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Education

1993–1998 Ph.D., Neurosciences, University of California, San Diego
1988–1992 B.A., Philosophy, Wellesley College
1990–1991 St. Hilda's College, Oxford University, Oxford, UK

Current Positions

2020– Chair of Physiology and Biophysics,
Wayne E. Crill Endowed Professor
University of Washington School of Medicine
2016– Professor of Physiology and Biophysics,
University of Washington School of Medicine
2013– Core Faculty, Washington National Primate Research Center

Past Positions

2019–2021 Associate Director for Research (Interim), Washington National Primate Research Center
2015–2019 Chief, Division of Neuroscience, Washington National Primate Research Center
2013–2016 Associate Professor of Physiology and Biophysics, University of Washington
2012–2013 Associate Professor of Neurology, Emory University School of Medicine
2009–2013 Core Faculty, Division of Neuropharmacology and Neurologic Diseases, Yerkes National Primate Center
2005–2012 Assistant Professor of Neurology, Emory University School of Medicine
1998–2005 Post-doctoral Research Fellow, Laboratory of Neuropsychology, NIMH

Fellowships, Awards, and Other Special Appointments

2023-2026 *PNAS* Editorial Board
2023- *Hippocampus* Editorial Board
2022 Elected Member, National Academy of Sciences
2022- Scientific Advisory Board, Klingenstein-Simons Fellowship
2022-2025 Wellcome Trust, Discovery Award Interview Panel
2020-2023 Executive Board, Neurodata Without Borders (NWB)
2019 Elected Member, International Neuropsychological Society
2018 McKnight Foundation Memory and Cognitive Disorders Award
2018 Elected Member, Memory Disorders Research Society
2016 Elected Member, Washington State Academy of Sciences

2014 Elected Member, Dana Alliance for Brain Initiatives
2014–2022 Scientific Advisory Board, caesar, Max Planck Research Institute
2014–2020 Associate Editor, *Behavioral Neuroscience*
2014–2016 Associate Editor, *Proceedings of the Royal Society B: Biological Sciences*
2014–2017 Standing Member, Learning and Memory study section, NIH
2011 National Academy of Sciences Troland Research Award
2010 Woodruff Leadership Academy, Emory University School of Medicine

Current Research Support

2022-2025 NIH UF1, NS126485, Role: MPI (with Adrienne Fairhall)
Tracking the Emergence of Internal Models
2019–2023 NIH U19, NS107609, Role: PI
Computational and Circuit Mechanisms Underlying Rapid Learning
2018–2023 NIH R01, MH117777, Role: PI
Temporally Coordinated Activity in the Primate Hippocampus Supporting Memory Formation
2017–2023 Simons Foundation, Simons Collaboration on the Global Brain, Role: PI
Remapping across Time, Space, and Region

Selected Publications

1. Goudar V, Peysakhovich B, Freedman DJ, Buffalo EA, Wang XJ. (2023) Schema formation in a neural population subspace underlies learning-to-learn in flexible sensorimotor problem-solving. *Nat Neurosci.* May;26(5):879-890. doi: 10.1038/s41593-023-01293-9. Epub 2023 Apr 6. PMID: 37024575
2. Goudar V, Kim JW, Liu Y, Dede AJO, Jutras MJ, Skelin I, Ruvalcaba M, Chang W, Fairhall AL, Lin JJ, Knight RT, Buffalo EA, Wang XJ. (2023) Comparing rapid rule-learning strategies in humans and monkeys. bioRxiv. doi: 10.1101/2023.01.10.523416. Preprint. PMID: 36711889
3. Liu AA, Henin S, Abbaspoor S, Bragin A, Buffalo EA, Farrell JS, Foster DJ, Frank LM, Gedankien T, Gotman J, Guidera JA, Hoffman KL, Jacobs J, Kahana MJ, Li L, Liao Z, Lin JJ, Losonczy A, Malach R, van der Meer MA, McClain K, McNaughton BL, Norman Y, Navas-Olive A, de la Prida LM, Rueckemann JW, Sakon JJ, Skelin I, Soltesz I, Staresina BP, Weiss SA, Wilson MA, Zaghloul KA, Zugaro M, Buzsáki G. A consensus statement on detection of hippocampal sharp wave ripples and differentiation from other fast oscillations. (2022) *Nat Commun.* Oct 12;13(1):6000. doi: 10.1038/s41467-022-33536-x. PMID: 36224194
4. Jafarpour A, Buffalo EA, Knight RT, Collins AGE. (2022) Event segmentation reveals working memory forgetting rate. *iScience.* Feb 14;25(3):103902. doi: 10.1016/j.isci.2022.103902. PMID: 35252809
5. Griggs DJ, Garcia AD, Au WY, Ojemann WKS, Johnson AG, Ting JT, Buffalo EA, Yazdan-Shahmorad A. (2022) Improving the Efficacy and Accessibility of Intracranial Viral Vector Delivery in Non-Human Primates. *Pharmaceutics.* Jul 8;14(7):1435. doi: 10.3390/pharmaceutics14071435. PMID: 35890331
6. Landi SM, Buffalo EA. (2022) Value representation in the monkey hippocampus. *Trends Cogn Sci.* Jan;26(1):4-5. doi: 10.1016/j.tics.2021.10.007. Epub 2021 Oct 27. PMID: 34756466

