Curriculum Vitae: Edvard I. Moser

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Place and Date of Birth, Nationality: Ålesund, Norway, 27. April 1962, Norwegian

Present positions:
Founding Vice-Director of Centre for Algorithms in the Cortex (2023 – 2033)
Founding Director of Kavli Institute for Systems Neuroscience (2007 –)
Professor of Neuroscience (1998 –)

External Scientific Member of the Max Planck Society, elected by the Biomedical section ((2015 –)

Past positions:
Founding Vice-Director of Centre for Neural Computation (2013 – 2022)
Founding Director of Centre for the Biology of Memory (2002 – 2012)
Associate Professor of Biological Psychology (1996-98)
Postdoc on Human Frontiers Grant, Univ Edinburgh and Univ College London (1994-96)
Ph D student on Res Council Norway personal grant at Univ Oslo & periodically Univ. Edinburgh (1991-95)

Education (all Univ. of Oslo):
Mathematics, statistics, programming (1984-85)
Psychology (1985-90)
Neurobiology (1990)

Research

The focus of my research is on neural network computations in the cortex, with particular emphasis on dynamic representation of space and memory in the hippocampal-entorhinal system.

I have studied how spatial location and spatial memory are computed in the brain. During the first block of my independent research, spanning almost two decades, my most noteworthy contribution – conducted together with my long-term colleague May-Britt Moser – is the Nobel-awarded discovery of grid cells in the entorhinal cortex, reported in 2005. This discovery was succeeded by our identification of a number of other cells with tuning to specific features in the spatial environment, such as border cells and object vector cells. We showed how these cells contribute to representation of self-location, how they interact in the computation of a spatial map, and how the outputs of these cells are used by memory networks in the hippocampus. The discovery of grid cells and their control of population dynamics in the hippocampus led to a revision of established hippocampus-centered views of how the brain calculates self-position, and spatial mapping became one of the first non-sensory cognitive functions to be characterized at a mechanistic level in neural networks. Grid cells attracted attention because the crystal-like structure underlying their firing fields does not arise out of sensory inputs but instead is created entirely within the brain itself, which opens doors to studies of neural computation at the high end of the cortical hierarchy, independently of lower-level sensory inputs and motor outputs.

In the second block of my research, which mostly spans the time after the 2014 Nobel prize, I have searched for the mechanisms underlying computation in the entorhinal-hippocampal space system and in cortical systems more generally. These computations are thought to take place in networks of thousands of intermingled neurons with diverse characteristics and cannot be understood by monitoring activity in one or few cells at the time. Beginning already in 2006, we have participated in the development of conceptual frameworks for understanding the formation and operation of grid cells and their interaction with other spatial cell types; however, it is not until a few years ago that tools for testing the proposed network dynamics became available. Our lab has been a member of the international consortium that developed the Neuropixels probes for parallel recording from thousands of neurons, which are completely transforming systems neuroscience. We have also developed, in our lab, the first miniature two-photon miscroscope by which activity can be imaged simultaneously from more than a thousand neurons in multiple planes of densely active cortical tissue at the same time as mice perform natural behaviors such as running, climbing and jumping, for many tens of minutes, without detectable impediment of the animal´s behavior. Using these tools to investigate hypotheses from the conceptual framework we have participated in developing, we have shown that grid cells, in agreement with continuous attractor network theories, operate on a low-dimensional manifold with the topology of a torus, regardless of behavior or state. These discoveries, enabled by the new tools for neural population recording in freely moving animals, illustrate the power of a combined theoretical-experimental approach to understanding brain computation. Following this path further, we expect to determine how the dynamics is implemented in the architecture of the network, as well as the mechanisms by which attractors are coordinated to generate a coherent representation of position that can be used during behavior for goal-directed navigation.

Prizes

1981: Fridtjov Oos' legat – prize for best exam paper in Norway in Norwegian language (nynorsk)*
1999: Prize for young scientists awarded by the Royal Norwegian Academy for Sciences and Letters
2005: 28th annual W. Alden Spencer Award (College of Physicians and Surgeons of Columbia University)
2006: 10th Prix "Liliane Bettencourt pour les Sciences du Vivant" (Fondation Bettencourt, Paris)
2006: 14th Betty and David Koetser Award for Brain Research (University of Zürich)
2008 : 30th Eric K. Fernström's Great Nordic Prize (Fernström Foundation, University of Lund)
2011: 26th Louis-Jeantet Prize for Medicine (Louis-Jeantet Foundation)
2011: Anders Jahre's Great Nordic Prize for Medical Research (Univ. Oslo)
2013: 13th Perl/UNC Neuroscience Prize (Univ. of North Carolina)
2013: 102nd annual Fridtjof Nansen Award of Outstanding Research in Science and Medicine, Norwegian Academy of Science
2013: 47th Louisa Gross Horwitz Prize for Biology or Biochemistry (Columbia University)
2014: 59th Karl Spencer Lashley Award (American Philosophical Society)
2014: 30th Koerber European Science Prize (Koerber Foundation)
2014: Nobel Prize in Medicine or Physiology
2014: Name of the Year (Dagbladet, major Norwegian newspaper)
2015: Trønder of the Year (Adresseavisen and Norwegian Broadcasting Company)
2015: Peer Gynt Prize (Peer Gynt of the Year) (after voting in the Norwegian Parliament)
2016: Pfizer Grant for Breakthrough Science lecture, Pfizer, Boston, 12 Nov*
2017: Lars Onsager Prize lecture, Norwegian University of Science and Technology; lecture 25 Jan 2018
2018: Grand Cross of the Royal Norwegian Order of St. Olav (H.M. Harald of Norway), 28 Feb 2018
2018: FIAS Senior Fellow Laureatus, Frankfurt Institute for Advanced Studies, 2 Sep 2018*
2020: Gunnerus Medal, Royal Norwegian Society of Sciences and Letters, 28 Feb 2020.
2023: Monrad-Krohn Prize for Neurology, University of Oslo, 15 March 2023.

All prizes except * shared with May-Britt Moser; Gross Horwitz and Nobel Prize also with John O'Keefe.

Elected memberships (academies and organizations)

2003–: The Royal Norwegian Society of Sciences and Letters (DKNVS)
2004–: The Norwegian Academy of Science (DNVA)

2010–: The Norwegian Academy of Technological Sciences (NTVA)
2011–: American Association for the Advancement of Science (AAAS)
2011–: European Molecular Biology Organization (EMBO)
2011–: Academia Europaea
2012–16: Society for Neuroscience Councilor
2014: National Academy of Sciences (USA)
2015: American Philosophical Society (USA)
2015: Max Planck Society (Martinsried, foreign member)
2015: The Physiological Society, London (honorary member)
2015: National Academy of Medicine (USA)
2016: German National Academy of Sciences Leopoldina
2016: Royal Swedish Academy of Sciences
2018: Fellow of the American Association for Psychological Science

2014-17: Honorary Professor at the University of Edinburgh
2017: Honarary Doctorate: University of Bergen, Norway (5 May 2017)
2018: Honorary Doctorate: Ben Gurion University, Israel (8 May 2018)

2021: Honorary Fellow of the Royal Institute of Navigation, London
2022: Honorary Doctorate, Cesar Vallejo University, Lima and Trujillo, Peru
2023: Foreign Member of the Royal Society (ForMemRS), London.

Appointments and international evaluations

2002: Centre of Excellence appointment by Research Council of Norway.
2003: Evaluation by Research Council of Norway Panel for Psychology /Psychiatry. Rated 'excellent'.
2006: Centre for the Biology of Memory rated "exceptionally good" at midterm evaluation.
2007: Founding Director of Kavli Institute for Systems Neuroscience.
2011: National Research Council evaluation of biological disciplines: Rated 'Undoubtedly excellent'.
2012: In its final report, the Scientific Advisory Board of the Centre for the Biology of Memory ranked the Moser group as among the top 0.1% of neuroscience groups worldwide (i.e. among the ~ top 10).
2012: Centre of Excellence appointment by Research Council of Norway.
2015: Egil and Pauline Braathen and Fred Kavli Centre for Cortical Microcircuits.
2020-25: K.G. Jebsen Centre for Alzheimer´s disease.
2021-26: Mohn Research Center for the Brain.
2023-33: Centre of Excellence appointment by Research Council of Norway.

