*Curriculum Vitae*

*Updated: 10/25/2025*

# Z. Zack Ma, Ph.D.


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## CURRENT APPOINTMENT:

**Assistant Professor (Research),** Department of Pharmacology, Vanderbilt University, Nashville, TN

## EDUCATION & TRAINING:

2002 **B.S.**, Biotechnology, Soochow University, Suzhou Medical College, Suzhou, CHINA

2011 **Ph.D.**, Molecular Biology & Genetics, Advisor: Dr. Jeffrey A. Loeb
Wayne State University School of Medicine, Detroit, MI.
*Dissertation*: *Axogial Communication Mediated by Soluble Neuregulin-1 and BDNF*

2011–2017 **Post-doc Fellow**, Neuroscience**,** Advisors: Dr. Luis F. Parada & Dr. Jane E. Johnson
University of Texas Southwestern Medical Center, Dallas, TX.

## RESEARCH EXPERIENCE:

2001–2002 *Undergraduate Research Assistant*, Laboratory of Dr. Ze-Guang Han, National Human Genome Center, Division of Functional Genomics, Shanghai, CHINA.
*Identify and characterize the interacting proteins of hLZP by using a yeast two-hybrid system.*

2002–2003 *Research Assistant*, Laboratory of Dr. Jing-de Zhu, National Key Laboratory for Oncogenes & Related Genes, Shanghai Cancer Institute, Shanghai, CHINA
*Investigate the methylation profiles of promoter CpG island of genes in liver cancer.*

2004–2011 *Graduate Research Assistant***,** Laboratory of Dr. Jeffrey A. Loeb, Center for Molecular Medicine & Genetics, Department of Neurology, Wayne State University, Detroit, MI
*Study in vivo functions of neuron-glial communication through soluble neuregulin1 and BDNF in glial cell development.*

2011–2015 *Postdoctoral Fellow*, Laboratory of Dr. Luis F. Parada, Department of Developmental Biology, University of Texas Southwestern Medical Center, Dallas, TX
*Explore the role of adult hippocampal neurogenesis in maintaining antidepressant effects by focusing on BDNF-TrkB signaling.*

2015–2017 *Postdoctoral Fellow*, Laboratory of Dr. Jane E. Johnson, Department of Neuroscience, University of Texas Southwestern Medical Center, Dallas, TX
*Investigate ASCL1 and PRDM13-mediated transcriptional and epigenetic regulation in neural stem cells for neuronal specification and generation.*

2018–2022 *Research Instructor*, Department of Pharmacology, Vanderbilt Brain Institute, Vanderbilt University, Nashville, TN
*Study synaptic and molecular mechanisms underlying sustained antidepressant effects of ketamine.*

2023– *Assistant Professor (Research)*, Department of Pharmacology, Vanderbilt Brain Institute, Vanderbilt University, Nashville, TN
*Study synaptic and molecular mechanisms underlying ketamine-induced hippocampal neural plasticity and sustained antidepressant actions.*

## PROFESSIONAL MEMBERSHIP

2006– Society for Neuroscience (SfN)
2017– International Society for Stem Cell Research (ISSCR)
2024– Society of Biological Psychiatry (SOBP)

## PROFESSIONAL ACTIVITIES

**Committee and Volunteer Work**

2007 Student Committee for the Summer Undergraduate Research Program, Wayne State University School of Medicine.
2008–2010 Planning Committee for Graduate Student Research Day, Wayne State University School of Medicine.
2013 Planning Committee for Postdoc Annual Symposium, UT Southwestern Medical Center.
2023–2024 Poster Judge for Vanderbilt Brain Institute Annual Retreat
2023–2024 Application Review Committee for Vanderbilt Undergraduate Summer Research Program
2024 Poster Judge for Vanderbilt Undergraduate Research Fair (3/28 & 11/4)
2024 Poster Judge for Southeastern Medical Scientist Symposium (9/21)
2024–2027 Travel Award Committee, Society of Biological Psychiatry (three-year term)

***Ad Hoc* Manuscript Review for *19* journals**

(*https://www.webofscience.com/wos/author/record/AEO-1528-2022*)
*Brain Research;* CNS & Neurological Disorders - Drug Targets*; Current Stem Cell Research & Therapy; Development, Growth and Differentiation; Developmental Neurobiology; Experimental Brain Research; FEBS Open Bio; Hippocampus; International Journal of Neuropsychopharmacology; International Journal of Neuroscience; Journal of Molecular Neuroscience; Journal of Neuroscience Research; Journal of the Neurological Sciences; Molecular Brain; Molecular Cancer; Neurochemistry International; Neuroscience Letters; Neuropsychopharmacology; Protein and Peptide Letters.*

