

MICHAEL D. EHLERS

Address HHMI, Department of Neurobiology
Duke University Medical Center
317 Bryan Research Building
Research Dr.
Box 3209
Durham, NC 27710
USA
(919)684-1828
FAX (919)668-0631
e-mail: ehlers@neuro.duke.edu

Education

- 1998: *Doctor of Medicine*, **The Johns Hopkins University School of Medicine**,
Baltimore, MD.
1998: *Doctor of Philosophy*, **The Johns Hopkins University School of Medicine**,
Department of Neuroscience, Baltimore, MD.
1991: *Bachelor of Science with Honors*, Chemistry, **California Institute of Technology**,
Pasadena, CA

Professional Experience

- 2005-present *Investigator*, **Howard Hughes Medical Institute**
- 2004-present *Associate Professor*, **Duke University Medical Center**, Department of Neurobiology,
with joint appointments in the Department of Cell Biology, the Department of
Pharmacology and Cancer Biology, and the Department of Pathology
- Current interests include understanding cell biological mechanisms that construct, shape, and maintain neuronal architecture and circuitry. Ongoing studies focus on identifying mechanisms underlying glutamate receptor trafficking to and from excitatory synapses, the secretory and endocytic machinery of dendrites and spines, and ubiquitin-dependent remodeling of the postsynaptic membrane.
- 2003-2005 *Director, Neuroproteomics Laboratory*, **Duke University Medical Center**
- Goal of the laboratory is to provide a cutting edge resource for technology development and proteomics approaches in the clinical and basic neurosciences. Current projects include quantitative analysis of synaptic protein ensembles in plasticity and pathology, identification and validation of biomarkers in neurologic and psychiatric disease, and fractionation methods for protein complexes from nervous tissue.
- 1998-2004 *Assistant Professor*, **Duke University Medical Center**, Department of Neurobiology,
with joint appointments in the Department of Cell Biology and the Department of
Pharmacology and Cancer Biology
- Revealed cellular mechanisms of protein trafficking and turnover in neuronal dendrites and their relationship to synapse formation and function.
- 1996-1998: *Postdoctoral Fellow*, Laboratory of Dr. Richard L. Huganir, **The Johns Hopkins University School of Medicine**, Department of Neuroscience.
- Identified and characterized the association of NMDA-type glutamate receptors with neuronal intermediate filaments. Investigated structural features of NMDA receptors required for

calcium/calmodulin-dependent inactivation. Investigated action of protein kinases and protein phosphatases on NMDA-type glutamate receptors. Identified cellular mechanisms involved in activity-dependent alterations in the number of postsynaptic AMPA-type glutamate receptors.

1994-1996: Doctoral Research, Laboratory of Dr. Richard L. Huganir, **The Johns Hopkins University School of Medicine**, Department of Neuroscience.

Identified novel mechanisms involved in regulating the subcellular localization of NMDA-type glutamate receptor subunits. Elucidated the primary molecular means by which NMDA receptor activity is controlled by intracellular calcium.

1992-1993: Graduate Research Assistant, Laboratory of Dr. Donald L. Price, **The Johns Hopkins University School of Medicine**, Department of Pathology.

Used in vivo animal models to describe the retrograde neuronal transport of neurotrophin receptors. Developed an in vitro primary neuronal culture system for the study of gene regulation during apoptosis.

1992: Graduate Research Assistant, Laboratories of Dr. J. James Frost and Dr. Ursula Scheffel, **The Johns Hopkins University School of Medicine**, Department of Radiology.

Examined the distribution of dopamine reuptake sites in mouse brain using high affinity radiolabeled cocaine analogs. Helped design clinical studies of dopamine reuptake site distribution in the living brains of patients recently diagnosed with Parkinson's Disease.

1990-1991: Undergraduate Research Assistant, Laboratory of Dr. Jesse. L. Beauchamp, **California Institute of Technology**, Division of Chemistry and Chemical Engineering.

Examined the chemical reactivity and energy absorption properties of peptides in the gas phase using laser ablation and ion cyclotron resonance spectrometry.

1988-1990: Undergraduate Research Assistant, Laboratory of Dr. John. H. Richards, **California Institute of Technology**, Division of Chemistry and Chemical Engineering.