Memberships

Society for Neuroscience (1992 -), Royal Norwegian Society of Sciences and Letters (elected; 2003 -), Norwegian Academy of Science (elected; 2004 -), Norwegian Academy of Technological Sciences (elected; 2010 -), Academia Europeaea (elected; 2011 -), Foreign Associate of the National Academy of Sciences of the United States of America (elected; 2014 -), International Member of the American Philosophical Society (elected; 2015-), Foreign member of the Royal Swedish Academy of Science (2016 -), Foreign member of the German Academy of Science, Leopoldina (elected; 2016-). Foreign member of the Royal Society of London (elected; 2023 -).

Commissions of trust

2005 – 06: Chairman of the Programme Committee of the Federation of European Neuroscience Societies (FENS) for Vienna 2006.
2008 Evaluation panel for RIKEN-MIT Neuroscience Research Center (2008).
2010 Ad hoc Scientific Advisory Board of Picower Ctr for Learn and Memory, MIT
2012 – 13: Panel Member for European Research Council Starting Grants (neuroscience).
2012 – 16: Society for Neuroscience Councillor (elected; European representative)

2013 – 17: Scientific Advisory Board of Ernst Strungmann Forum, Frankfurt
2015 – 21: Scientific Advisory Board of Friedrich Miescher Institute in Basel
2015 – 18: Scientific Advisory Board of Knut and Alice Wallenberg Foundation
2016 Advisory Council member Max Planck Institute Florida, July 13-14
2017 Advisory Council member RIKEN BSI SAS, Sept. 29-30
2019 – : International Steering Committee of the Edmond and Lily Safra Center for Brain Science at the Hebrew University of Jerusalem
2020 – : International Scientific Advisory Board of Chinese Institute of Brain Research, Beijing

Editorship

*Current Opinion in Neurobiology (*Co-Chief Editor, with Cori Bargmann), 2010–2014

Editorial Boards: Present

Hippocampus (2003–)
Faculty of 1000 (2003– ca 2020)
Neuron (2007 –)

BrainFacts.org (2011 – 2015)

Editorial Boards: Past

Science (Board of Reviewing Editors, 2004–2013)
Journal of Neuroscience (Reviewing Editor 2005–2010; Associate Editor 2003-2004)
Neuroscience (Section Editor for Behavioural Neuroscience, 2003–05; Editorial Board member 2000–05)
Neural Systems and Circuits (2010 -2012)

Guest editor: *Current Opinion in Neurobiology* (Dec 2007, Neurobiology of Behavior, with Barry Dickson)
Hippocampus (Dec 2008, Special Issue on Grid Cells, with M. Hasselmo and M-B Moser)

Referee service

Regular reviews for Nature, Science, Nature Neuroscience, Neuron, Cell, PNAS.

Less frequenly: Current Biology, Nature Reviews Neuroscience, Hippocampus, in addition to ~10-20 other scientific journals.

Grant proposals

Human Frontiers Science Program, The Welcome Trust, The Royal Society of London, National Science Foundation, The Irish Health Research Board, The Israel Science Foundation, Vienna Science and Technology Fund, Singapore Stem Cell Consortium, The Finnish Research Council, The Swedish Research Council, The Norwegian Research Council, French National Research Council.

Other

2020 (and before): Highly Cited Researcher – on Clarivate list of 0.1% most cited researchers in Web of Science 2010-2019.

Selected invited lectures

2000: EURESCO 2000 meeting on Retrieval of Memory, Granada, Spain (org. Y Dudai and T Robbins).
2001: Winter Conference on Neural Plasticity, Antigua (symposium organizer H Eichenbaum).
2001: Keystone Symposium on Hippocampus: The Integration of Cellular Mechanisms and Cognitive Function, Taos Civi Center, New Mexico, USA (organizers: E Schuman, M Wilson and M Mayford).

2001: Arctic Symposium on Memory and Memory Disorders, Saariselkä, Finland (org.: G Buzsaki et al.)
2001: CalTech seminar, Dept. of Biology, CalTech, Los Angeles, U.S.A. (E Schuman)
2001: EU Advanced Course in Computational Neuroscience, Trieste, Italy (organizers: A Treves et al.).
2002: FENS 2002 Satellite Symposium: Synaptic Plasticity: A Systems Viewpoint, Bristol (organizers C Warburton, M Brown, R Muller and Z Bortolotto).
2003: Spatial Representation in Animals, Toulouse 24-25 Jan 2003 (organizer Martin Giurfa).
2003: Molecular Basis of CNS Disorders, Bonn, 20-22 Feb 2003.
2003: Seminars at UCLA, L.A., and Salk Institute, San Diego, USA, May 2003 (organizers: Alcino Silva, Larry Squire and Terry Sejnowski).
2004: Lecture at Picower Centre for Learning and Memory, Massachusetts Institute of Technology 1 April (organizers M. Sheng and S. Tonegawa) and Boston University, 30 March (H Eichenbaum).
2004: EURESCO conference on the Representation of the Memory Trace, May 14-19, Obernai, France.
2005: Learning & Memory meeting, Cold Spring Harbor, New York, USA, April 20-24.
2005: Lecture at Rutgers University, Newark (with Gyuri Buzsaki), April 21st.
2005: Memory Concepts meeting (McDonnell Foundation), Newark, September.
2005: 28th annual W. Alden Spencer Award, given by the College of Physicians and Surgeons of Columbia University, New York, October 21.
2005: Abschluss-Symposium des SFB, Berlin, October 24-25.
2005: Presidential Lecture, Society for Neuroscience Annual Meeting, Washington, USA, November
2006: Distinguished Visitor, Kavli Institute for Brain and Mind, San Diego: Feb 14-27.
2006: Caltech Seminar, Los Angeles, Feb 21.
2006: Robert Greer Visiting Lectureship, University of Texas Medical School, Houston, March 2.
2006: Fondation Ipsen meeting on 'Memories: Molecules and Circuits', April 24th
2006: Gatsby workshop on 'Principles of Neural Representation', London, May 10-12th.
2006: The Lausanne Neuroscience Seminars, Brain Mind Institute and Univ. of Lausanne, June 12th.
2006: Boehringer Ingelheim Seminar Series, Hungarian Academy of Sciences, Budapest, June 13 th.
2006: Oxford Autumn School in Neuroscience, 25-26 Sept.
2006: Shanghai Symposium in Neuroscience, Shanghai Inst. of Brain Functional Genomics, Oct 30th.
2007: Weizmann Institute of Science, Israel: Inaugurate lecture at graduate school neuroscience program.
2007: Plenary Lecture at British Neuroscience Association's biannual meeting, April 21-24.
2007: Schwammerdamm lecture, Amsterdam, May 23rd.
2007: Plenary Lecture at Societe des Neurosciences (French Neuroscience Ass.), Montpellier, May 22-25.
2007: Plenary lecture at Gordon Research Conference on Neural Circuits and Plasticity, Newport RI, July 1-6.
2007: Plenary Lecture at IBRO biannual meeting, Melbourne, July 12-17.
2007: Plenary Lecture at Scandinavian Physiology Society meeting, Oslo, August 10-12.
2007: Plenary Lecture at Ninth Nordic Meeting in Neuropsychology, Goteborg, August 19-22.
2007: Fred Kavli symposium, Santa Barbara, September 15.
2007: Speaker at Ascona Circuits meeting: The assembly and function of neuronal circuits, Monte Verita, Switzerland, Sept 23-28.
2007: Princeton Univ.: Neuroscience Institute seminar series, Nov. 9.
2007: Hebb lecture, McGill University, Montreal, Nov. 10.
2008: Salk-Nature-Ipsen Symposium: Genes, circuits and behaviour. Salk Institute, La Jolla, Jan 10-13.
2008: Lecture at Max Planck Institute for Brain Research, Heidelberg, Feb 15.
2008: Seminar at Janelia Farm Research Campus, VA, March 12.
2008: Seminar at State Univ New York, Brooklyn, March 13.
2008: Speaker at 'Neuronal Circuits: from Structure to Function', Cold Spring Harbor, 13-16 March
2008: Monthly Lecture at Rockefeller University (for broad neuroscience community), April 18.
2008: Speaker at Nobel symposium on 'Genes, Brain and Behavior', Karolinska Institutet, Stockholm, June 12-15.
2008: Speaker at Molecular and Cellular Cognition Society FENS2008 satellite meeting, Geneva, July 10-11.
2009: Plenary speaker at Hungarian Neuroscience meeting, Budapest, 22-24 Jan 2009.
2009: Friday lecture at the Functional Imaging lab at UCL, London, 27 Feb
2009: Plenary lecture at Neuroscience Day, Edinburgh neuroscience community, 25-26 March
2009: Lecture at European Molecular Biology Lab, Rome, 30 April
2009: Duncan lecture, Northwestern Univ., Evanston, Illionois, 7 May
2009: Lectures at UC Berkeley and UC San Fransisco, 13-14 May

