BIOGRAPHICAL SKETCH

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NAME: Malenka, Robert C.

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POSITION TITLE: Pritzker Professor of Psychiatry and Behavioral Sciences

EDUCATION/TRAINING *(Begin with baccalaureate or other initial professional education, such as nursing, include postdoctoral training and residency training if applicable. Add/delete rows as necessary.)*

INSTITUTION AND LOCATION	DEGREE *(if applicable)*	Completion Date MM/YYYY	FIELD OF STUDY
Harvard College, Cambridge, MA.	A.B.	06/1978	Biology
Stanford University, Stanford, CA.	Ph.D.	06/1983	Neuroscience
Stanford University, Stanford, CA.	M.D.	06/1983	
Stanford University, Stanford, CA.	Internship	06/1984	Psychiatry
U.C.S.F., San Francisco, CA.	Postdoc	06/1986	Neuro (Roger Nicoll)
Stanford University, Stanford, CA.	Residency	06/1989	Psychiatry

A. Personal Statement/Role in the Project

For over 30 years my research has focused on the molecular mechanisms and functions of a variety of forms of synaptic plasticity in a number of different brain regions including the hippocampus, nucleus accumbens dorsal striatum and ventral tegmental area. My laboratory uses molecular manipulations in combination with a variety of cell biological, optogenetic and electrophysiological assays in a variety of different *in vitro* and *in vivo* preparations. We also perform experiments that incorporate molecular manipulations of defined neuronal populations with the goal of elucidating the functions of synaptic plasticity in defined circuits and behaviors. Over the course of my career, I have supervised over 80 postdoctoral fellows and 10 graduate students, almost all of whom have pursued academic careers in leading institutions. I have served on over 20 thesis committees and have mentored many graduate students and postdoctoral fellows who have not worked directly with me. I view one of my main jobs to be rigorous research training and mentoring of future generations of biomedical research scientists. I look forward to working closely with Elizabeth Steinberg on her exciting project as it progresses.

B. Positions and Honors

Positions and Employment

1984-1986 Postdoctoral Fellow, Department of Pharmacology (Roger Nicoll), U.C.S.F.
1983-1984 Intern, Department of Psychiatry, Stanford University School of Medicine
1989-1999 Resident, Department of Psychiatry, Stanford University School of Medicine
1989-1999 Assistant (89-94), Associate (94-97), Full Professor of Psychiatry & Physiology, U.C.S.F.
1997-1999 Director, Center for the Neurobiology of Addiction, U.C.S.F.
1999-present Pritzker Professor of Psychiatry & Behavioral Sciences; Director, Pritzker Laboratory,
2008-2013 co-Director, Stanford Institute for Neuro-Innovation and Translational Neurosciences
2008-present Associate Chair, Dept. of Psychiatry, Stanford University School of Medicine
2013-present Deputy Director, Stanford Neurosciences Institute

Professional Service (selected)

1994-present	Edit. Boards (selected): Neuron, Neuropharm.,Trends Neurosci., Neurosci. Lett.
1999-2004	Society for Neuroscience, Program Committee (Chair, 2003)
2001-2004	National Advisory Council on Drug Abuse, NIH (NIDA)
2003-2007	Member-at-Large, Steering Committee, Section on Neuroscience, AAAS
2001-present	Scientific Council, Brain and Behavior Research Foundation (formerly NARSAD)
2006-2010	Council, Society for Neuroscience
2006-present	Scientific Advisory Board, Stanley Center for Psychiatric Research, Broad Institute, MIT
2010-present	Board of Directors, The Brain Research Foundation, Chicago, IL
2010-present	Scientific Advisory Board, International Mental Health Research Organization
2012-present	Scientific Advisory Board, Cure Alzheimer's Fund
2012-present	Council, American College of Neuropsychopharmacology
2012-present	Scientific Advisory Board, One Mind for Research

Honors and Fellowships (selected)

1978	Phi Beta Kappa, Summa cum laude (Harvard College)
1987	American Psychiatric Association Resident Research Award
1989-1992	Klingenstein Fellowship in the Neurosciences
1990-1992	Alfred P. Sloan Research Fellow
1990-1994	NARSAD Young Investigator Award
1990-1993	McKnight Scholars Award in Neuroscience
1991-1996	N.I.M.H. Research Scientist Development Award, Level II
1993	Society for Neuroscience Young Investigator Award
1996-2001	N.I.M.H. Independent Scientist Award
1997-2000	McKnight Investigator Award
1998	ACNP Daniel H. Efron Award
1999-2006	Associate of the Neurosciences Research Program
2000	Dargut and Milena Kemali Foundation International Prize in Neuroscience
2002	CINP-Lilly Neuroscience Basic Research Award
2004	Member, Institute of Medicine of the National Academy of Sciences
2005	Fellow, American Academy of Arts and Sciences
2006	Perl/UNC Neuroscience Prize
2009	Fellow, American Association for the Advancement of Science
2009	Fellow, American College of Neuropsychopharmacology
2010	NARSAD Goldman-Rakic Prize for Outstanding Cognitive Neuroscience Research
2011	Pasarow Foundation Award for Extraordinary Accomplishment in Medical Research
2011	Member, National Academy of Sciences
2011	ACNP Julius Axelrod Mentorship Award
2016	Society for Neuroscience Julius Axelrod Prize

