of the hippocampus and subiculum on memory*)
- 1988-1992 Ian Reid (PhD Thesis: *The neurobiology of olfactory learning in the rat*)
- 1989-1993 Kathryn Jeffrey (PhD Thesis: *Hippocampal long-term potentiation: and electrophysiological correlate of spatial learning in the rat*)
- 1989-1994 David Bannerman (PhD Thesis: *The relationship between hippocampal long-term potentiation and spatial learning*)
- 1991-1996 Robert Biegler (PhD Thesis: *Short and medium range navigation and its relationship to cognitive mapping and associative learning*)
- 1992-1996 Hirohisa Nakada (PhD Thesis: *The effects of a non-competitive NMDA receptor antagonist FR115427 on LTP, spontaneous behaviour and performance in the water maze*)
- 1995-2001 Livia de Hoz (PhD Thesis: *Memories along the longitudinal axis of a rodent hippocampus: acquisition and consolidation of variants of a spatial task*)
- 1995-1999 David Foster (PhD Thesis: *A computational inquiry into navigation with particular reference to the hippocampus*)
- 1996-1997 Holly Bridge (MSc Dissertation: *The electrophysiological and behavioural consequences of temporary hippocampal inactivation*)
- 1998-2003 Colin O'Carroll (PhD Thesis: *Investigations of protein synthesis dependent long-term potentiation and the role of dopamine in long-term memory*)
- 1999-2005 Guiquan Chen (PhD Thesis: *Investigations of age- and plaque-related learning deficits in PDAPP mice and evaluations of anti-amyloidosis strategies on APP transgenic mice*)

- 2002-2006 Dione Kobayashi (PhD Thesis: *Behavioural and histochemical characterisation of a novel BACE knockout x PDAPP mouse model of Alzheimer's Disease: examination of potential effects of BACE inhibition on Alzheimer's Disease and the role of AOO, A β and BACE in normal and pathological memory function*)
- 2003-2010 Roger Redondo (PhD Thesis: *The tagging and capture hypothesis of synaptic plasticity; the roles of calmodulin kinases and the phenomenon of behavioural tagging*)
- 2004-2009 Bruno Tiexera da Silva (PhD Thesis: *Synaptic tagging and capture mechanisms during the formation of memory: an exploratory study*)
- 2006-2011 Dorothy Tse (PhD Thesis: *Schema and memory consolidation*)
- 2010-2011 Hanna Nowers (MSc Dissertation: *The characterization of synaptic tagging and capture in the mouse*)
- 2010- Sarah Bates (PhD) - ongoing
- 2010- Mathew Harris (PhD) - ongoing
- 2011- Adrian Duszakiewicz (PhD) - ongoing
- 2013- Andrea Moreno (PhD student – shared with Institute for Neuroscience in Alicante).

SELECTED PUBLICATIONS

- RGM Morris**, P Garrud, JNP Rawlins and J O'Keefe (1982) Place navigation impaired in rats with hippocampal lesions. *Nature*, 297: 681-683 (3389 citations, ISI list).
- RGM Morris** (1984) Developments of a watermaze procedure for studying spatial learning in the rat. *J. Neurosci. Meth.* 11: 47-60 (2724 citations).
- RGM Morris**, E Anderson, M Baudry and GS Lynch (1986) Selective impairment of learning and blockade of long-term potentiation in vivo by AP5, an NMDA antagonist. *Nature*, 319: 774-776 (2272 citations).
- U Frey and **RGM Morris** (1997) Synaptic tagging and long-term potentiation. *Nature*, 385: 533-536 (673 citations)
- G Chen, KS Chen, J Knox, J Inglis, A Bernard, SJ Martin, A Justice, L McConlogue, D Games, SB Freedman and **RGM Morris** (2000) A learning deficit related to age and B-amyloid plaques in a mouse model of Alzheimer's Disease. *Nature*, 408: 975-979. (407 citations).
- P Andersen, **Morris RGM**, TVP Bliss, J O'Keefe and D Amaral (2007) *The Hippocampus Book*, Oxford University Press, Oxford and New York. Pp 863.
- D Tse, RF. Langston, M Makeyama, I Bethus, PA Spooner, ER Wood, MP Witter and **RGM Morris** (2007) Schemas and memory consolidation. *Science*, 316: 76-82. (191 citations).
- S-H Wang, RL Redondo and **RGM Morris** (2010) Relevance of synaptic tagging and capture to the persistence of long-term potentiation and everyday spatial memory. *Proc. Natl. Acad. Sci.*, 107: 19537-19542 (17 citations)
- RL Redondo and **RGM Morris** (2011) Making memories last: the synaptic tagging and capture hypothesis. *Nature Rev. Neurosci.*, 12: 17-30 (67 citations)
- D Tse, T Takeuchi, M Makeyama, Y Kajii, H Okuno, C Tohyama, H Bito and **RGM Morris** (2011) Schema-Dependent gene activation and Memory Encoding in Neocortex. *Science*, 333, 891-895 (46 citations).
- Takeuchi T, Duszakiewicz A and Morris RGM (2014) The synaptic plasticity and memory hypothesis: encoding, storage and persistence. *Philosophical Transactions of the Royal Society*, 369: 20130288. <http://dx.doi.org/10.1098/rstb.2013.0288> (just published).