2009: Keynote Lecture at McKnight Conference in Neuroscience, Aspen, Colorado, 4-8 June
2009: Ernst Strüngmann Forum (former Dahlem Conference), Frankfurt, 16-21 Aug.
2009: Gordon Conference on Excitatory Synapses and Brain Funciton, Les Diablerets, Switzerland, 10 Sept.
2010: Heller lecture, Hebrew University, Jerusalem, 22 March
2010: Lecture at Bir Zeit University, Ramallah, 23 March
2010: Center for Brain Science, Harvard, 4 March
2010: CSHL Asia Inaugural Neuroscience Symposium, Suzhou, China, 12-17 April
2010: New Concepts in Neuroscience conference, Bergen, Norway: 26-28 May
2010: Gatsby workshop on grid cells, London, 30 June – 2 July
2010: Attention & Performance conference on Space, Time and Number, Abbey of Vaux de Cernay, France, 6-10 July
2010: Berlin Brain Days: keynote lecture, 1-3 Nov.
2010: Lecture at Max Planck Inst. for Brain Res., Frankfurt
2011: Neural Plasticity conference, Morea, Tahiti, 14-18 Feb
2011: NIH campuswide seminar, Bethesda, 14 March
2011: Ely Lilly speaker at Université de Montreal 15-17 March
2011: Synapses – from molecules to circuits and behaviour, Cold Spring Harbor, April 12-16
2011: Lecture at Instituto De Neurociencias, Alicante, May 13
2011: Speaker at Nobel symposium 'Machines, Molecules and Mind', Sånga-Säby, Stockholm, May 25-28
2011: Lecture at Institute for Neuroscience and Pharmacology, Copenhagen University, 31 Aug.
2011: Plenary lecture at EMBO meeting, Vienna, 11-14 Sep
2011: Søren Falch Lecture, Univ. Bergen, 30 Sep
2011: Kavli Distinguished Lecture, Yale, 17 Nov
2012: Max Birnstiel Lecture at IMP, Vienna, 18 Jan
2012: Adrian seminar, Cambridge University, 13 Feb
2012: Lecture at opening symposium of Neuroscience Centre at UCLA (A. Silva), 5-6 March
2012: Bauer Lectures, Brandeis University, Boston, 2-4 April
2012: Plenary Lecture at Soelden neuroscience meeting, Austria, 10-12 April
2012: Plenary talk at INS Nordic Meeting in Neuropsychology, Oslo 27 June
2012: Public scientific lecture at Karolinska Institute, Stockholm, 18 September
2012: Symposium speaker, Society for Neuroscience, New Orleans, 15 Oct
2012: EMBO meeting short talk for new members 24 Oct, Heidelberg
2012: Univ Basel and FMI: All-campus seminar in neuroscience, 25 Oct
2012: Lecture at Institut de Biologie de l'Ecole Normale Superieure, Paris, 16 Nov
2012: Lecture at Univ. Bristol, 19 Nov
2013: Lecture at Max Planck Inst for Immunol and Epigenetics, Freiburg, 7 Feb
2013: Lecture at Neural Plasticity meeting, Curacao, February 15th
2013: First annual Jupiter Brain Sunposium, February 18-20th
2013: 8th Annual Eric M. Shooter Lecture, Stanford Univ Sch Med, 10 April
2013: Keynote Lecture, UT Austin Learning and Memory Conference, 12-14 April
2013: Lecture at Duke University, 15-16 April
2013: Perl/UNC Neuroscience Prize Lecture 17 April
2013: Royal Society scientific meeting, "Space in the Brain: Cells, Circuits, Codes and Cognition" May 1-3, London.
2013: Plenary Lecture Belgian Neuroscience Meeting 31 May
2013: Lecture at Univ. of Würzburg 8 May
2013: Lecture at Univ. Helsinki, 9 Sep.
2013: ESF Neuroscience meeting, Stresa, Italy, 20-23 Oct.
2013: Kenneth O. Johnson Memorial Lecture, Johns Hopkins Univ., 15. Nov.
2013: Nov2k symposium plenary lecture, Stockholm, 21-22 Nov.
2013: Hungarian Academy of Science: Neuroscience Seminar Series, 5-6 Dec.
2014: Lecture, Palestinian Neuroscience Initiative symposium, Al-Quds University, 14 Jan.
2014: **Louisa Gross Horwitz Prize Lecture, 16 Jan**
2014: Friday Lecture Series seminar at Rockefeller University, 17 Jan.
2014: Kavli Institute for Theoretical Physics neurophysics workshop, Santa Barbara, 3-7 Feb.
2014: Lecture at Centre for Neural Circuits and Behavior, Univ. of Oxford, 24 March