Generated structural mutants of E. coli beta-lactamase for use in kinetic assays of enzymatic activity.

Teaching Experience

2003-present Neurobiology of Disease (NBI 361), **Duke University Medical Center**

Lectures on clinical features and pathogenesis of neurodegenerative disorders given as part of an upper level graduate course.

2001-2002 Cellular Signaling (CBI 417), **Duke University Medical Center**

Lectures on cellular mechanisms of learning and memory given as part of an advanced graduate course in Cell Biology.

1999-present: Basic Neurobiology (MBI 202), **Duke University Medical Center**

Lectures on neurotransmitters and neurotransmitter receptors given to first year medical students.

1999-present: Molecular Cell Biology (CBI 251), **Duke University Medical Center**

Lectures on signal transduction mechanisms given as part of the Cell & Molecular Biology Graduate Program curriculum.

1998-2000: Neuronal Signaling (NBI 317), **Duke University Medical Center**.

Lectures on ion channels, receptors, and synaptic plasticity given as part of the Neurobiology Graduate Program core curriculum.

1992-1994: Teaching Assistant, Medical Neuroscience Course, **The Johns Hopkins University School of Medicine**, Department of Neuroscience..

Conducted teaching sessions with sections of 20-25 medical students covering cellular neurobiology and neuroanatomy in both formal and small tutorial settings.

1990-1991: Senior Teaching Assistant, Organic Synthesis Teaching Laboratories, **California Institute of Technology**, Division of Chemistry and Chemical Engineering.

Responsible for designing and implementing laboratory exercises for the Organic Synthesis courses. Taught laboratory courses with sections of 10-12 undergraduates.

1989-1991: Tutor in Chemistry, Biology, and Mathematics, **California Institute of Technology**, Office of the Dean of Students, Scientific Outreach Program.

Tutored local high school students recognized for excellence in the natural sciences.

Awards and Fellowships

John J. Abel Award in Pharmacology, 2007

Daniel X. Freedman Award for outstanding basic science research, NARSAD, 2006

Fulbright Scholar Award, 2006

Howard Hughes Medical Institute, Investigator, 2005

Thomas Langford Lectureship Award, 2004

Wakeman Scholar Award in Neurobiology, 2004

Raymond and Beverly Sackler Foundation Scholar Award, 2004

NINDS "Top Science Advances" Selectee, 2003

Eppendorf and *Science* Prize for Neurobiology, 2003

awarded for the most outstanding neurobiological research by a young scientist performed during the past three years

Broad Scholar in the Neurosciences Award, 2003

Faculty of 1000 Exceptional Paper 2003

#1 in Neuroscience, #2 in all of Biology

NARSAD Young Investigator Award, 2002

Winter Conference on Brain Research Fellowship, 2002

Ruth Salta Junior Investigator Achievement Award of the National Heart Foundation, 2001

Ellison Foundation New Scholar Award, 2001

Ruth Salta Junior Investigator Achievement Award of the National Heart Foundation, 2000

NARSAD Young Investigator Award, 2000

Alfred P. Sloan Research Fellow Award, 2000

George H. Hitchings New Investigator Award, 1999

McKnight Scholar Award, 1999

Klingenstein Fellowship in the Neurosciences Award 1999

Whitehead Scholar Award, 1998

Howard Hughes Postdoctoral Fellowship, 1998.

Alpha Omega Alpha, elected 1998.

David Israel Macht Young Investigator Award, 1996.

Medical Scientist Training Program Fellow, 1991-1998.

Schaffer Cell Biology/Anatomy Award, 1992.

Richard P. Schuster Memorial Prize for Excellence in Chemistry, 1991.

American Chemical Society Award, 1990.

Los Angeles Philanthropic Society Scholarship, 1989-1991.

John Stauffer Merit Award, 1989-1991.

Caltech Merit Scholar, 1989-1991.
National Merit Scholar, 1987.
William Randolph Hearst Foundation Award, 1987.