C. Contributions to Science

I am an acknowledged world leader in elucidating the mechanisms and functions of synaptic plasticity in the mammalian brain. I defined the core mechanisms underlying the triggering and expression of NMDA receptor-dependent long-term potentiation (LTP) and long-term depression (LTD) in the hippocampus. I was the first to demonstrate that rises in postsynaptic calcium and the activation of calcium-dependent kinases and phosphatases are required for the triggering of LTP and LTD, respectively. I established the existence of so-called "silent synapses" and was the first to provide direct evidence that AMPA receptor trafficking could be influenced by activity. This led to the demonstration that AMPA receptor endocytosis was critical for LTD and AMPA receptor exocytosis contributes to LTP. Most recently, in collaboration with Thomas Südhof, I have defined the critical role of postsynaptic SNARE proteins and complexin in LTP and am exploring the roles of synaptic cell

adhesion proteins in synaptic function. This body of work, along with the contributions to be discussed in subsequent sections, has resulted in >250 peer reviewed publications including >45 papers in Nature, Science and Cell, and >65 papers in Neuron and Nature Neuroscience. According to Thomson Reuters Essential Science Indicators (URL: http://sciencewatch.com/articles/scientist-rankings-neuroscience-behaviour-1997-2007), from 1997-2007 I was the 8th most cited scientist in the world in the "neurosciences and behavior" category in terms of total citations, and the 2nd most cited scientist in the world in terms of citations per paper. Google Scholar lists my overall h-index as 134. My total list of publications can be found on PubMed at: http://www.ncbi.nlm.nih.gov/pubmed/?term=Malenka+R. Because this body of work covers many topics, I will consider this summary of my work on LTP and LTD to incorporate three of my most significant scientific contributions and thus will list 12 publications on these topics from the last 15 years.

Beattie, E.C., Carroll, R.C., Yu, X., Morishita, W., Yasuda, H., von Zastrow, M., Malenka, R.C. Regulation of AMPA receptor endocytosis by a signaling mechanism shared with LTD. **Nature Neuroscience** 3: 1291-1300, 2000. (PMID: 11100150)

Castillo, P.E., Schoch, S., Schmitz, F., Sudhof, T.C. and Malenka, R.C. Rim1α is required for presynaptic long-term potentiation. **Nature** 415: 327-330, 2002. (PMID: 11797010)

Malinow, R. and Malenka R.C. AMPA receptor trafficking and synaptic plasticity. **Annu. Rev. Neurosci.** 25: 103-126, 2002. (PMID: 12052905)

Malenka, R.C. and Bear, M.F. LTP and LTD: an embarrassment of riches. **Neuron** 44: 5-21, 2004. (PMID: 15450156)

Xu, W., Schluter, O.M., Steiner, P., Czervionke, B.L., Sabatini, B. & Malenka, R.C. Molecular dissociation of the role of PSD-95 in regulating synaptic strength and LTD. **Neuron** 57: 248-262, 2008. (PMCID: PMC3147180)

Bhattacharyya, S., Biou, V., Xu, W., Schluter, O. & Malenka, R.C. A critical role for PSD-95/AKAP interactions in endocytosis of synaptic AMPA receptors. **Nature Neurosci.** 12: 172-181, 2009. (PMCID: PMC2694745)

Jurado, S., Biou, V. & Malenka, R.C. A calcineurin/AKAP complex is required for NMDA receptor-dependent long-term depression. **Nature Neurosci.** 13: 1053-1055, 2010. (PMCID: PMC2943866)

Soler-Llavina, G.J., Fuccillo, M.V., Ko, J., Sudhof, T.C. & Malenka, R.C. The neurexin ligands, neuroligins and leucine-rich repeat transmembrane proteins, perform convergent and divergent synaptic functions in vivo. **Proc. Natl. Acad. Sci. USA** 108: 16502-16509, 2011. (PMCID: PMC3189075)

Ahmad, M., Polepalli, J.S., Goswami, D., Yang, X., Kaeser-Woo, Y.J., Südhof, T.C. & Malenka, R.C. Postsynaptic complexin controls AMPA receptor exocytosis during LTP. **Neuron**. 73: 260-267, 2012. (PMCID: PMC3269030)

Jurado, S., Goswami, D., Zhang, Y., Molina, A.J., Sudhof, T.C. & Malenka, R.C. LTP requires a unique postsynaptic SNARE fusion machinery. **Neuron** 77: 542-558, 2013. **(**PMCID: PMC3569727)