2014: Lecture at Institute Pasteur, Paris, 26 March
2014: 'How to read a map' conference, Janelia Farm Res. Campus, 6-9 April
2014: Keynote lecture at NYU Med Ctr annual retreat, 10-12 April
2014: Lundbeck/FENS Brain Conference, Rungstedgaard, Denmark, 20-23 April
2014: Neural Networks in the Arctic, Spitsbergen 5-10 June
2014: Keynote lecture, Gordon conference on "Synaptic Transmission", Waterville, New Hampshire, 3-8 August
2014: Keynote lecture, Scandinavian Physiological Society Annual Meeting, Stockholm, 22-24 Aug
2014: Koerber lecture 2014, Univeristy of Hamburg, 4 Sept.
2014: Opening symposium for Max Planck Institute for Brain Research, Frankfurt, 24-25 Sept.
2014: **Bernstein Lecture, Max Planck Institute for Neurobiology, Martinsried, Munich, 15 Oct**
2014: Symposium talk at Dept. of Neurobiology at Ludwig-Maximilian University of Munich, 20 Oct
2014: Lecture, Institute for Basic Medical Sciences, University of Oslo, 24 Oct
2014: Keynote Lecture, 50th anniversary celebration of Edward Tolman, Univ. Berkeley, 11 Nov
2014: **Nobel Lecture in Medicine or Physiology, Karolinska Institute, Stockholm, 7 Dec**
2015: Lecture, Technical University of Munich, 15 Jan
2015: Keynote lecture, European Workshop on Cognitive Neuropsychology, Bressanone, Italy, 26 Jan
2015: Popular lecture, Parliament of Sweden, Stockholm, 11 March
2015: Cambridge Neuroscience Day, Keynote lecture, Cambridge University, 20 March
2015: University of Arizona neuroscience day, keynote lecture, Tucson, 27 March
2015: Lecture, Fondation Ipsen symposium, Paris, 13 April
2015: Lecture, Norwegian Academy of Science, Oslo 16 April
2015: Lecture, Harvard University, Boston, 27 April
2015: Lecture, University of Lund, Sweden, 6 May
2015: Plenary lecture, 1st Nordic Neuroscience Meeting, Trondheim, 11 June
2015: Lecture, Cognition, Brain and Technollogy Summer School, Barcelona, 1 Sept
2015: Lecture, retreat for Friedrich Miescher Institute, Grindelwald, 17 Sept
2015: Lecture, Ascona Neural Circuits Meeting, Ascona, Switzerland, 28 Sep-1 Oct
2015: Lecture, Hebrew University Retreat, Barcelona, 9 Oct
2015: Lecture, Janelia Farm conference on entorhinal-hippocampal circuits, 9-11 Nov
2015: Lecture, Sendai University, Japan, 25 Nov
2015: RIKEN Brain Science Institute lecture, Tokyo, 26 Nov
2015: Lecture, Year of the Brain, Univ. of Oslo, 2 Dec.
2015: Nobel Dialogue – The Future of Intelligence – panel discussion, Gothenburg, Dec 9th.
2016: Annual Nobel Laureate Lecture, Göttingen Center for Nanoscale Microscopy and Molecular Physiology of the Brain Max Planck Institute for Biophysical Chemistry, Göttingen, 27 Jan
2016: Annual Nobel Laureate Lecture, German Cancer Research Centre, Heidelberg, 28 Jan.
2016: Spring Picower Lecture, MIT, 24 Feb
2016: Pinkel Endowed Lecture, Univ Pennsylvania, 25 Feb
2016: Vernon Mountcastle Lecture, Johns Hopkins Univ., 26 Feb
2016: Lecture, Universidad del Rosario, Bogota, Colombia, 1 March
2016: Keynote lecture, Eastern Psychological Association, New York, 4 March
2016: Nobel Laureates at TU Dresden Lecture, Technical Univ. Dresden, Germany, 13 April
2016: Bjørn Christiansen Lecture, University of Bergen, 19 May
2016: Lecture Hippocampus 25 years anniversary, Boston, 24 May
2016: Keynote lecture American Psychological Association, Annual Meeting, Chicago, 26 May
2016: Lecture, Areadne meeting, Santorini, Greece, 22-25 June
2016: Lecture at STARMUS Festival in honour of Steve Hawking, Tenerife, 26-30 June
2016: Keynote Lecture, Cajal Club, Copenhagen, 1 July
2016: Presidential Lecture, FENS biannual meeting, Copenhagen, 2-6 July
2016: Lecture at Champalimaud neuroscience symposium, 21-24 Sept.6:
2016: Keynote lecture at International Elderly Health Forum, Tai´an, China, 23-25 Sept.
2016: HKUST anniversary lecture, Hong Kong University of Sci and Technol, 21 Oct
2016: Pfizer Grant for Breakthrough Science lecture, Pfizer, Boston, 12 Nov
2016: Public lecture, DAI Heidelberg Science Festival, 24 Nov.
2016: Lecture at opening of Einstein Centre for Neurosciences Berlin 9 Dec.

2016: Lecture, Umeå University, 16 Dec.
2017: Alice and Joseph Brooks International Lecture on the Neurosciences, Harvard Med. School, 26 Jan.
2017: Lecture at NYU Genomics and Systems Biology conference, Saadiyat Campus, Abu Dhabi, 6-9 Feb.
2017: Nobel Dialogue – The Future of Intelligence – panel discussion, Tokyo, 26 Feb.
2017: Keynote at 10th HOPE meeting of Japan Society for the Promotion of Science, Tokyo, 27 Feb.
2017: Lecture at 'Mathematics of Memory' school, Barcelona, 10 March.
2017: Annual Albert Einstein Lecture, Israel Academy of Sciences and Humanities, Jerusalem, 14 Mar.
2017: 5th Rita Levi-Montalcini Memorial Lecture, Accademia Nazionale dei Lincei, Rome, 19 April.
2017: Lecture at University of Florence, 20 April.
2017: Public lecture, Festival della Scienza Medica, Bologna, Italy, 21 April.
2017: Keynote at Francis Crick Symposium in Neuroscience, Cold Spring Harbor Asia, Souzhou, China, 8 May
2017: Presidential Lecture, German National Academy of Sciences Leopoldina, Berlin 15 May
2017: Lecture at Nobel Forum, Fuzhou, China, 16 June
2017: Lecture at Starmus Science Festival IV, Trondheim, 18-23 June
2017: Keynote lecture, Brainy Days, Hebrew University, Jerusalem, 28-29 June.
2017: Lecture, Al-Quds University, Palestine, 1 July.
2017: Lecture at European Congress of Psychology, Amsterdam, 12 July
2017: Public lecture, Central European University, Budapest, 31 Aug.
2017: Public lecture, 650-year anniversary of the University of Pecs, Hungary, 1 Sept.
2017: Lecture, Cognition, Brain and Technollogy Summer School, Barcelona, 4 Sept
2017: Public Lecture, Institute for Bioengineering of Catalonia, Barcelona, 4 Sept.
2017: Public lecture, University of Lund 350 years anniversary, 6 Sept.
2017: Keynote lecture at 6th Annuial Conference of Western Returned Scholars Association (WRSA, Zhengzhou, China, 15 Sept.
2017: Soriano lecture, Presidential symposium at World Congress of Neurology, Kyoto, 18 Sept.
2017: Nobel Prize lecture, Zhejiang University, China, 20 Sept.
2017: Hareidsstemna, keynote lecture, 21 Oct
2017: UCL Nobel Prize Lecture 2017, University College London, 26 Oct.
2017: Keynote lecture at Global Hard & Core Technology Innovation Conference, Xi'an Municipal Government, China, 6-7 Nov.
2017: Keynote lecture at Tencent Global Partner Conference, Chengdu, China, 8-9 Nov.
2017: Society for Neuroscience, symposium lecture, Washington DC, 14 Nov.
2017: Ciudad de las Ideas Science Festival, Pueblo City, Mexico, 15-18 Nov.
2017: SciLife symposium, keynote lecture, Wallenberg Foundation, Aula Medica, Karolinske Institute, Stockholm, 11 Dec.
2017: Winter school in neuroscience, Obergurgl, Austria, 12-15 Dec.
2018: Earth Civilization Community International Summit, Xiamen, China, 23 Jan.
2018: Lecture at Centro Atomico Bariloche, Argentina, San Carols de Bariloche, Argentina, 26 March
2018: Keynote Lecture at Learning and Memory International Meeting, UC Irvine, 17-20 April
2018: Keynote Lecture at BIT Congress, Dailan, China, 25 April
2018: Lecture, IST, Austria, 7 May
2018: Honorary doctorate lecture, Ben Gurion University, Israel, 8 May.
2018: Lecture at Sainsbury Wellcome Centre grid-cell meeting, London, 21-22 May
2018: Keynote lecture, Nencki Institute symposium, Warzaw, 24-26 May
2018: Lecture at 68th Lindau Nobel Laureate Meeting (medicine-physiology), 25 June
2018: Nobel lecture, *The World*, Trondheim, 29 Aug
2018: Frankfurt Institute of Advanced lectures laureate lecture, 3 Sept.
2018: Mongolian Neuroscience meeting keynote lecture, Ulaanbaatar, 23 Sept.
2018: World Laureate Forum keynote lecture, Shanghai, 29 Oct.
2018: Göran Gustafsson lecture, Uppsala University, 18 Dec.
2019: Distinguished lecture of Tulane Brainn Institute, Tulane University, New Orleans, 23 Jan.
2019: Richard P. Bunge Lecture, University of Miami Neuroscience Program, 25 Jan
2019: Annual Neural Plasticity meeting, Moorea, French Polynesia, 10-14 Feb.
2019: Lecture, Neuroimaging Course, Max Planck Florida Institute, 22 Feb.
2019: Stanford Mind, Brain and Computation (MBC) Symposium, 27 Feb.
2019: Keynote, Computational and Systems Neuroscience meeting, Cosyne, Lisboa, 1-2 March