University Service

Director of Admissions, Neurobiology Graduate Program
Duke Medicine Science Advisory Council (2006 – present)
MSTP Steering Committee (2006 – present)
Neurobiology Faculty Search Committee (2006-2007)
Duke University Medical Center Strategic Plan Implementation Committee (2006 – present)
Duke University Science Retreat Planning Committee (2005)
Medical Scientist Training Program Executive Committee (2005 – 2006)
Neurogenomics Faculty Search Committee (2004)
Computational Neurobiology Faculty Search Committee (2003)
Pharmacological Sciences Training Program Executive Committee (2003 – present)
Duke University Proteomics Advisory Committee (2003 – present)
Center for Translational Neuroscience Faculty Search Committee (2003)
Neurobiology Faculty Search Committee (2003)
Alpha Omega Alpha Research Presentations Committee (2001 – present)
Institutional Animal Care and Use Committee (2001 – 2005)
Medical Scientist Training Program Admissions Advisory Committee (2000 – 2005)
Neurobiology Molecular Core Facility Committee (2000 – present)
Neurobiology Faculty Search Committee (1999)
Neurobiology Steering Committee (1999-present)
Medical Student 3rd Year Research Director, Neurosciences (2000-2001)
M.D./Ph.D. Coordinator, Neurobiology (1999-present)
Neurobiology Graduate Admissions Committee (1999-present)

Professional Activities

National and International Service

Member, Eppendorf & *Science* Prize Selection Committee (2007 – 2009)

Professional Societies

Member, International Society for Neurochemistry (2005 – present)
Member, American Society for Biochemistry and Molecular Biology (2003 – present)
Member, American Society for Cell Biology (1999 – present)
Member, Society for Neuroscience (1992 – present)

Grant Reviewer

Neurological Foundation of New Zealand
AAAS Women's International Science Collaboration Program
The Wellcome Trust, United Kingdom
Alzheimer's Association
Department of Defense Experimental Program to Stimulate Competitive Research (DEPSCoR)
Medical Research Council, United Kingdom
U.S.-Israel Binational Science Foundation
Volkswagen Foundation, Germany

NIH Service

NIH Molecular, Developmental, and Cellular Neuroscience Study Section (MDCN1), Ad hoc member

Editorial Boards

Journal of Biological Chemistry, Editorial Board Member (2003 – present)
 Journal of Neuroscience, Associate Editor (2003 – present)
 Faculty of 1000, Neurobiology of Disease Section (2004 – present)
 Molecular and Cellular Neuroscience, Associate Editor (2005 – present)
 Brain Cell Biology, Editorial Board Member (2006 – present)
 Debates in Neuroscience, Editorial Board Member (2006 – present)
 Ubiquitin-Proteasome Section, Targeted Protein Database, Current BioData Ltd (2006 – present)