7. Bliss-Moreau E, Amara RR, Buffalo EA, Colman RJ, Embers ME, Morrison JH, Quillen EE, Sacha JB, Roberts CT; National Primate Research Center Consortium Rigor and Reproducibility Working Group. (2021) Improving rigor and reproducibility in nonhuman primate research. *Am J Primatol.* Dec;83(12):e23331. doi: 10.1002/ajp.23331. Epub 2021 Sep 20. PMID: 34541703
8. Rueckemann, J.W., Sosa M., Giacomo, L.M., and Buffalo, E.A. (2021) The Grid Code for Ordered Experience. *Nature Reviews Neuroscience*, Oct;22(10):637-649. doi: 10.1038/s41583-021-00499-9. Epub 2021 Aug 27. PMID: 34453151
9. Llorens A, Tzovara A, Bellier L, Bhaya-Grossman I, Bidet-Caulet A, Chang WK, Cross ZR, Dominguez-Faus R, Flinker A, Fonken Y, Gorenstein MA, Holdgraf C, Hoy CW, Ivanova MV, Jimenez RT, Jun S, Kam JWY, Kidd C, Marcelle E, Marciano D, Martin S, Myers NE, Ojala K, Perry A, Pinheiro-Chagas P, Riès SK, Saez I, Skelin I, Slama K, Staveland B, Bassett DS, Buffalo EA, Fairhall AL, Kopell NJ, Kray LJ, Lin JJ, Nobre AC, Riley D, Solbakk AK, Wallis JD, Wang XJ, Yuval-Greenberg S, Kastner S, Knight RT, Dronkers NF. (2021) Gender bias in academia: A lifetime problem that needs solutions. *Neuron.* Jul 7;109(13):2047-2074.
10. Buffalo EA, Courtney SM, De Weerd P, Doyon J, Jiang Y, Karni A, Kastner S, Pessoa L, Rossi A. (2021) Lessons from Leslie: A Tribute to an Extraordinary Scientist and Mentor. *Trends in Neuroscience*, Apr;44(4):241-243.
11. Bright, I.M., Meister, M.L.R., Cruzado, N.A., Tiganj, A., Howard, M.W., and Buffalo, E.A. (2020) A temporal record of the past with a spectrum of time constants in the monkey entorhinal cortex. *Proceedings of the National Academy of Sciences*, Aug 18; 117(3):20274-20283.
12. Garcia, A.D. and Buffalo, E.A. (2020). Anatomy and function of the primate entorhinal cortex. *Annual Review of Vision Science*, Epub Jun 24.
13. Bott, N.T., Madero E.N., Glenn, J.M., Lange, A.R., Anderson, J.J., Newton D.O., Brennan, A.H., Buffalo, E.A., Rentz, D.M., and Zola, S.M. (2020) Device-embedded cameras for eye tracking-based cognitive assessment: Implications for teleneuropsychology. *Telemed J E Health*, Apr 26(4):477-481. Epub 2019 Jun 4.
14. Buffalo, E.A., Movshon, J.A., and Wurtz, R.H. (2019). From basic brain research to treating human brain disorders. *Proceedings of the National Academy of Sciences*, Dec23.
15. Wilming, N., König, P., König, S.D., and Buffalo, E.A. (2018) Entorhinal cortex receptive fields are modulated by spatial attention, even without movement. *eLife*, Mar14;7, pp. 31745.
16. Meister, M.L.R., and Buffalo, E.A. (2018) Neurons in primate entorhinal cortex represent gaze position in multiple spatial reference frames. *Journal of Neuroscience*, Jan 31, pp:2432-17.
17. Killian, N.J. and Buffalo, E.A. (2018). Grid cells map the visual world. *Nature Neuroscience*, Feb; 21(2);161-162.
18. Nummela, S.U., Jutras, M.J., Wixted, J.T., Buffalo, E.A., and Miller C.T. (2018) Recognition memory in marmoset and macaque monkeys: A comparison of active vision. *Journal of Cognitive Neuroscience*, 4:1-11.
19. Bott, N., Madero, E.N., Glenn, J., Lange, A., Anderson, J., Newton, D., Brennan, A., Buffalo, E.A., Rentz, D., and Zola, S. (2018) Device-embedded cameras for eye tracking-based cognitive assessment: Validation with paper-pencil and computerized