2019: Keynote, African Neuroscience Meeting, Lagos, Nigeria, 26 March
2019: Wallenberg Centre National Fellows Convent, Gothenburg, 3 April
2019: Keynote, NIH Brain Initiative meeting, Washington DC, 11 April
2019: Kavli Saloon meeting, Volcan Arenal, Costa Rica, 28-30 April
2019: Brain Conference: Dynamics of the Brain, Rungstedgaard, Denmark, 9-12 June
2019: European Academy of Neurology: opening lecture, Lillestrøm, Norway, 29 June
2019: Keynote at retreat of Helen Wills Neuroscience Institute, UC Berkeley, Lake Tahoe, 19-21 Sept.
2019: Lindau Lecture at Heidelberg Laureate Forum, 23 Sept.
2019: Keynote at retreat of Helen Wills Neuroscience Institute, UC Berkeley, Lake Tahoe, 21-22 Sept.
2019: Invited speaker at Ascona Neural Circuits meeting, Ascona, Switzerland, 30 Sept.- 4 Oct.
2019: World Laureate Forum lecture, Shanghai, 28 Oct – 1 Nov.
2019: International conference on Neural Cells, Circuits, and Behavior: Tsinghua Univ., Beijing, 26 Nov.
2019: Royal Academy of Science, Amsterdam, Netherlands: van Rood and van Bekkum Lecture, 16 Dec
2020: Keynote lecture at Cosyne Workshop "15 Years of Grid Cells", Denver CO, 2-3 Mar.
2020: Keynote lecture, Science of Consciousness, Arizona, U.S., Sept 18, virtual
2020: Public interview and discussion, Lindau Nobel laureate meeting, Germany, 29 June – 2 July, virtual.
2020: Keynote lecture, Beijing Brain Conference, Chinese Institute of Brain Research, 24 Oct, virtual.
2020: Lecture and panel discussion, World Laureate Forum, Shanghai, China, 30 Oct – Nov 2, virtual.
2020: Keynote Lecture, American Epilepsy Society, Dec 6, virtual.
2021: Keynote lecture, Korean Basic Medical Conference, June 24, virtual.
2021: Public interview and discussion, Lindau Nobel laureate meeting, Germany, 28 June – 1 July, virtual.
2021: Opening lecture, EBBS (European Brain and Behaviour Society), 4 Sept, virtual.
2021: Lecture and panel discussion, World Laureate Forum, Shanghai, China, Nov 1-2, virtual.
2021: Keynote Lecture, Australian Neuroscience Society, Dec 6, virtual.
2022: Nobel Lecture, American Physiological Society, Experimental Biology, Philadelphia, April 5.
2022: Public interview and discussion, Nobel Foundation, Gothenburg, 4 May.
2022: Lecture, Optogen, Paris, 13 May.
2022: Opening lecture, Neuronal Plasticity in Brain Disorders and Their Treatment, Helsinki 12-13 June.
2022: Closing lecture, Open Microscopy Symposium, Paris, 7-8 July.
2022: Lecture, FENS (Federation of European Neuroscience Societies), Paris, 9-13 July.
2022: Lecture, Symposium in honor of Tobias Bonhoeffer, Max Planck Inst for Biol Intelligence, 14 July.
2022: Lecture, STARMUS science festival, Jerevan, Armenia, 4-5 Sept.
2022: Keynote lecture, Latin American Neuroscience meeting (FALAN), 14 Sept, virtual.
2022: Lecture, Ascona Circuits meeting, Switzerland, 26-30 Sept.
2022: Lecture, Århus University, Denmark, 24 Oct
2022: Neuropixels symposium lecture, Society for Neuroscience, San Diego, 16 Nov.
2022: Lecture, Max Planck Florida Institute, Jupiter, 18 Nov.
2022: Lecture, University of Copenhagen, BRIDGE alumni event, 14 Dec.
2023: Lecture, Workshop on "Physics modelling of thought", Max Planck Institute for Science History, Berlin, 10-12 Jan.
2023: Lecture and Nobel Dialogue participation, University of Pavia, 1-2 March
2023: Vice-Chancellor´s Open Lecture, University of Cape Town, South Africa, 22-23 March
2023: NYU Colloquium, New York Univerisity, 17 April
2023: Lecture, Lake Thun Conference, 7-11 May
2023: Lindau Nobel Laureate meeting, 28-30 June
2023: Lecture, Carla Shatz Festschrift 26 Aug
2023: Lecture, Seattle: Lake Conferences on Neural coding and dynamics, 17-21 September
2023: Keynote lecture, Argentinian Society for Neuroscience, San Luis, 1-7 Oct
2023: World Laureate Association Frontiers Lecture, Shanghai 6-8 Nov
2023: BioTech Graz Nobel Lecture, 11-12 Dec
2023: University of Freiburg Lecture, 12 Dec
2024: Keynote lecture, Nordic Neuroscience Meeting, 15-16 Jan
2024: Lectures at Chulalongkorn and Mahibol Universities, Bangkok, by Intn Peace Foundation, 12-13 Feb

Symposia and conference organizer (recent)
2002: Memory functions of the hippocampus. Spring Hippocampal Research Conference, Grand Cayman.

2002: Hippocampal memory networks: Between molecules and behaviour. FENS 2002, Paris.
2004: Population codes in the hippocampus. Spring Hippocampal Research Conference, Grand Cayman.
2005: Learning & Memory meeting, Cold Spring Harbor, New York, USA, April 20-24.
2008: Fridtjof Nansen conference on Neural Networks and Memory, June 4-8, conference organizer.
2008: Kavli Prize symposium, Univ. of Oslo and NTNU, Sept 8-11, co-organizer.
2009: Ascona Cicruit meeting: co-organizer, 4-8 Oct.
2010: Kavli Prize symposium, Univ. of Oslo and NTNU, Sept 6-9, co-organizer.
2011: Ascona Cicruit meeting: co-organizer, 25-29 Sept.
2013: Kavli Community Symposium, organizer, 22-23 Aug.
2013: Ascona Cicruit meeting: co-organizer 29 Sept – 4 Oct
2014: Neural Networks in the Arctic, conference organizer, Spitsbergen 5-10 June
2015: Inaugural Nordic Neuroscience meeting, 300 participants, Trondheim 10-12 June. Organizer.
2015: Ascona Cicruit meeting: co-organizer 27 Sept – 1 Oct
2017: Francis Crick symposium in neuroscience, Cold Spring Harbor, Souzhou, China, 8-12 May
2017: 2nd Nordic Neuroscience meeting, 300 participants, Stockhom 7-9 June. Co-organizer
2017: Starmus Science Festival IV, Trondheim, 18-23 June
2017: Ascona Cicruit meeting: co-organizer 1 Oct – 6 Oct
2018: Kavli Prize symposium, NTNU, Sept 6-7, co-organizer.
2022: Kavli Prize symposium, NTNU, Sept 7-9, co-organizer.

Current research supervision (mostly shared with M.-B. Moser)

Postdoc: R I Jacobsen (2014 –), R Gardner (2015 –), H Oberhaus (2016 –), BK Kanter (2020 –), CM Lykken (2020 –), M. Pofahl (2022 –), M Guaramagna (2022 –), I Polti (2023 –), E Baumler (2024 –).

PhD.: N Dagslott (2011 –), T Waaga (2015 –), T Slettmoen (2016 –), A Z Vollan (2016 –), V Normand (2017 –), J Carpenter (2019 –); H Enequist (2020 –), NL de Jong (2021 –), A Lautrup (2022 –).