**Research Grant Review**

2/28/2023 MRC UK Research and Innovation, African Research Leaders 2023 Research Grant

**Other Activities**

09–11/2015 Completed a Stanford online course - Writing in the Sciences
08/2017 Selected to attend FASEB career workshop for advancing research workforce diversity
06/2023 Selected to attend Allen Institute Neuropixels and OpenScope Workshop
2024,2025 Invited to nominate candidates for the Nobel Prize in Physiology or Medicine
09/2024 Invited guest editor for a JOVE Method Collection
11/2024 Completed a Cold Spring Harbor Laboratory course - RNAseq Analysis
05/2025 Selected to attend Advanced Techniques in Neuroimaging Workshop organized by Stanford University and UC Santa Cruz

## HONORS & AWARDS

1999–2002 Undergraduate Scholarship Award, Suzhou Medical College / Soochow University
2002 Excellent Thesis Award (*Top 2%*), Dept. of Biotechnology, Soochow University

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| 2005 | Thomas C. Rumble University Graduate Fellowship (*Top 1 in the program*), WSU |
| 2006,2009 | Graduate Student Professional Travel Award, School of Medicine, WSU |
| 2008 | Excellent Oral Presentation Award, Graduate Student Research Day, WSU |
| 2017 | MARC Travel Award of FASEB |
| 2023 | Scale Success Award, Vanderbilt University |
| 2024,2025 | Nominator invited by the Nobel Assembly for the Prize in Physiology or Medicine |

## GRANT SUPPORTS

Scale Success Award, Vanderbilt University (9/1/2023 - 11/30/2024)
Title: Synaptic and molecular mechanisms of the DUSP6-ERK pathway to sustain antidepressant effects of ketamine.
Role: Principal Investigator
Total Direct Costs: $50,000

## PUBLICATIONS

**Peer-Reviewed Articles** (>928 citations, *https://scholar.google.com/citations?user=sfV43nwAAAAJ*)

1. Xu ZG, Du JJ, Zhang X, Cheng ZH, **Ma ZZ**, Xiao HS, Yu L, Wang ZQ, Li YY, Huo KK, Han ZG (2003) A novel liver-specific zona pellucida domain containing protein that is expressed rarely in hepatocellular carcinoma. *Hepatology* 38:735-744. PMID: 12939600.
2. Yu J, Zhang HY, **Ma ZZ**, Lu W, Wang YF, Zhu JD (2003) Methylation profiling of twenty-four genes and concordant methylation behaviors of nineteen genes that may contribute to hepatocellular carcinogenesis. *Cell Research* 13(5):319-333. PMID: 14672555.
3. **Ma Z**, Li Q, An H, Pankonin MS, Wang J, Loeb JA (2009) Targeting human epidermal growth factor receptor signaling with the Neuregulin's heparin-binding domain. *Journal of Biological Chemistry* 284(46): 32108-15. PMID: 19717564.
4. Calvo M, Zhu N, Tsantoulas C, **Ma Z**, Grist J, Loeb JA, Bennett DL (2010) Neuregulin-ErbB signaling promotes microglial proliferation and chemotaxis contributing to microgliosis and pain after peripheral nerve injury. *Journal of Neuroscience* 30(15): 5437-50. PMID: 20392965.
5. Calvo M, Zhu N, Grist J, **Ma Z**, Loeb JA, Bennett DL (2011) Following nerve injury neuregulin-1 drives microglial proliferation and neuropathic pain via the MEK/ERK pathway. *Glia* 59(4): 554-68. PMID: 21319222.
6. **Ma Z**, Wang J, Song F, Loeb JA (2011) Critical period of axoglial signaling between Neuregulin1 and BDNF required for early Schwann cell survival and differentiation. *Journal of Neuroscience* 31(26):9630-40. PMID: 21715628.
   *Editorial's pick in "This week in the Journal". J Neurosci. 29 June 2011, 31(26): i.*
   *Recommended by Faculty of 1000: 14 Oct. 2011, F1000.com/13340004*
7. Jeng D, **Ma Z**, Berrett JW, McFadden G, Loeb JA, Essani K (2013) The tanapoxvirus 15L protein is a virus-encoded Neuregulin that promotes viral replication in human endothelial cells. *Journal of Virology* 87(6):3018-26. PMID: 23269801.
8. Uruena A, Mona B, Kollipara RK, **Ma Z**, Borromeo MD, Chang JC, Johnson JE (2017) Repression by PRDM13 is critical for generating precise neuronal identity. *eLife* 6:e25787. PMID: 28850031.
9. **Ma Z*,** Zang T, Birnbaum SG, Wang Z, Johnson JE, Zhang CL, Parada LF* (2017) TrkB dependent adult hippocampal progenitor differentiation mediates sustained ketamine antidepressant response. *Nature Communications 8(1):1668*. PMID: 29162814. ***Co-corresponding authors**