Papers=181; Citations=23,000+ ISI List; Citations/paper=126; h-index=58; ISI Highly Cited.

FULL LIST of PUBLICATIONS

PHD THESIS

Morris R G M (1973) The acquisition and maintenance of avoidance behaviour, University of Sussex.

BOOKS

- B1 Morris R G M (1989) Parallel distributed processing: implications of psychology and neurobiology Clarendon Press, Oxford, (Editor).
- B2 Bliss T V P, Collingridge G L and Morris R G M (2003) Long term potentiation: enhancing neuroscience for 30 years. Oxford University Press (Editor)
- B3 Morris R G M, Tarrassenko L and Kenward M (2005) Cognitive Systems: Information Processing meets Brain Science. Elsevier Press, Amsterdam.
- B4 Andersen P, Morris R G M, Bliss T V P, O'Keefe J and Amaral D (2007) The Hippocampus Book, Oxford University Press, pp 836.

POPULAR SCIENCE

- P1 Brain Research Association (1995, 2003) Neuroscience: The Science of the Brain Booklet (32 pp) prepared for Sixth Formers (Morris R G M, Fillenz M and Dickenson A). 2nd edition 2003. Now translated into Slovenian, Spanish and Mandarin; other languages pending, and now distributed by FENS.

ARTICLES PUBLISHED AS SOLE AUTHOR

- # Article
- S1. Morris R G M (1974) Pavlovian conditioned inhibition of fear during shuttlebox avoidance behaviour, *Learning and Motivation*, 5: 424-447.
- S2. Morris R G M (1974) Two independent effects of variation in intertrial interval upon leverpress avoidance learning by rats, *Animal Learning and Behaviour*, 2: 189-192.
- S3. Morris R G M (1975) Preconditioning of reinforcing properties to an exteroceptive feedback stimulus, *Learning and Motivation*, 6: 289-298.
- S4. Morris R G M (1979) The necessity and justification for cognitive concepts in animal learning: a reply to Galvani, *Quarterly Journal of Experimental Psychology*, 31: 535-538.
- S5. Morris R G M (1981) Spatial localisation does not require the presence of local cues, *Learning and Motivation*, 12: 239-260.
- S6. Morris R G M (1983) Neural subsystems of exploration in rats, In J Archer and L Birke (Eds), *Exploration in animals and humans*, Van Nostrand, London, pp 117-146.
- S7. Morris R G M (1983) An attempt to dissociate 'spatial mapping' and 'working-memory' theories of hippocampal function, In W Siefert (Ed.) *The Neurobiology of the Hippocampus*, Academic Press, London, pp 405-432.
- S8. Morris R G M (1983) Modelling amnesia and the study of memory in animals, *Trends in Neurosciences*, 6, 479-483.
- S9. Morris R G M (1984) Developments of a water-maze procedure for studying spatial learning in the rat, *J. Neuroscience Methods*, 11: 47-60.
- S10. Morris R G M (1984) Is the distinction between procedural and declarative memory useful with respect to animal models of amnesia? In J L McGaugh, G. Lynch and N Weinberger (Eds.) *The Neurobiology of Learning and Memory*, Guildford Press, New York, pp 119-124.
- S11. Morris R G M (1985) Moving on from modelling amnesia, In N M Weinberger, J L McGaugh and G S Lynch (Eds.) *Memory Systems of the Brain: Animal and Human Cognitive Processes*, Guildford Press, New York, 452-462.
- S12. Morris R G M (1988) Elements of a hypothesis concerning the participation of hippocampal NMDA receptors in learning. In D Lodge (Ed.), *Excitatory Amino Acids in Health and Disease*, Wiley, pp 297-320.
- S13. Morris R G M (1989) Synaptic plasticity and learning: selective impairment of learning and blockade of long-term potentiation in vivo by the N-methyl-D-aspartate receptor antagonist AP5. *J Neuroscience*, 9:

3040-3057.