Completed postdocs: F. Sargolini (2004-06; now Associate Professor at Univ. Marseille), P Ganter (2002-06), S Leutgeb (2002–07; now Assistant Professor at UCSD), V Brun (2005-07; now Assoc. Professor at Univ. Tromsø), A Sale (2006-07), J Leutgeb (2003-08; now Assistant Professor at UCSD), M Fyhn (2005-08 ; now Assoc. Professor at Univ. Oslo), T Hafting (2005-08 ; now Assoc. Professor Univ. Oslo), J Angie (2007-08; now Lecturer at Univ. St. Andrews), R Langston (2007-10 ; now Lecturer at Univ. Dundee), K Jezek (2005-10 ; now Assoc. Professor at Czech Academy of Sciences), L Colgin (2005-10 ; now Assistant Professor at UT Austin)**, D Derdikman (2005-10; now Assistant Professor at Technion in Haifa), A Tashiro (2006-12; now Assistant Professor at Nanyang Technol. Univ., Singapore)*, E Kropff (2008-11; now Assistant Professor at Neuronal Plasticity Laboratory, Leloir Institute, Buenos Aires, Argentina), L Giocomo (2009-11; now Assistant Professor at Stanford Univ.)***, J Whitlock (2007-13) ****, T van Cauter (2008-13), S-J Zhang (2008-11) ; H Yamahachi (2011-13) ; H Ito (2009-15; group leader at Max Planck Institute for Brain Research in Frankfurt a.M. from 1.1.2016), K Igarachi (2008-15; Assistant Professor at UC Irvine from 1.1.2016), J Ye (2008-15; new postdoc with M Bjørås, NTNU), F Donato (2013-19; Assistant Professor at Univ. Basel from 2019) #, M Hagglund (2013-19), M Carvalho (2014-19), N Tanke (2014-19), D Ledergerber (2011-19), D Rowland (2011-19; Associate Editor at Nature Neuroscience from 2019 and at Nature from 2020), J Sugar (2017-21; Associate Professor, Univ. Oslo), Ø Høydal (2020-21; Associate Professor, Høgskulen i Volda); G Quattrocolo (2017-21; group leader at Kavli, NTNU); RD do Vale (2021–22; Novo Nordisk), S Gonzalo Cogno (2017-23; now group leader at Kavli, NTNU); W Zong (2018-23; now group leader at Kavli, NTNU), D Hayden (2022–24).

Completed PhDs: S Molden (2005), H-A Steffenach (2005), F Tuvnes (2005), M Fyhn (2005)*****, V Brun (2005), H-A Steffenach (2005), M K Otnæss (2006), T Solstad (2009) and Kirsten Gj Kjelstrup (2010), T Bonnevie (2014), C Boccara (2014), T Stensola (2014), C Alme (2015), L Lu (2015), A Tsao (2015), C Miao (2015), H Stensola (2016), I U Kruge (2017), T Wernle (2018), T L Bjerknes (2018), Ø Høydal (2020), J S Blackstad (2022), S Andersson (2023), E Skytøen (2024), A Nagelhus (2024).

*Ayumu Tashiro received ERC Starting Grant in 2008 (at the Kavli Institute), also recipient of Gruber International Prize 2008 (awarded at Society for Neuroscience annual meeting); **Laura Colgin received

the Gruber International Prize 2010; ***Lisa Giocomo received the Gruber International Prize 2012, she was offered an ERC Starting Grant in 2012, and she received the Young Investigator Award of the Society for Neuroscience in 2018: ****Jonathan Whitlock received an ERC Starting Grant in 2013 (Kavli Institute, 1.1.2014 –); *****Marianne Fyhn received the Donald B Lindsley Award for best PhD in behavioural neuroscience in 2005 and was a runner-up for the Science Eppendorff Prize in 2007. # Flavio Donato received the Science Eppendorff Prize in 2017 and an ERC Starting Grant in 2019 (Univ. Basel).

Selected national administrative experience

Head of Interdisciplinary Programme in Neuroscience at NTNU (1998 – 2002); Head of Strategic University Programme in neuroscience at NTNU (2000–03); Head of international research consortium funded by European Commission (FW5; 2000–03); Member of Mental Health Board of Norwegian Research Council (2001–05); Director of Centre for the Biol. of Memory (Centre of Excellence, 2002–). Head of Program Committee for Neuroscience Research and Education at NTNU (2003 - 2005). Responsible for master programme in neuroscience at NTNU (2003 - 2005).

Funding (selected)

2000 – 2003: ***European Commission Framework V*** 'Quality of Life and Management of Living Resources Work Program / Research and technological development activities of a generic nature': 15.4 million NOK (1.9 mill. Euro; 20% to M/E Moser). Coordinator.

2002 – 2012: ***Centre of Excellence*** *Appointment by Norw. Res. Council:* Total budget 100 million NOK (12.5 mill Euro) over 10 years. See above.

2008 – 2010: ***European Commission Framework VII***: Collaborative Project: Small or medium-scale focused research project: HEALTH-2007-2.2.1-2: Coding in neuronal assemblies. 22 million NOK (3 mill. Euro; 20% to M/E Moser). Coordinator.

2008 – : ***Endowment from Kavli Foundation to establish Kavli Institute for Systems Neuroscience***; total of 7 million NOK per year, including supplementary funding from NTNU. Unlimited in time.

2009 – 2013: ***European Research Council Advanced Investigator Grant***; individual grant, total of 20 million NOK over 5 years (2.5 M Euro).

2011 – 2016: **NORBRAIN stage 1. Large-scale infrastructure program of the Research Council of Norway**. 85 million NOK (50% to Univ of Oslo). Coordinator.

2013 – 2015: ***European Commission Framework VII***: ICT Future Emerging Technologies (ICT-2011.9.11): 2.9 million Euro over 3 years. Coordinator.

2013 – 2022: ***Centre of Excellence*** *Appointment by Norw. Res. Council:* Total budget 175 million NOK (24 mill Euro) over 10 years. See above.

2014 – 2019: ***European Research Council Advanced Investigator Grant***; individual grant, total of 20 million NOK over 5 years (2.5 M Euro).

2014 – : **Ministry of Science and Education**: Annual contribution of 16 MNOK to Kavli Institute over the National Budget for infrastructure and technical support staff

2015 –: **Egil and Pauline Braathen and Fred Kavli Center for Cortical Microcircuits**, 6 M dollar from Braathen, 6 M dollar from Kavli, 25% ´gaveforsterkning´via Research Council.

2016 – 2021: **NORBRAIN stage 2. Large-scale infrastructure program of the Research Council of Norway**. 70 million NOK for 7T MR scanner. Coorindator. Users: MR group. Enables recruitment of Christian Doeller for professorship at Kavli.

2019 – 2022: **Research Council of Norway FRIPRO** grant (2 postdocs; 10 MNOK over 3 years)

2019 – : **Ministry of Science and Education**: Additional basic funding of 12 MNOK over the National Budget earmarked to Moser and Moser.

2020 – 2025: **NORBRAIN stage 3 Large-scale infrastructure program of the Research Council of Norway**. 50+ million NOK (whereof 30 MNOK to Moser/Witter). Coordinator.

2020 – 2025: **K.G. Jebsen Centre for Alzheimer´s disease**. 40+ million NOK from Foundation and Regional Health Authorities. NTNU and St. Olav´s Hospital. Coordinator.

2021 – 2026: **Mohn Centre for Brain Research**, Trond Mohn Foundation, member (node leader until startup).

2021 – 2027: ***European Research Council Synergy Grant***; total of 110 million NOK over 5 years (10 M Euro, 7.2 M to NTNU). Collaboration with Yoram Burak, Hebrew University of Jerusalem.

2023 – 2033: ***Centre of Excellence*** *Appointment by Norw. Res. Council:* From NRC 149 million NOK (14 mill Euro) over 10 years. See above.

Publications

ORCID http://orcid.org/0000-0003-0226-5566

Theses:

Moser, E.I. & Moser, M.-B. (1990). Spatial learning in a water maze following hippocampal lesions: Effects of the volume and the septo-temporal location of the lesion. Thesis (´hovedoppgave´) in Psychology, University of Oslo.

Moser, E.I. (1995). Field potential changes in the dentate gyrus during spatial learning in the rat. Dr. philos. thesis.

Articles: * = most significant publications

Skårdal, O., Lind, E., van der Welle Gjøen, J., Moser, E., Smørdal, T., Nyhus, S.T. & Moser, M.B. (1986). The interactional effects of personality and gender in small groups: A missing perspective in research. International Journal of Small Group Research, 2, 172-185.