Commerical and Industry Activities

2006 Frontiers of Neuroscience Drug Discovery Summit, Merck & Co., Inc.

Invited Lectures

- 2007: Academia Sinica Taiwan Institute of Molecular Biology Seminar, National Yang-Ming University Taiwan Neuroscience Seminar, University of Massachusetts Medical School Neuroscience Seminar, Vanderbilt Neuroscience Seminar, University of Alabama Birmingham Neurobiology Seminar, British Neuroscience Association Symposium on Ubiquitin and Synaptic Function, University College London Physiology Seminar, Cold Spring Harbor Meeting on Synapses from Molecules to Behavior, NIMH Neuroscience Lecture, NIEHS Frontiers in Environmental Science Seminar, Emory University Human Genetics Seminar, University of Iowa Symposium on Structural and Functional Organization of the Synapse, University of Iowa Obermann Conference on Synapses
- 2006: Case Western Reserve Neuroscience Seminar, NIH Porter Neuroscience Lecture, Cornell-Weill Medical School Biochemistry Seminar, Club Exocytose-Endocytose Conference of the Société de Biologie Cellulaire de France, Cell Biology of the Neuron Gordon Research Conference, Centro de Investigación Médica Aplicada Universidad de Navarra Neuroscience Seminar, Gordon Research Conference on Synaptic Transmission, INSERM Grenoble Neuroscience Seminar, European Summer Synapse School Research Seminar, University of Pittsburgh Neurobiology Seminar
- 2005: Institut François Magendie-Université de Bordeaux Neuroscience Seminar, Montreal Neurological Institute Killam Lecture, Duke University's Thomas Langford Lecture, Medical College of George Neuroscience Seminar, University of North Carolina Chapel Hill Synapse Club Seminar, Neural Circuits and Plasticity Gordon Research Conference, National MD/PhD Student Symposium Featured Speaker, Universität Kaiserslautern Invited Lecture, International Society for Neurochemistry Symposium Speaker, Gordon Research Conference on Excitatory Amino Acids and Brain Function, École Normale Supérieure Biology Seminar, Yale University Biology Seminar, University of Washington Physiology & Biophysics Seminar, University of British Columbia Neuroscience Seminar
- 2004: Washington University-St. Louis Neurobiology Seminar, Northwestern University Neurobiology & Physiology Seminar, University of Chicago Neurobiology Seminar, Harvard Children's Hospital Neuroscience Seminar, Harvard Medical School Molecular Biology & Genetics Seminar, Caltech Biology Seminar, University of Virginia Neuroscience Seminar, Stanford University Neuroscience Seminar, Brandeis University Biology Seminar, Gordon Research Conference on Cell Biology of the Neuron, FASEB Conference on Ubiquitin and Cellular Regulation, Eppendorf AG Special Lecture, Harden Conference on the Ubiquitin Proteasome System in Health and Disease, Colorado State University Molecular Cellular and Integrative Neuroscience Seminar, University of Colorado Health Sciences Center Neuroscience Seminar
- 2003: University of North Carolina-Chapel Hill Cell and Molecular Physiology Seminar, University of Texas-Houston Medical Center Neurobiology Seminar, University of Southern California Biology Seminar, Johns Hopkins University Special Lecture in Neurology, University of Tennessee Health Sciences Center Pharmacology Seminar, Stanford University Neurobiology Seminar, Mount Sinai School of Medicine Translational Neuroscience Seminar, Gladstone Institute of Neurological Disease Neuroscience Seminar, Gordon Research Conference on Excitatory Amino Acids and Brain Function, Duke University Neurobiology Seminar, Baylor College of Medicine Brain and Behavior Seminar
- 2002: Baylor College of Medicine Neuroscience Seminar, Winter Conference on Brain Research

- Symposium on AMPA and NMDA Receptor Targeting and Trafficking, NIH-NIEHS Signal Transduction Seminar, Brown University Neuroscience Seminar, University of North Carolina Synapse Club Seminar, SUNY Stony Brook Neurobiology and Behavior Seminar, McKnight Conference on Neuroscience, Japanese Neuroscience Society Conference Symposium on Synaptic Targeting of Glutamate Receptors, Penn State Life Science Consortium Seminar, Emory University Cell Biology Seminar, Neurobiology of Aging Symposium on the Molecular and Cellular Basis of Synaptic Dysfunction and Loss in Alzheimer's Disease
- 2001: Duke University Pharmacology Seminar; University of North Carolina-Chapel Hill Cell Biology Seminar, Society for Neuroscience Symposium on Hebb and Homeostasis in Synaptic Plasticity; NIH-NINDS Neurosciences Seminar, Johns Hopkins University Neuroscience Seminar, Albert Einstein College of Medicine Neuroscience Seminar
- 2000: Duke University Neurobiology Symposium, Duke University Cell Biology Seminar
- 1998: Duke University Neurobiology Symposium

Miscellaneous

Conference Organizer, Structural & Functional Organization of the Synapse, Iowa City, 2007
 Session Chair, Cold Spring Harbor Meeting on Synapses: from Molecules to Behavior, 2007
 Session Organizer, Gordon Research Conference on Cell Biology of the Neuron, 2004
 Member, Faculty of 1000, Neurobiology of Disease and Regeneration Section
 Participant, Duke University Summer Research Opportunities Program for Minority Undergraduates
 Contributor, Alzheimer's Research Forum
 Contributor, Neuroscience, Second Edition, eds. Purves et al, Sinauer Press (Sunderland, MA)
 Contributor, Alliance for Cellular Signaling, subfield: NMDA receptor signaling
 Reviewer for the following journals: *Science, Nature, Cell, Neuron, Nature Neuroscience, Nature Cell Biology, PLoS Biology, Nature Reviews Neuroscience, Journal of Cell Biology, Journal of Neuroscience, Genes & Development, Trends in Neurosciences, Journal of Biological Chemistry, Journal of Neurophysiology, Journal of Cell Science, EMBO Journal, EMBO Reports, FASEB Journal, Molecular and Cellular Neuroscience, Molecular and Cellular Biology, Neuroscience, European Journal of Neuroscience, Neuroscience Letters, Journal of Neurochemistry, Neuroscience Research, Neurobiology of Aging, Chemistry and Biology, Molecular Interventions, Archives of General Psychiatry, Journal of Neuroscience Methods, Archives of Neurology, Brain Research, Journal of Neuroscience Methods*