- cognitive composites. *Journal of Medical Internet Research*, 20(7):e11143.
20. Rueckemann, J.W. and Buffalo, E.A. (2017) Spatial responses, immediate experience, and memory in the monkey hippocampus. *Current Opinion in Behavioral Sciences*, 17:155-160.
 21. Rueckemann, J.W. and Buffalo, E.A. (2017) Neuroscience: Auditory landscape on the cognitive map. *Nature*, 543(7647):631-632.
 22. Wilming, N., Kietzmann, T.C., Jutras, M., Xue, C., Treue, S., Buffalo, E.A., and König, P. (2017). Differential contribution of low- and high-level image content to eye movements in monkeys and humans. *Cerebral Cortex*, 21(1):279-293.
 23. König, S.D. and Buffalo, E.A. (2016). Modeling visual exploration in rhesus macaques with bottom-up salience and oculomotor statistics. *Frontiers in Integrative Neuroscience*, 30 June; 10:23.
 24. Meister, M.L. and Buffalo, E.A. (2016). Getting directions from the hippocampus: The neural connection between looking and memory. *Neurobiology of Learning and Memory*, 134 Pt A:135-44.
 25. Eichenbaum, H., Amaral, D.G., Buffalo, E.A., Buzsaki, G., Cohen, N., Davachi, L., Frank, L., Heckers, S., Morris, R.G.M., Moser, E.I., Nadel, L., O'Keefe J., Preston, A., Ranganath, C., Silva, A., and Witter, M. (2016). Hippocampus at 25. *Hippocampus*, 26(10):1238-49.
 26. Killian, N.J., Potter, S., and Buffalo, E.A. (2015). Saccade direction encoding in the primate entorhinal cortex during visual exploration. *Proceedings of the National Academy of Sciences*, 112(51):15743-8.
 27. Schiller, D., Eichenbaum, H., Buffalo, E.A., Davachi, L., Foster, D., Leutgeb, S., and Ranganath, C. (2015). Memory and Space: Towards an Understanding of the Cognitive Map. *Journal of Neuroscience*, 35(41):13904-11.
 28. Buffalo, E.A. (2015). Bridging the gap between spatial and mnemonic views of the hippocampal formation. *Hippocampus*, 25(6):713-8.
 29. Solyst, J.A. and Buffalo, E.A. (2014). Social relevance drives viewing behavior independent of low-level salience in rhesus macaques. *Frontiers in Neuroscience*, 8:354.
 30. Killian, N.J. and Buffalo, E.A. (2014). Distinct frequencies mark the direction of communication. *Proceedings of the National Academy of Sciences*, 111(40):14316-7.
 31. König, S.D. and Buffalo, E.A. (2014). A nonparametric method for detecting fixations and saccades using cluster analysis: Removing the need for arbitrary thresholds. *Journal of Neuroscience Methods*, 227:121-31.
 32. Jutras, M.J. and Buffalo, E.A. (2014). Oscillatory correlates of memory in non-human primates. *Neuroimage*, 85 Part 2:694-701.
 33. Vinck M., Womelsdorf T., Buffalo, E.A., Desimone R., and Fries, P. (2013). Attentional modulation of cell-class-specific gamma-band synchronization in awake monkey area V4. *Neuron*, 80(4):1077-89.
 34. Jutras, M.J., Fries, P., and Buffalo, E.A. (2013). Oscillatory activity in the monkey hippocampus during visual exploration and memory formation. *Proceedings of the National Academy of Sciences*, 110(32):13144-9.
 35. Killian, N.J., Jutras, M.J., and Buffalo, E.A. (2012). A map of visual space in the primate entorhinal cortex. *Nature*, 491(7426):761-4.