Moser, M.B., Moser, E.I., Wultz, B. & Sagvolden, T. (1988).Component analyses differentiate between exploratory behavior of SHR and WKY rats in a two-compartment free-exploration open field. Scandinavian Journal of Psychology, 29, 200-206.

Wultz, B., Sagvolden, T., Moser, E.I. & Moser, M.B. (1990). The spontaneously hypertensive rat as an animal model of attention deficit hyperactivity disorder: Methylphenidate effects on the exploratory behavior of SHR and WKY rats in a two-compartment free-exploration open field. Behavioral and Neural Biology, 53, 88-102.

Moser, E.I. (1991). Finnes det en nosologisk distinkt ADD-populasjon? Tidsskrift for Norsk Psykologforening, 28, 477-487.

Moser, E.I., Mathiesen, I. & Andersen, P. (1993). Association between brain temperature and dentate field potentials in exploring and swimming rats. **Science**, 259, 1324-1326.

Moser, E.I., Moser, M.-B. & Andersen, P. (1993). Spatial learning impairment parallels the magnitude of dorsal hippocampal lesions, but is hardly present following ventral lesions. **Journal of Neuroscience** 13, 3916-3925.

Moser, E.I., Moser, M.-B. & Andersen, P. (1993). Synaptic potentiation in the rat dentate gyrus during exploratory learning. Neuroreport, 5, 317-320.

Moser, E.I. & Andersen, P. (1994). Conserved spatial learning in cooled rats in spite of slowing of dentate field potentials. **Journal of Neuroscience** 14, 4458-4466.

Moser, E.I., Moser, M.-B. & Andersen, P. (1994). Potentiation of dentate synapses initiated by exploratory learning: Dissociation from brain temperature, motor activity and arousal. Learning & Memory, 1, 55-73.

Moser, M.-B., Moser, E.I., Forrest, E., Andersen, P. & Morris, R.G.M. (1995). Spatial learning with a minislab in the dorsal hippocampus. **Proceedings of the National Academy of the Sciences USA**, 92, 9697-9701.

Moser, E.I. (1995). Learning-related changes in hippocampal field potentials. Behavioural Brain Research, 71, 11-18.

Andersen, P. & Moser, E.I. (1995). Brain temperature and hippocampal function. Hippocampus , 5, 491-498.

Moser, E.I. (1996). Altered inhibition of dentate granule cells during spatial learning in an exploration task. **Journal of Neuroscience**, 16, 1247-1259.

Moser, E.I. & Mathiesen, I. (1996). Relationship between neuronal activity and brain temperature in rats. Neuroreport, 7, 1876-1880.

Paulsen O. & Moser E.I. (1998). A model of hippocampal memory formation and retrieval: GABAergic control of synaptic plasticity. **Trends in Neurosciences**, 21, 273-278.

Moser, M.-B. Moser, E.I. (1998). Distributed encoding and retrieval of spatial memory in the hippocampus. **Journal of Neuroscience**, 18, 7535-7542.

Moser, E.I., Krobert, K.A., Moser, M.-B. & Morris, R.G.M. (1998). Saturation of long-term potentiation does impair spatial learning. **Science**, 281, 2038-2042.

Moser, M.-B. & Moser, E.I. (1998). Functional differentiation in the hippocampus. Hippocampus, 8, 608-619.

Moser, E.I. & Moser, M.-B. (1999). Is learning blocked by saturation of synaptic weights in the hippocampus? Neuroscience and Biobehavioral Reviews, 23, 661-672.

Otnæss, M.K., Brun, V.H., Moser, M.-B. & Moser, E.I. (1999). Pretraining prevents spatial learning impairment following saturation of hippocampal long-term potentiation. **Journal of Neuroscience**, 19, RC49 (1-5).

Moser, M.B. & Moser, E.I. (2000). Pretraining and the function of hippocampal long-term potentiation. **Neuron** 26, 559-561.

Brun, V.H., Ytterbø, K., Morris, R.G.M., Moser, M.B. & Moser, E.I. (2001). Retrograde amnesia for spatial memory induced by NMDA receptor-mediated long-term potentiation. **Journal of Neuroscience**, 21, 356-362.

Hollup, S.A., Molden, S., Donnett, J.G., Moser, M.B. & Moser, E.I. (2001). Accumulation of hippocampal place fields at the goal location in an annular watermaze task. **Journal of Neuroscience**, 21, 1635-1644.

Hollup, S.A., Molden, S., Donnett, J.G., Moser, M.B. & Moser, E.I. (2001). Place fields of rat hippocampal pyramidal cells and spatial learning in the watermaze. **European Journal of Neuroscience**, 13, 1197-1208.

Hollup, S.A., Kjelstrup, K.G., Hoff, J., Moser, M.-B. & Moser, E.I. (2001). Impaired recognition of the goal location during spatial navigation in rats with hippocampal lesions. **Journal of Neuroscience**, 21, 4505-4513.

Moser, E.I. & Paulsen, O. (2001). New excitement in cognitive space: Between place cells and spatial memory. **Current Opinion in Neurobiology**, 11, 745-751.

Steffenach, H.-A., Sloviter, R.S., Moser, E.I. & Moser, M.-B. (2002). Impaired retention of spatial memory after transection of longitudinally-oriented axons of hippocampal CA3 pyramidal cells. **Proceedings of the National Academy of the Sciences USA**, 99, 3194-3198.

* Brun, V.H., Otnæss, M.K., Molden, S., Steffenach, H.-A., Witter, M.P., Moser, M.-B., Moser, E.I. (2002). Place cells and place representation maintained by direct entorhinal-hippocampal circuitry. **Science**, 296, 2089-2284.

Fyhn, M., Molden, S., Hollup, S.A., Moser, M.-B. & Moser, E.I. (2002). Hippocampal neurons responding to first-time dislocation of a target object. **Neuron**, 35, 555-566.

Kjelstrup, K.G., Tuvnes, F.A., Steffenach, H.-A., Murison, R., Moser, E.I., Moser, M.-B. (2002). Reduced fear expression after lesions of the ventral hippocampus. **Proceedings of the National Academy of the Sciences USA**, 99, 10825-10830.

Morris, R.G.M., Moser, E.I., Henderson, C., di Luca, M., Witter, M.P. & Freund, T. (2002). Euroscience moves into sixth gear! **Trends in Neurosciences**, 25, 591-594.

Morris, R.G.M., Moser, E.I., Riedel, G., Martin, S.J., Sandin, J., Day, M. & O'Carroll, C. (2003). Elements of a neurobiological theory of the hippocampus: the role of activity-dependent synaptic plasticity in memory. Philosophical Transactions of the Royal Society, Biological Sciences, 358, 773-786.

Moser, E.I. (2003). Interneurons take charge [News and Views article]. **Nature**, 421, 797-799.

Moser, E.I. & Moser, M.-B. (2003). One-shot memory in hippocampal CA3 neurons. **Neuron**, 38, 147-148.

Tuvnes, F.A., Steffenach, H.-A., Murison, R., Moser, M.-B. & Moser, E.I. (2003). Selective hippocampal lesions do not increase adrenocortical activity. **Journal of Neuroscience**, 23, 4345-4354.

Moser, E.I. (2004). Place cells demand attention. **Neuron**, 42, 183-185.

* Fyhn, M., Molden, S., Witter, M.P., Moser, E.I. and Moser, M.-B. (2004). Spatial representation in the entorhinal cortex. **Science**, 305, 1258-1264 (Research Article).

Leutgeb, S., Leutgeb, J.K., Treves, A., Moser, M.-B. and Moser, E.I. (2004). Distinct ensemble codes in hippocampal areas CA3 and CA1. **Science** 305, 1295-1298.

Guzowski, J.F., Knierim, J.J, and Moser, E.I. (2004). Ensemble dynamics in hippocampal areas CA3 and CA1. **Neuron**, 44, 581-584.

Moser, E.I., Moser, M-B., Lipa, P., Newton, M., Houston, F.P., Barnes, C.A. and McNaughton, B.L. (2005). A test of the reverberatory activity hypothesis for hippocampal place cells. Neuroscience, 130, 519-526.