Soler-Llavina, G.J., Arstikaitis, P., Morishita, W., Ahmad, M., Sudhof, T.C. & Malenka, R.C. Leucine-rich repeat transmembrane proteins are essential for maintenance of long-term potentiation. **Neuron** 79: 439-446, 2013. (PMCID:PMC3741667)

Wu, D., Bacaj, T., Morishita, W., Goswami, D., Arendt, K.L., Xu, W., Chen. L., Malenka, R.C., & Sudhof, T.C. Postsynaptic synaptotagmins mediate AMPA receptor exocytosis during LTP. **Nature** 544: 316-321, 2017. (PMID: 28355182)

In the mid-90's, I began exploring synaptic function and plasticity in key nodes of the circuitry underlying motivated behaviors with the goal of probing synaptic adaptations that contribute to the pathological circuit adaptations that underlie neuropsychiatric disorders including addiction, depression, autism and Parkinson's disease. I was the first to establish that drugs of abuse modify synaptic function in VTA dopamine neurons and nucleus accumbens medium spiny neurons. This led to the elucidation of differences in the connectivity and functions of VTA dopamine neurons based on their projection targets. I also established the synaptic effects and some of the behavioral roles in the nucleus accumbens of a variety of neuropeptides including oxytocin, melanocortin, and galanin. Similar to my work on AMPA receptor trafficking, my work on synaptic plasticity in the VTA, nucleus accumbens and dorsal striatum has helped establish new methodological approaches and new fields of inquiry that many labs throughout the world are currently pursuing. I list 8 papers to document these statements.

Thomas, M.J., Beurrier, C., Bonci, A. and Malenka, R.C. Long-term depression in the nucleus accumbens: a neural correlate of behavioral sensitization to cocaine. **Nature Neurosci.** 4: 1217-1223, 2001. (PMID: 11694884)

Saal, D., Dong, Y., Bonci, A. and Malenka, R.C. Drugs of abuse and stress trigger a common synaptic adaptation in dopamine neurons. **Neuron** 37: 577-582, 2003. (PMID: 12597856)

Lammel, S., Ion, D.I., Roeper, J. & Malenka, R.C. Projection-specific modulation of dopamine neuron synapses by aversive and rewarding stimuli. **Neuron** 70: 855-862, 2011. (PMCID: PMC3112473)

Lim, B.K., Huang, K.W., Grueter, B.A., Rothwell, P.E. & Malenka, R.C. Anhedonia requires MC4 receptor-mediated synaptic adaptations in nucleus accumbens. **Nature** 487: 183-189, 2012. (PMCID: PMC3397405)

Lammel, S., Lim, B.K., Ran, C. Huang, K.W., Betley, M.J., Tye, K., Deisseroth, K. & Malenka, R.C. Input-specific control of reward and aversion in the ventral tegmental area. **Nature** 491: 212-217, 2012. (PMCID: PMC3493743)

Dolen, G., Darvishzadeh, A., Huang, K.W. & Malenka, R.C. Social reward requires coordinated activity of nucleus accumbens oxytocin and serotonin. **Nature** 501: 179-184, 2013. (PMCID: PMC4091761)

Schwartz, N., Temkin, P., Jurado, S., Lim, B.K., Heifets, B.D., Polepali, J.S. & Malenka. R.C. Decreased motivation during chronic pain requires long-term depression in the nucleus accumbens. **Science** 345: 535-542, 2014. (PMCID: PMC4219555).

Beier, K.T., Steinberg, E.E., DeLoach, K.E., Xie, S., Miyamichi, K., Sxhwarz, L., Gao, X.J., Kremer, E.M., Malenka, R.C. & Luo, L. Circuit architecture of VTA dopamine neurons revealed by systematic input-ouput mapping. **Cell** 162: 622-634 2015 (PMCID: PMC4522312)

D. Research Support

Simons Foundation (SFARI) (P.I. Malenka) 09/01/14-08/31/17
Neural mechanisms of social reward in mouse models of autism

The major goals of this project are to examine the effects of rewarding and aversive stimuli on mesocorticolimbic dopamine circuitry in mouse models of autism. The effects of oxytocin on nucleus accumbens synaptic function will also be studied. I lead all aspects of this project.
Overlap: There is no overlap with the current proposal.

2 P01 DA008227 (P.I. Nestler) 07/01/13–06/30/18
NIH/NIDA
Molecular neurobiology of drug addiction

I direct one component of this program project. The major goals of my project are to examine the electrophysiological changes that occur in the nucleus accumbens at specific sets of inputs following chronic administration of drugs of abuse.
Overlap: There is no overlap with the current proposal.

NIMH 1 P50 MH086403 (P.I. Malenka) 06/01/15-05/30/20
Activity-dependent synaptic and circuit plasticity

This is a renewal of a Conte Center, for which I am the Director. Other PI's are: L. Chen, K. Deisseroth, and T. Südhof. The major goals of my component of this program project are to examine the effects of genetic manipulations of synaptotagmins in the postsynaptic compartment of excitatory synapses on CA1 pyramidal neurons on basal synaptic transmission and synaptic plasticity.
Overlap: None