- S14. Morris R G M (1989) Does the hippocampus play a disproportionate role in spatial memory? In Shimamura A, Squire L R, and Mishkin, M (Eds.), FESN Study Group on Learning and Memory, Geneva, pp 39-45.
- S15. Morris R G M (1989) Computational neuroscience: modeling the brain. In Morris R G M (Ed.) Parallel Distributed Processing: Implications for Psychology and Neurobiology, Clarendon Press, Oxford, pp 203-212.
- S16. Morris R G M (1989) Does synaptic plasticity play a role in information storage in the vertebrate brain? In Morris R G M (Ed.) Parallel Distributed Processing: Implications for Psychology and Neurobiology, Clarendon Press, Oxford, pp 248-285.
- S17. Morris R G M (1990) Synaptic plasticity, neural architecture and forms of memory. In J L McGaugh, N Weinberger and G Lynch (Eds.), Brain Organisation and Memory: Cells, Systems and Circuits, Oxford University Press, pp 52-76.
- S18. Morris R G M (1990) The role of NMDA receptors in certain kinds of learning and memory. In L R Squire and E Lindenlaub (Eds), The Biology of Memory, Schattauer Verlag, Stuttgart, pp 299-318.
- S19. Morris R G M (1990) It's heads they win, tails I lose! Psychobiology, 18: 261-266.
- S20. Morris R G M (1990) Memoria a Breve e a lungo termine. SFERA (Italy), 19: 58-59.
- S21. Morris R G M (1990) Towards a representational hypothesis of the role of hippocampal synaptic plasticity in spatial and other forms of learning, Cold Spring Harbor Symposium Series, 55, The Brain, pp 161-174.
- S22. Morris R G M (1991) Distinctive computations and relevant associative processes: hippocampal role in processing, retrieval but not storage of allocentric spatial memory, Hippocampus, 1: 287-290.
- S23. Morris R G M (1992) Long-term potentiation: behavioural role, In L R Squire, J H Byrne, L Nadel, D L Schacter and R F Thompson (Eds.), Encyclopaedia of Learning and Memory, Macmillan, New York, pp 368-371.
- S24. Morris R G M (1993) Are the mechanisms of long-term potentiation involved in learning? The Physiological Society Magazine, 7: 42-45.
- S25. Morris R G M (1993) The need for a functional analysis of spatial and other kinds of learning to interpret lesion-induced dissociations, In P Andersen, O Hvalby, O Paulsen and B Hokfelt (Eds.), Memory Concepts: Basic and Clinical Aspects, Excerpta Medica, Amsterdam, 1993, pp 47-64.
- S26. Morris R G M (1994) Reflections on whether hippocampal LTP plays a role in certain kinds of learning or memory, Dahlem Konferenzen (Life Sciences), 54: pp 5-23.
- S27. Morris R G M (1994) The neural basis of learning with particular reference to the role of synaptic plasticity: Where are we a century after Cajal's speculations? In N J Mackintosh (Eds.), Animal Learning and Cognition, Academic Press, San Diego, pp 135-184.
- S28. Morris R G M (1996) Learning, memory and synaptic plasticity: Cellular mechanisms, network architecture and the recording of attended experience. In D Magnusson (Ed.), Individual development over the lifespan : Biological and Psychological Perspectives, Nobel Symposium. Cambridge University Press, New York, pp 139-161.
- S29. Morris R G M (1996) Spatial memory and the hippocampus: the need for psychological analyses to identify the information processing underlying spatial learning. In T. Ono, B.L.McNaughton, S. Molotchnikoff, E.T.Rolls and H. Nishijo (Eds.) Perception, Memory and Emotion: Frontier in Neuroscience. Elsevier, Oxford. pp 319-341.
- S30. Morris R G M (2000) Reversible inactivation of excitatory neurotransmission reveals the participation of the hippocampus in distinct memory processes. In O. Hayaishi (ed.) Challenges for Neuroscience in the 21st Century, Taniguchi Symposia on the Brain Sciences, No 22. Japan Scientific Societies Press, Tokyo. pp 191-224.
- S31. Morris R G M (2001) Episodic-like memory in animals: psychological criteria, neural mechanisms and the value of episodic-like tasks to investigate animal models of neurodegenerative disease. Philosophical Transactions of the Royal Society, London, B., 356: 1453-1465.
- S32. Morris R G M (2002) Neurology and Neuroscience: two cultures, common destiny. Practical Neurology, 2: 312-317.
- S33. Morris R G M (2003) Long-term potentiation and memory. Philosophical Transactions of the Royal Society, London, B., 358: 643-647.