NIH Research Grants (current support only – Ehlers as PI)

2002 – present	Intracellular Trafficking of AMPA Receptors (R01 MH64748)
2000 – present	Synaptic Targeting of NMDA Receptors (R01 NS39402)
2004 – present	Molecular Targets of A-beta-Induced Synaptic Dysfunction (R01 AG24492)
2005 – present	The Endocytic Machinery of Dendritic Spines (R01 NS047574)

Trainees

Predoctoral

Ana Oliveira (2005 – 2006)
 Rui Peixoto (2004 – present)
 Kathryn Condon (2004 – present)
 Tingting Wang (2004 – present)
 Ming-Chia Lee (2004 – present)
 Jason Yi (2004 – present)
 Zhiping Wang (2003 – present)
 Sangmi Lim (2002 – 2005)
 Mikyoung Park (2001 – 2006)
 April C. Horton (1999 – 2005, currently resident in Anesthesiology, U Penn)
 Derek B. Scott (1999 – 2004)

Postdoctoral

- Hyun-Soo Je, Ph.D. (2006 – present)
 Thomas Newpher, Ph.D. (2006 – present)
 David Cao, Ph.D. (2006 – present)
 Cyril Hanus, Ph.D. (2006 – present)
 Ian Davison, Ph.D. (2005 – present)
 Benjamin Arenkiel, Ph.D. (2005 – present)
 Matthew Kennedy, Ph.D. (2005 – present)
 Thomas Helton, Ph.D. (2004 – present)
 Jiuyi Lu, Ph.D. (2002 – present)
 Takeshi Otsuka, Ph.D. (2002 – 2004)
 currently Assistant Professor, National Institute of Physiological Sciences, Okazaki, Japan)
 Goang-Won Cho, Ph.D. (2002 – 2003)
 currently Research Professor, The Catholic University of Korea, Seoul, South Korea
 Isabel Perez-Otano (2000 – 2004)
 currently Assistant Professor, CIMA, Universidad de Navarra, Pamplona, Spain
 M. McLean Bolton, Ph.D. (2000 – 2001)
 currently research fellow with Dr. Donald Lo, Duke University, Durham, NC
 Yuanyue Mu, Ph.D. (2000 – 2006)
 currently research fellow with Dr. Jonathan Stamler, Duke University, Durham, NC
 Thomas A. Blanpied, Ph.D. (2000 – 2005)
 currently Assistant Professor, University of Maryland, Baltimore, MD

Peer-Reviewed Publications

- A. C. Horton, J. J. Yi, and **M. D. Ehlers** (2007). Cell type-specific dendritic polarity in the absence of spatially organized external cues. *Brain Cell Biol.* (in press).
- I. E. Michailidis, T. D. Helton, V. I. Petrou, T. Mirshahi, **M. D. Ehlers**, and D. E. Logothetis (2007). PIP₂ regulates NMDA receptor activity through alpha-actinin. *J. Neurosci.* (in press).
- ****M. D. Ehlers**, M. Heine, L. Groc, M.-C. Lee, and D. Choquet (2007). Diffusional trapping of GluR1 AMPA receptors by input-specific synaptic activity. *Neuron* 54:447-460.
 ** Corresponding author
- B. R. Arenkiel, J. Peca, I. G. Davison, C. Feliciano, K. Deisseroth, G. J. Augustine, ****M. D. Ehlers**, and G. Feng (2007). In vivo light-induced activation of neural circuitry in transgenic mice expressing channelrhodopsin-2. *Neuron* 54:205-218..
 ** Corresponding author
- M. Park, J. M Salgado, L. Ostroff, T. D. Helton, C. G. Robinson, K. M. Harris, and **M. D. Ehlers** (2006). Plasticity-induced growth of dendritic spines by exocytic trafficking from recycling endosomes. *Neuron* 52:817-830.
- I. Pérez-Otaño, R. Lujan, S. J. Tavalin, M. Plomann, J. Modregger, X.-B. Liu, E. G. Jones, S. F. Heinemann, D. C. Lo, and **M. D. Ehlers** (2006). Endocytosis and synaptic removal of NR3A-containing NMDA receptors by PACSIN1/Syndapin1. *Nature Neurosci.* 9:611-621.
- H.-S. Hoe, A. Pocivavsek, G. Chakraborty, Z. Fu, S. Vicini, **M. D. Ehlers**, and G. W. Rebeck (2006). Apolipoprotein E receptor 2 interactions with the NMDA receptor. *J. Biol. Chem.* 281:3425-3431.