10. Lin PY[#], **Ma ZZ[#],** Mahgoub M, Kavalali ET, Monteggia LM (2021) A synaptic locus for TrkB signaling underlying ketamine rapid antidepressant action. *Cell Reports* 36(7):109513. PMID: 34407417. **[#]Equal contributions**
11. Uzay B, Houcek A, **Ma ZZ**, Konradi C, Monteggia LM, Kavalali ET (2023) Neurotransmitter release progressively desynchronizes in induced human neurons during synapse maturation and aging. *Cell Reports* 42 (2): 112042. PMID: 36701235.
12. Houcek A[#], **Ma ZZ[#] ***, Trauterman B, Uzay B, Monteggia L, Kavalali ET***** (2024) CRISPR/Cas9 editing of synaptic genes in human embryonic stem cells for functional analysis in induced human neurons. *STAR Protocols* 5(2):103089. PMID: 38795356. **[#]Equal contributions; *Co-corresponding authors**
13. **Ma ZZ***, Guzikowski NJ, Kim JW, Kavalali ET, Monteggia LM***** (2025) Enhanced ERK activity extends ketamine antidepressant effects by augmenting synaptic plasticity. *Science* 388, 646-655. PMID: 40339008. ***Co-corresponding authors**
*Perspective by Kenji Hashimoto, Science 388, 589-590 (2025) PMID: 40339034*
*Highlighted in Nature Reviews Drug Discovery (2025) PMID: 40457009*
14. **Ma ZZ[#]**, Hale MA[#], Mona B, Uruena A, Johnson JE (2025) PRDM13 is required for specification of PAX2 lineage inhibitory neurons in the developing cerebellum. *Developmental Biology* 527, 17-25. PMID: 40721003. **[#]Equal contributions**
15. McCarthy CI, **Ma ZZ**, Monteggia LM, Kavalali ET (2025) Spontaneous glutamate release activates mGluR signaling to drive rapid antidepressant responses. *Proceedings of the National Academy of Sciences* 122(37):e2510642122. PMID:40924453.

**Book Chapters**

1. Wang J, **Ma Z**, Loeb JA (2013) Cell-specific targeting of fusion proteins through heparin-binding. In the book "*Fusion Protein Technologies for Biopharmaceuticals: Applications and Challenges*", Schmidt S., editor. John Wiley & Sons, Inc. Hoboken, NJ. doi:10.1002/9781118354599.ch27

**Published Meeting Abstracts**

1. **Ma Z**, Pankonin MS, An H, Loeb JA. Targeting heparin-binding forms of Neuregulin1 from axons to glia promotes Schwann cell survival. 540.19/N13; *2006 Society for Neuroscience Annual Meeting, Atlanta, GA.*
2. **Ma Z**, Loeb JA. Neurotrophin-induced targeting of heparin-binding forms of Neuregulin1 from axons to glia regulates Schwann cell Development. 126.16/A43; *2009 Society for Neuroscience Annual Meeting, Chicago, IL.*
3. Calvo M, Zhu N, Tsantoulas C, **Ma Z**, Grist J, Loeb J, Bennett D. 377 Neuregulin-ErbB signaling promotes microglial proliferation and chemotaxis contributing to microgliosis and pain following peripheral nerve injury. *2010 European Journal of Pain Supplements, 4: 107-107.*
4. **Ma Z,** Parada LF. SSRI-induced endogenous BDNF from newborn cells regulates adult neurogenesis and the prolonged anti-depressant effect. 426.01/AA10; *2014 Society for Neuroscience Annual Meeting, Washington DC.*
5. Lin PY, Mahgoub M, **Ma Z**, Kavalali ET, Monteggia LM. The role of synaptic BDNF-TrkB signaling in ketamine-mediated antidepressant effects. 287.14/G9; *2018 Society for Neuroscience Annual Meeting, San Diego, CA.*
6. Uzay B, Houcek A., **Ma ZZ**, Konradi CL 3 LM, Kavalali ET. Non-cell autonomous regulation of neurotransmitter release synchrony in human synapses. 112.24/C19; *2022 Society for Neuroscience Annual Meeting, San Diego, CA.*

7. **Ma ZZ**, Lin PY, Kim JW, Guzikowski NJ, Altamirano RM, Kavalali ET, Monteggia LM. The role of ERK activation in ketamine-induced synaptic plasticity and antidepressant actions. 227.12/JJ5; *2022 Society for Neuroscience Annual Meeting, San Diego, CA*.
8. Uzay B, **Ma ZZ**, Monteggia LM, Kavalali ET. Phenotypic analysis of mice carrying SNAP25 L50S mutation. NANO42.06; *2023 Society for Neuroscience Annual Meeting, Washington, DC*.
9. **Ma ZZ**. Adult-born neurons induced by fluoxetine or ketamine sustain the antidepressant effects. *Biological Psychiatry* 95 (10), S172, 2024.