- S34 Morris RGM (2005) *Memory and the Hippocampus: Elements of a Neurobiological Theory*. The Frijda Lecture, Vossiuspers UvA, The Netherlands (ISBN 90 5629 379 6)
- S35 Morris, RGM (2006) Elements of a neurobiological theory of hippocampal function: the role of synaptic-plasticity, synaptic tagging and schemas. The EJN Award Lecture. *European Journal of Neuroscience*, 23: 2829-2846.
- S36 Morris, RGM (2008) Morris watermaze. *Scholarpedia*, 3(8): 6315.
- S37 Morris, RGM (2012) *The Neurobiology of Learning and Memory*. In *Neuroscience in the 21st Century*, SpringerReference.com. Also distributed gratis by the World Health Organization via their HINARI website to 60 developing countries.
- S38 Morris, RGM (2013) *The making and keeping of memory: insights from neurobiological mechanisms*. Booklet for Carl Friedrich von Siemens Stiftung (in German). Privately published.
- S39 Morris RGM (2013) NMDA receptors and memory encoding. *Neuropharmacology*, 74: 32-40.

JOINT ARTICLES PUBLISHED

- | # | <i>Article</i> |
|------|---|
| J1. | Dearing M F, Dickinson A, Halliday M S and Morris R G M (1974) Effects of a negative correlation between a positive and negative US on conditioned suppression in rats, <i>Animal Learning and Behaviour</i> , 2: 193-195. |
| J2. | Dickinson A and Morris R G M (1975) Conditioned acceleration and free-operant avoidance following septal lesions in rats, <i>Physiological Psychology</i> , 3: 107-112. |
| J3. | Morris R G M, Einon D F and Morgan M J (1976) Persistent behaviour in extinction after partial deprivation in training, <i>Quarterly Journal of Experimental Psychology</i> , 28: 633-642. |
| J4. | Morgan M J, Einon D F and Morris R G M (1977) Inhibition and isolation rearing in the rat: extinction and satiation, <i>Physiology and Behaviour</i> , 18: 1-5. |
| J5. | Morris R G M and Alt M B (1978) An experiment to design a map for a large museum <i>Museums Journal</i> , 77: 179-180. |
| J6. | Morris R G M and Black A H (1978) Hippocampal electrical activity and behaviour elicited by nonreward, <i>Behavioural Biology</i> , 22: 524-532. |
| J7. | Alt M B and Morris R G M (1979) The Human Biology Exhibition at the Natural History Museum, <i>Bulletin of the British Psychological Society</i> , 32: 273-278. |
| J8. | Morris R G M, Garrud P, Rawlins J N P and O'Keefe J (1982) Place navigation impaired in rats with hippocampal lesions, <i>Nature</i> , 297: 681-683. |
| J9. | Dewhurst I C, Hagan J J, Morris R G M and Griffiths R (1983) Hippocampal electrical-activity and GABA metabolism in brain tissue following administration of homocysteine, <i>Journal of Neurochemistry</i> , 40: 752-757. |
| J10. | Morris R G M and Hagan J J (1983) Hippocampal electrical activity and ballistic movement In W Siefert (ed) <i>The Neurobiology of the Hippocampus</i> , Academic Press, London, pp 321-333. |
| J11. | Hagan J J, Alpert J, Morris R G M and Iversen S D (1983), The effects of catecholamine depletion upon spatial memory in rats, <i>Behavioural Brain Research</i> , 9: 83-104. |
| J12. | Morris R G M and Baker M D (1984) Does long-term potentiation have anything to do with learning or memory? In N Butters and L R Squire (eds), <i>Neuropsychology of Memory</i> , Guildford Press, New York, pp 521-535. |
| J13. | Schenk F and Morris R G M (1985) Dissociation between components of spatial memory in rats after recovery from the effects of retrohippocampal lesions, <i>Experimental Brain Research</i> , 58: 11-28. |
| J14. | Morris R G M and Doyle J (1985) Successive incompatible tasks: evidence for separate subsystems for storage of spatial knowledge, In G Buszaki and C H Vanderwolf (eds), <i>Electrical activity of the Archicortex</i> , Akademiai Kiado, Budapest, pp 281-293. |
| J15. | Hagan J J, Tweedie F and Morris R G M (1986) Lack of task specificity and absence of post-training effects of atropine upon learning, <i>Behavioural Neuroscience</i> , 100: 483-493. |
| J16. | Morris, RGM, Anderson E, Baudry M, and GS Lynch (1986) Selective impairment of learning and blockade of long-term potentiation in vivo by an N-methyl-D-aspartate receptor antagonist, AP5. <i>Nature</i> , 319: 774-776. |
| J17. | Morris R G M, Hagan J J and Rawlins J N P (1986) Allocentric spatial learning by hippocampectomised |