- A. C. Horton, B. Racz, E. E. Monson, A. L. Lin, R. J. Weinberg, and **M. D. Ehlers** (2005). Polarized secretory trafficking directs cargo for asymmetric dendrite growth and morphogenesis. *Neuron* 48:757-771.
- I. K. Svenson, M. T. Kloos, A. Jacon, C Gallione, A. C. Horton, M. A. Pericak-Vance, **M. D. Ehlers**, D. A. Marchuk (2005). Subcellular localization of spastin: implications for the pathogenesis of hereditary spastic paraplegia. *Neurogenetics* 6: 135-41.
- R. T. Terry-Lorenzo, D. W. Roadcap, T. Otsuka, T. A. Blanpied, P. Zamorano, C. C. Garner, S. Shenolikar, and **M. D. Ehlers** (2005). Neurabin/protein phosphatase-1 complex regulates dendritic spine morphogenesis and maturation. *Mol. Biol. Cell* 16:2349-2362.
- M. Park, E. C. Penick, J. G. Edwards, J. A. Kauer, and **M. D. Ehlers** (2004). Recycling endosomes supply AMPA receptors for LTP. *Science* 305:1972-1975.
- B. Racz, T. A. Blanpied, ****M.D. Ehlers**, and R. J. Weinberg (2004). Lateral organization of endocytic machinery in dendritic spines. *Nature Neurosci.* 7:917-918.
** Corresponding author
- D. B. Scott, I. Michailidis, Y. Mu, D. Logothetis, and **M. D. Ehlers** (2004). Endocytosis and degradative sorting of NMDA receptors by conserved membrane-proximal signals. *J. Neurosci.* 24: 7096-7109.
- T. A. Blanpied, D. B. Scott, and **M. D. Ehlers** (2003). Age-related regulation of dendritic endocytosis associated with altered clathrin dynamics. *Neurobiol. Aging* 24:1095-1104.
- Y. Mu, T. Otsuka, A. C. Horton, D. B. Scott, and **M. D. Ehlers** (2003). Activity-dependent mRNA splicing controls ER export and synaptic delivery of NMDA receptors. *Neuron* 40:581-594.
- D. B. Scott, T. A. Blanpied, and **M. D. Ehlers** (2003). Coordinated PKA and PKC phosphorylation suppresses RXR-mediated ER retention and regulates the surface delivery of NMDA receptors. *Neuropharm.* 45:755-767.
- A. C. Horton and **M. D. Ehlers** (2003). Dual modes of endoplasmic reticulum-to-Golgi transport in dendrites revealed by live-cell imaging. *J. Neurosci.* 23: 6188-6199.
- M.D. Ehlers** (2003). Activity level controls postsynaptic composition and signaling via the ubiquitin-proteasome system. *Nature Neurosci.* 6:231-242.
- T.A. Blanpied, D.B. Scott, and **M.D. Ehlers** (2002). Dynamics and regulation of clathrin coats at specialized endocytic zones of dendrites and spines. *Neuron* 36:435-449.
- K. W. Roche, S. Standley, J. McCallum, C. D. Ly, **M. D. Ehlers**, and R. J. Wenthold (2001). Molecular determinants of NMDA receptor internalization. *Nature Neurosci.* 4:794-802
- D. B. Scott, T. A. Blanpied, G. T. Swanson, C. Zhang, and **M. D. Ehlers** (2001). An NMDA receptor ER retention signal regulated by phosphorylation and alternative splicing. *J. Neurosci.* 21:3063-3072.
- M. D. Ehlers** (2000). Reinsertion or degradation of AMPA receptors determined by activity-dependent endocytic sorting. *Neuron* 28:511-525.
- D. Liao, X. Zhang, R. J. O'Brien, **M. D. Ehlers**, and R. L. Huganir (1999). Regulation of morphological postsynaptic silent synapses in developing hippocampal neurons. *Nature Neurosci.* 2:37-43.