## PRESENTATIONS

**Posters**

10/17/2006 *Society for Neuroscience Annual Meeting, Atlanta, GA.* "Targeting heparin-binding forms of Neuregulin1 from axons to glia promotes Schwann cell survival."

10/18/2009 *Society for Neuroscience Annual Meeting, Chicago, IL.* "Neurotrophin-induced targeting of heparin-binding forms of Neuregulin1 from axons to glia regulates Schwann cell Development."

10/26/2010 *Center for Molecular Medicine & Genetics Retreat, Wayne State University School of Medicine, Detroit, MI.* "Neurotrophin-induced targeting of heparin-binding forms of Neuregulin1 from axons to glia regulates Schwann cell Development."

11/17/2014 *Society for Neuroscience Annual Meeting, Washington, DC.* "SSRI-induced endogenous BDNF from newborn cells regulates adult neurogenesis and the prolonged antidepressant effect."

11/13/2022 *Society for Neuroscience Annual Meeting, San Diego, CA.* "The role of ERK activation in ketamine-induced synaptic plasticity and antidepressant actions."

05/29/2023 *Gordon Research Conference (GRC) - Neurotrophic Mechanisms in Health and Disease, Newport, RI.* "Targeting ERK Signaling to Sustain the Antidepressant Effects of Ketamine."

12/06/2023 *62nd Annual Meeting of American College of Neuropsychopharmacology (ACNP), Tampa, FL.* "TrkB-ERK Dependent Hippocampal Neural Plasticity Mediates the Sustained Antidepressant Effects of Ketamine."

05/09/2024 *Society of Biological Psychiatry (SOBP) Annual Meeting, Austin, TX.* "Adult-born neurons induced by fluoxetine or ketamine sustain the antidepressant effects."

07/14/2024 *Gordon Research Conference (GRC) – Synaptic Transmission, Lucca, Italy.* "ERK regulation of ketamine-induced CA1 synaptic plasticity."

**Invited Talks**

08/08/2007 *Wayne State University School of Medicine.* "Axon-glial Communication Mediated by Neuregulins and Neurotrophic Factors." **Invited** by the Summer Undergraduate Research Program (SURP).

09/25/2008 *Wayne State University School of Medicine.* "Targeting Neuregulin-1 from Axons to Glia Promotes Schwann Cell Survival." **Invited** by the Committee of Graduate Student Research Day (GSRD).

06/20/2011 *University of North Carolina at Chapel Hill, Neuroscience Center.* "Reciprocal signaling between soluble Neuregulin-1 and BDNF regulates Schwann cell development *in vivo*." **Invited** by Dr. ES Anton's Laboratory for a postdoctoral fellow position.

6/24/2011 *MIT, McGovern Institute for Brain Research.* "Reciprocal signaling between soluble Neuregulin-1 and BDNF regulates Schwann cell development *in vivo.*" **Invited** by Dr. Yingxi Lin's Laboratory for a postdoctoral fellow position.

8/11/2011 *University of Texas Southwestern Medical Center, Department of Developmental Biology.* "Reciprocal signaling between soluble Neuregulin-1 and BDNF regulates early Schwann cell development." **Invited** by Dr. Luis Parada's Laboratory for a postdoctoral fellow position.

06/11/2015 *University of Texas Southwestern Medical Center, Department of Neuroscience.* "BDNF/trkB signaling and Adult Hippocampal Neurogenesis in Antidepressant response." **Invited** by Dr. Jane Johnson's Laboratory for a postdoctoral fellow position.

01/25/2018 *University of New Mexico, Clinical & Translational Science Center.* "Adult Neurogenesis: Sustained Antidepressant Responses and Beyond." **Invited** by the KL2 Scholar Program for a tenure-track faculty position.

05/24/2018 *Vanderbilt University, Vanderbilt Brain Institute, Department of Pharmacology.* "Adult Neurogenesis: Sustained Antidepressant Responses and Beyond." **Invited** by Dr. Lisa Monteggia for a research-track faculty position.

05/29/2023 *Gordon Research Conference - Neurotrophic Mechanisms in Health and Disease.* "Targeting ERK Signaling to Sustain the Antidepressant Effects of Ketamine." **Invited** by Dr. Rejji Kuruvilla for a short talk.

12/01/2025 *Yale University School of Medicine.* "Targeting ERK Signaling to Sustain the Antidepressant Effects of Ketamine." **Invited** by the Division of Molecular Psychiatry and Biological Sciences Training Program (BSTP) for a seminar talk.