- rats: a further test of the 'spatial mapping' and 'working memory' theories of hippocampal function, *Quarterly Journal of Experimental Psychology*, 38B: 365-395.
- J18. McNaughton N and Morris R G M (1987) Chloradiazepoxide and anxiolytic benzodiazepine, impairs place navigation in rats, *Behavioural Brain Research*, 2: 39-46.
- J19. Morris R G M, Hagan J J, Jensen J, Faraday R, Baudry M and Lynch G S (1987) Spatial learning in the rat: impairments induced by the thiol-proteinase inhibitor, Leupeptin, and an analysis of ³[H]-glutamate receptor binding in relation to learning, *Behavioural and Neural Biology*, 47: 333-345.
- J20. McNaughton B L and Morris R G M (1987) Hippocampal synaptic enhancement and information storage within a distributed memory system, *Trends Neurosci.*, 10: 408-415.
- J21. Hagan J J and Morris R G M (1988) The cholinergic hypothesis of memory: a review of animal studies, In L L Iversen, S D Iversen and S Snyder (eds) *Handbook of Psychopharmacology*, Plenum Press, 20: 237-324.
- J22. Hagan J J, Salamone J D, Simpson J, Iversen S D and Morris R G M (1988) Place navigation in rats is impaired by lesions of medial septum and diagonal band but not nucleus basalis magnocellularis, *Behavioural Brain Research*, 27: 9-20.
- J23. Morris R G M, Kandel E R and Squire L R (1988) The neuroscience of learning and memory: cells, neural circuits and behaviour, *Trends in Neuroscience*, 11: 125-127.
- J24. Davis S, Butcher S P and Morris R G M (1988) The role of NMDA receptors in certain kinds of learning, In E Cavalheiro et al (eds), *Recent Advances in Excitatory Amino Acids Research*, New York: Alan Liss, pp 385-392.
- J25. Tonkiss J, Morris R G M and Rawlins J N P (1988) Intra-ventricular infusion of the NMDA antagonist AP5 impairs DRL performance in the rat, *Experimental Brain Research*, 7: 181-188.
- J26. Morris R G M, Halliwell R F, and Bowery N (1989) Synaptic plasticity and learning II: do different types of plasticity underlie different types of learning? *Neuropsychologia*, 27: 41-59.
- J27. Morris R G M, Davis S and Butcher S P (1989) The role of NMDA receptors in learning and memory, In J C Watkins and G L Collingridge (eds), *The NMDA Receptor*, IRL Press, Oxford, pp 137-151.
- J28. Eichenbaum H, Stewart C and Morris R G M (1990) Hippocampal representation in place learning, *J Neuroscience*, 10: 3531-3542.
- J29. Morris R G M, Schenk F, Tweedie F and Jarrard L E (1990) Ibotenate lesions of the hippocampus and/or subiculum: dissociating components of allocentric spatial learning, *European Journal of Neuroscience*, 2: 1016-1028.
- J30. Morris R G M, Davis S and Butcher S P (1990) Hippocampal synaptic plasticity and NMDA receptors: a role in information storage? *Phil. Trans. Roy. Soc. Lond. B.*, 329: 187-204.
- J31. Butcher S P, Hamberger A and Morris R G M (1991) Intracerebral distribution of DL-2- amino-phosphonopentanoic acid (AP5) and the dissociation of different types of learning, *Experimental Brain Research*, 83: 521-526.
- J32. Reid I C and Morris R G M (1991) N-methyl-D-aspartate receptors and learning: a framework for classifying some recent studies, In B S Meldrum, F Moroni, R P Simon and J H Woods (eds), *Excitatory Amino Acids*, Raven Press, New York, pp 521-532.
- J33. Davis S, Butcher S P and Morris R G M (1992) The N-methyl-D-aspartate receptor antagonist 2-amino-5-phosphonopentanoate (AP5) impairs spatial learning and LTP in vivo at comparable intracerebral concentrations to those that block LTP in vitro. *J Neuroscience*, 12: 21-34.
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- J35. Morris R G M and Kennedy M B (1992) The Pierian Spring. *Current Biology*, 2: 511-514.
- J36. McNaughton N and Morris R G M (1992) Buspirone produces a dose-related impairment in spatial navigation. *Psychopharmacology*, 43: 167-171.
- J37. Biegler R and Morris R G M (1993) Landmark stability is a prerequisite for spatial but not discrimination learning, *Nature*, 361: 631-633.
- J38. Reid I C and Morris R G M (1993) The enigma of olfactory learning, *Trends in Neuroscience*, 16: 17-26.
- J39. Jeffery K J and Morris R G M (1993) Cumulative long-term potentiation in the rat dentate gyrus correlates with, but does not modify, performance in the watermaze, *Hippocampus*, 1993, 3: 133-140.
- J40. Stewart C A and Morris R G M (1993) The Watermaze, In *Behavioural Neuroscience: A Practical Approach*, A Sahgal (ed), IRL Press at Oxford, Chapter 9, Vol 1, 107-122.