M. D. Ehlers, E. T. Fung, R. J. O'Brien, and R. L. Huganir (1998). Splice variant-specific interaction of the NMDA receptor subunit NR1 with neuronal intermediate filaments. *J. Neurosci.* **18**(2):720-730.

S. Zhang, **M. D. Ehlers**, J. P. Bernhardt, and R. L. Huganir (1998). Calmodulin mediates calcium-dependent desensitization of NMDA receptors. *Neuron* **21**:443-453.

** Equally contributing authors.

R. J. O'Brien, S. Kamboj, **M. D. Ehlers**, D. Liao, K. R. Rosen, G. D. Fischbach, and R. L. Huganir (1998). Activity-dependent modulation of synaptic AMPA receptor accumulation. *Neuron* **21**:1067-1078.

R. J. O'Brien, A. L. Mammen, S. Blackshaw, **M. D. Ehlers**, J. D. Rothstein, and R. L. Huganir (1997). The development of excitatory synapses in cultured rat spinal neurons. *J. Neurosci.* **17**(19):7339-7350.

W. G. Tingley, **M. D. Ehlers**, K. Kameyama, C. Doherty, J. B. Ptak, C. T. Riley, and R. L. Huganir (1997). Characterization of protein kinase A and protein kinase C phosphorylation of the N-methyl-D-aspartate receptor NR1 subunit using phosphorylation site-specific antibodies. *J. Biol. Chem.* **272**:5157-5166.

M. D. Ehlers, S. Zhang, J. P. Bernhardt, and R. L. Huganir (1996). Inactivation of NMDA receptors by direct interaction of calmodulin with the NR1 subunit. *Cell* **84**:745-755.

L.-F. Lau, A. L. Mammen, **M. D. Ehlers**, S. Kindler, W. J. Chung, C. C. Garner, and R. L. Huganir (1996). Interaction of the N-methyl-D-aspartate receptor complex with a novel synapse-associated protein, SAP102. *J. Biol. Chem.* **271**:21622-21628.

U. Scheffel, C. Steinert, S. E. Kim, **M. D. Ehlers**, J. W. Boja, and M. J. Kuhar (1996). Effect of dopaminergic drugs on the in vivo binding of [³H]WIN 35,428 to central dopamine transporters. *Synapse* **23**:61-69.

M. D. Ehlers, W. G. Tingley, and R. L. Huganir (1995). Regulated subcellular distribution of the NR1 subunit of the NMDA receptor. *Science* **269**:1734-1737.

M. D. Ehlers, D. R. Kaplan, D. L. Price, and V. E. Koliatsos (1995). NGF-stimulated retrograde transport of trkA in the mammalian nervous system. *J. Cell Biol.* **130**:149-156.

J. J. Frost, A. J. Rosier, S. G. Reich, J. S. Smith, **M. D. Ehlers**, S. H. Snyder, H. T. Raver, and R. F. Dannals (1993). Positron emission tomographic imaging of the dopamine transporter with ¹¹C-WIN 35,428 reveals marked declines in mild Parkinson's disease. *Ann. Neurol.* **34**:423-431.

Invited Reviews

J.J Yi and **M. D. Ehlers** (2007). Emerging roles for ubiquitin and protein degradation in neuronal function. *Pharmacol. Rev.* **59**:14-39

M. J. Kennedy and **M. D. Ehlers** (2006). Organelles and trafficking machinery for postsynaptic plasticity. *Ann. Rev. Neurosci.* **29**:325-362.

J. J. Yi and **M. D. Ehlers** (2005). Targeting protein degradation in the nervous system. *Curr. Med. Chem. – Central Nervous System Agents* **5**:285-306.