Steffenach, H.-A., Witter, M.P., Moser, M.-B., and Moser, E.I. (2005). Spatial memory in the rat requires the dorsolateral band of the entorhinal cortex. **Neuron**, 45, 301-313.

De Hoz, L., Moser, E.I., and Morris, R.G.M. (2005). Spatial learning with unilateral and bilateral hippocampal networks. European Journal of Neuroscience, 22, 745-754.

Leutgeb, S., Leutgeb, J.K., Barnes, C.A., Moser, E.I., McNaughton, B.L., and Moser, M.-B (2005). Independent codes for spatial and episodic memory in the hippocampus. **Science**, 309, 619-623.

* Hafting, T., Fyhn, M., Molden, S., Moser, M.-B., and Moser, E.I. (2005). Microstructure of a spatial map in the entorhinal cortex. **Nature**, 436, 801-806 (Article).

Leutgeb, J.K., Leutgeb, S., Treves, A., Meyer, R., Barnes, C.A., McNaughton, B.L., Moser, M.-B., and Moser, E.I. (2005). Progressive transformation of hippocampal neuronal representations in 'morphed' environments. **Neuron**, 20, 345-358.

Leutgeb, S., Leutgeb, J.K., Moser, M.-B., and Moser, E.I. (2005). Place cells, spatial maps and the population code for memory. **Current Opinion in Neurobiology**, 15, 738-746.

Colgin, L.L, and Moser, E.I. (2006). Rewinding the memory record. **Nature**, 440, 615-617.

* Sargolini, F., Fyhn, M., Hafting, T., McNaughton, B.L., Witter, M.P., Moser, M.-B., and Moser, E.I. (2006). Conjunctive representation of position, direction and velocity in entorhinal cortex. **Science**, 312, 754-758.

McNaughton, B.L., Battaglia, F.P., Jensen, O., Moser, E.I., and Moser, M.-B. (2006). Path-integration and the neural basis of the 'cognitive map'. **Nature Reviews Neuroscience**, 7, 663-678.

Leutgeb, S., Leutgeb, J.K., Moser, E.I., and Moser, M.-B (2006). Fast rate coding in hippocampal CA3 cell assemblies. Hippocampus, 16, 765-774.

Solstad, T., Moser, E.I., and Einevoll, G.T. (2006). From grid cells to place cells: a mathematical model. Hippocampus, 16, 1026-1031.

Witter, M.P. and Moser, E.I. (2006). Spatial representation and the architecture of the entorhinal cortex. **Trends in Neurosciences**, 29, 671-678.

* Leutgeb, J.K., Leutgeb, S., Moser, M.-B., and Moser, E.I. (2007). Pattern separation in dentate gyrus and CA3 of the hippocampus. **Science** , 315, 961-966 (Research Article).

* Fyhn, M., Hafting, T., Treves, A., Moser, M.-B. and Moser, E.I. (2007). Hippocampal remapping and grid realignment in entorhinal cortex. **Nature**, 446, 190-194.

Leutgeb, J.K. and Moser, E.I. (2007). Enigmas of the dentate gyrus. **Neuron**, 55, 176-178.

Moser, E.I. (2007). Atlas on our shoulders. **Nature**, 409, 406.

Moser, E.I. and Moser, M.-B (2007). Grid cells. Scholarpedia, 2:3394.

Dickson, B.J. and Moser, E.I. (2007). Editorial Overview: Neurobiology of Behaviour. **Current Opinion in Neurobiology** 17, 672-674.

Brun, V.H., Leutgeb, S., Wu, H.-Q., Schwarcz, R., Witter, M.P., Moser, E.I. and Moser, M.-B. (2008). Impaired spatial representation in CA1 after lesion of direct input from entorhinal cortex. **Neuron** 57, 290-302.

* Moser, E.I., Kropff, E. and Moser, M.-B. (2008). Place cells, grid cells and the brain's spatial representation system. **Annual Reviews of Neuroscience**, 31, 69-89.

* Hafting, T., Fyhn, M., Bonnevie, T., Moser, M.-B. and Moser, E.I. (2008). Hippocampus-independent phase precession in entorhinal grid cells. **Nature** 453, 1248-1252.

Treves, A., Tashiro, A., Witter, M.P. and Moser, E.I. (2008). What is the mammalian dentate gyrus good for? Neuroscience Forefront Review. **Neuroscience** 154, 1155-1172.

Kjelstrup, K.B., Solstad, T., Brun, V.H., Hafting, T., Leutgeb, S., Witter, M.P., Moser, E.I. and Moser, M.-B. (2008). Finite scales of spatial representation in the hippocampus. **Science** 321, 140-143.

Colgin, L.L., Moser, E.I. and Moser, M.-B. (2008). Understanding memory through hippocampal remapping. **Trends in Neurosciences**, 31, 469-477.

Whitlock, J.R., Sutherland, R.J., Witter, M.P., Moser, M.-B. and Moser, E.I. (2008). Navigating from hippocampus to parietal cortex. **Proceedings of the National Academy of the Sciences USA** 105, 14755-14762.

Hasselmo, M.E., Moser, E.I. and Moser M.-B. (2008). Foreword: Special Issue on Grid Cells. **Hippocampus**, 18, 1141 (co-Editors).

Moser, E.I. and Moser, M.-B. (2008). A metric for space. **Hippocampus**, 18, 1142-1156 (lead article for grid cell special issue).

Fyhn, M., Hafting, T.H., Moser, E.I. and Moser, M.-B. (2008). Grid cells in mice. **Hippocampus**, 18, 1230-1238.

Brun, V.H., Solstad, T., Kjelstrup, K.B., Fyhn, M., Witter, M.P., Moser, E.I. and Moser, M.-B. (2008). Progressive increase in grid scale from dorsal to ventral medial entorhinal cortex. **Hippocampus**, 18, 1200-1212.

* Solstad, T., Boccara, C.N., Kropff, E., Moser, M.-B. and Moser, E.I. (2008). Representation of geometric borders in the entorhinal cortex. **Science**, 322, 1865-1868.

* Derdikman D, Whitlock JR, Tsao A, Fyhn M, Hafting T, Moser M-B and Moser EI (2009). Fragmentation of grid cell maps in a multicompartment environment. **Nature Neurosci**, 12, 1325-1332.

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Colgin LL, Moser EI (2009). Hippocampal theta rhythms follow the beat of their own drum. **Nature Neurosci**., 12, 1483-1484.

* Langston RF, Ainge J, Cowey JJ, Canto CB, Bjerknes TL, Witter MP, Moser EI, Moser M-B (2010). Development of the spatial representation system in the rat. **Science**, 328, 1576-1580.

Colgin LL, Leutgeb S, Jezek K, Leutgeb JK, Moser EI, McNaughton BL and Moser M-B (2010). Attractor-map versus autoassociation based attractor dynamics in the hippocampal network**. J. Neurophysiol**., 104, 35-50.

* Boccara CB, Sargolini F, Hult V, Solstad T, Witter MP, Moser EI and Moser M-B (2010). Grid cells in pre- and parasubiculum. **Nature Neurosci**., 13, 987-994.

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Colgin LL, Moser EI (2010). Gamma oscillations in the hippocampus. **Physiology**, 25, 319-329.

* Henriksen EJ, Colgin LL, Barnes CA, Witter MP, Moser M-B, and Moser EI (2010). Spatial representation along the proximodistal axis of CA1. **Neuron**, 68, 127-137.

Derdikman D, Moser EI (2010). A manifold of spatial maps in the brain. **Trends Cogn. Sci.**, 14, 561-569.

Moser EI, Moser M-B (2011). Seeing into the future. **Nature**, 469, 303-304.

Moser EI (2011). The multi-laned hippocampus. **Nature Neurosci**. 14, 407-408.

Moser M-B, Moser EI (2011). Crystals of the brain. **EMBO Mol. Med.** 3, 1-4.

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