- J41. Morris R G M and Reid I C (1993) Reply to Slotnick, Trends in Neuroscience, 16: 261-262.
- J42. Morris R G M and M Davis (1994) The role of NMDA receptors in learning and memory, In The NMDA Receptor, 2nd Edition, J C Watkins and G L Collingridge (eds), Oxford University Press, pp 340-375.
- J43. Lathe R and Morris R G M (1994) Analysing brain function and dysfunction in transgenic animals, Neuropathology and Applied Neurobiology, 20: 350-358.
- J44. Bannerman D M, Chapman P F, Kelly P A T, Butcher S P and Morris R G M (1994) Inhibition of nitric oxide synthase does not impair spatial learning, J. Neuroscience, 14: 7404-7414.
- J45. Bannerman D M, Chapman P F, Kelly P A T, Butcher S P and Morris R G M (1994) Inhibition of nitric oxide synthase does not prevent the induction of long-term potentiation *in vivo*, J Neuroscience, 14: 7415-7425.
- J46. Bannerman D M, Butcher S P and Morris R G M (1994) Intracerebroventricular injection of nitric oxide synthase inhibitor does not affect long-term slope potentiation *in vivo*, Neuropharmacology, 33: 1387-1397.
- J47. Spooner R I W, Thomson A, Hall J, Morris R G M and Salter S H (1994) The Atlantis Platform: A new design and further developments of Buresova's on-demand platform for the water maze. Learning and Memory, 1: 203-211.
- J48. Yau J I W, Morris R G M and Seckl J R (1994) Hippocampal corticosteroid receptor mRNA expression and spatial learning in the aged Wistar rat. Brain Research, 657: 59-64.
- J49. Morris R G M, Amaral D G and Mishkin M (1995) Cognitive Neuroscience - Editorial Overview. Current Opinion in Neurobiology, 5: 137-140.
- J50. Bannerman D M, Good M A, Butcher S P, Ramsay M and Morris R G M (1995) Distinct components of spatial learning revealed by prior training and NMDA receptor blockade. Nature, 378: 182-186.
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- J53. Biegler R and Morris R G M (1996) Landmark Stability: Studies exploring whether the perceived stability of the environment influences spatial representation. J. Exp. Biology, 199: 187-193.
- J54. Morris R G M, Bannerman D M and Good M (1996) NMDA Receptors and spatial learning: Differential pretraining dissociates the behavioral effects of the receptor antagonist AP5 and selective lesions. In N. Kato (Ed.) The Hippocampus: Functions and Clinical Relevance. Elsevier Science, pp 55-73.
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- J58. Frey J U and Morris R G M (1997) Synaptic tagging and long-term potentiation. Nature, 385: 533-536.
- J59. Morris R G M and Frey J U (1997) Hippocampal synaptic plasticity: role in spatial learning or the automatic recording of attended experience? Phil. Trans. Roy. Soc. Lond. B., 352: 1489-1503.
- J60. Martin S J and Morris R G M (1997) (R,S)-a-Methyl-4-carboxyphenylglycine (MCPG) fails to block long-term potentiation under urethane anaesthesia *in vivo*. Neuropharmacology, 36: 1339-1354.
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