J. J. Yi and **M.D. Ehlers** (2005). Ubiquitin and protein turnover in synapse function. *Neuron* **47**:629-632.

M.D. Ehlers (2005). Dendrite development: a surprising origin. *J. Cell Biol.* 170:517-519.

I. Perez-Otano and **M. D. Ehlers** (2005). Homeostatic plasticity and NMDA receptor trafficking. *Trends Neurosci.* 28:229-238.

M. D. Ehlers (2005). Synapse formation: astrocytes spout off. *Curr Biol.* 15:R134-147.

A. C. Horton and **M. D. Ehlers** (2004). Secretory trafficking in neuronal dendrites. *Nature Cell Biol.* 6:585-591.

T. A. Blanpied and **M. D. Ehlers** (2004). The microanatomy of dendritic spines: emerging principles of synaptic pathology in psychiatric disease. *Biol. Psychiatry* 55:1121-1127.

I. Perez-Otano and **M. D. Ehlers** (2004). Learning from NMDA receptor trafficking: Clues to the development and maturation of glutamatergic synapses. *Neurosignals* 13:175-189.

M. D. Ehlers (2004). Deconstructing the axon: Wallerian degeneration and the ubiquitin-proteasome system. *Trends Neurosci.* 27:3-6.

M. D. Ehlers (2003). Ubiquitin and the deconstruction of synapses. *Science* 302:800-801.

A. C. Horton and **M. D. Ehlers** (2003). Neuronal polarity and trafficking. *Neuron* 40:277-295.

M. D. Ehlers (2003). Ubiquitin and synaptic dysfunction. *Trends Neurosci.* 26:4-7.

M. D. Ehlers (2002). Molecular morphogens for dendritic spines. *Trends Neurosci.* 25:64-67.

M. D. Ehlers and G. Feng (2001). Good communications: A review of Synapses. *Nature* 411:416-417.

M. M. Bolton, T. A. Blanpied, and **M. D. Ehlers** (2000). Localization and stabilization of ionotropic glutamate receptors at synapses. *Cell. Mol. Life Sci.* 57:1517-1525.

M. D. Ehlers (1999). Glutamate receptors connected by the shanks. *Curr. Biol.* 9:R848-R850.

M. D. Ehlers and G. J. Augustine (1999). Calmodulin at the channel gate. *Nature* 399:105-107.

M. D. Ehlers, A. L. Mammen, L.-F. Lau, and R. L. Huganir (1996). Synaptic targeting of glutamate receptors. *Curr. Opin. Cell Biol.* 8:484-489.

Book Chapters

K. H. Condon and **M. D. Ehlers** (2007). Postsynaptic Machinery for Receptor Trafficking. In: *Protein Trafficking in Neurons*, (A. J. Bean, ed) pp. 143-174 London: Elsevier Academic Press.

D. B. Scott and **M. D. Ehlers** (2004). Glutamate Receptors, Ionotropic in *The Encyclopedia of Biological Chemistry*, (W. J. Lennarz and M. D. Lane, eds) Elsevier, Oxford, Vol. 2, pp. 213-219.

Abstracts

- J. Lu, T. D. Helton, R. A. Blanpied, B. Racz, T. M. Newpher, R. J. Weinberg, and **M. D. Ehlers** (2007). Postsynaptic positioning of endocytic zones and AMPA receptor cycling in dendritic spines. *Gordon Research Conference: Excitatory Amino Acids and Brain Function*.
- J. M. Salgado, L. Ostroff, M. Park, **M. D. Ehlers**, and K. M. Harris (2006). Endosomes as a basis for spine plasticity at CA1 hippocampal synapses. *Soc. Neurosci. Abstr.*
- M. Park, J. M. Salgado, L. Ostroff, K. M. Harris, and **M. D. Ehlers** (2006). Exocytotic membrane trafficking for morphological plasticity of dendritic spines during LTP. *Soc. Neurosci. Abstr.*
- I. G. Davison, **M. D. Ehlers**, and L. C. Katz (2006). Systemic spatial activation of the main olfactory bulb using in vivo photostimulation. *Soc. Neurosci. Abstr.*
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