36. Buffalo, E.A., Fries, P., Landman, R., Buschman, T.J., and Desimone, R. (2011). Laminar differences in gamma and alpha coherence in the ventral stream. *Proceedings of the National Academy of Sciences*, 108:11262-7.
37. Lagun, D., Manzanares, C., Zola, S.M., Buffalo, E.A., and Agichtein, E. (2011). Detecting cognitive impairment by eye movement analysis using automatic classification algorithms. *Journal of Neuroscience Methods*, 201:196-203.
38. Jutras, M.J. and Buffalo, E.A. (2010). Recognition memory signals in the macaque hippocampus. *Proceedings of the National Academy of Sciences*, 107:401-6.
39. Jutras, M.J. and Buffalo, E.A. (2010). Synchronous neural activity and memory formation. *Current Opinion in Neurobiology*, 20:150-5. Epub March 18, 2010.
40. Buffalo, E.A., Fries, P., Landman, R., Liang, H., and Desimone, R. (2010). A backwards progression of attentional effects in the ventral stream. *Proceedings of the National Academy of Science*, 107: 361-5.
41. Jutras, M.J., Fries, P., and Buffalo, E.A. (2009). Gamma-band synchronization in the macaque hippocampus and memory formation. *Journal of Neuroscience*, 29:12521-31.
42. Bellgowan, P.S.F., Buffalo, E.A., Bodurka J., and Martin A. (2009) Lateralized spatial and object memory encoding in entorhinal and perirhinal cortices. *Learning and Memory*, 16:433-438.
43. Buffalo, E.A., Bellgowan, P.S.F., and Martin, A. (2006) Distinct roles for medial temporal lobe structures in memory for objects and their locations. *Learning and Memory*, 13:638-643.
44. Liang, H., Bressler, S.L., Buffalo, E.A., Desimone, R., and Fries, P. (2005) Empirical mode decomposition of field potentials from macaque V4 in visual spatial attention. *Biological Cybernetics*, 92:380-392.
45. Buffalo, E.A., Bertini, G., Ungerleider, L.G., and Desimone, R. (2005) Impaired filtering of distracter stimuli by TE neurons following V4 and TEO lesions in macaques. *Cerebral Cortex*, 15:141-151.
46. Bertini, G., Buffalo, E.A., DeWeerd, P., Ungerleider, L.G., and Desimone, R. (2004) Visual responses to targets and distracters by inferior temporal neurons after lesions of extrastriate areas V4 and TEO. *NeuroReport*, 15:1611-1615.
47. Floel, A., Peoppel, D., Buffalo, E.A., Braun, A., Wu, C.W.H., Seo, H.J., Stefan, K., Knecht, S., and Cohen, L.G. (2004) Prefrontal cortex asymmetry for memory encoding of words and abstract shapes. *Cerebral Cortex*, 14:404-409.
48. Squire, L.R., Schmolck, H., and Buffalo, E.A. (2001). Memory distortions develop over time: A reply to D.B. Horn. *Psychological Science*, 12:182.
49. Buffalo, E.A., Ramus, S.J., Squire, L.R., and Zola, S.M. (2000). Perception and recognition memory following perirhinal cortex lesions in the monkey. *Learning and Memory*, 7:375-382.
50. Stefanacci, L., Buffalo, E.A., Schmolck, H., and Squire, L.R. (2000). Profound amnesia after damage to the medial temporal lobe: A neuroanatomical and neuropsychological profile of patient E.P. *Journal of Neuroscience*, 20:7024-7036.
51. Schmolck, H., Buffalo, E.A., and Squire, L.R. (2000). Memory distortions develop over time: Recollections of the O.J. Simpson trial verdict after 15 and 32 months.

- Psychological Science*, 11:39-45.
52. Zola, S.M., Squire, L.R., Teng, E., Stefanacci, L., Buffalo, E.A., and Clark, R.E. (2000). Impaired recognition memory in monkeys after damage limited to the hippocampal region. *Journal of Neuroscience*, 20:451-463.
 53. Buffalo, E.A., Ramus, S.J., Clark, R., Teng, E., Squire, L.R., and Zola, S.M. (1999). Dissociation between the effects of damage to the perirhinal cortex and area TE. *Learning and Memory*, 6:572-599.
 54. Paule, M.G., Chelonis, J.J., Buffalo, E.A., Blake, D.J., and Casey, P.H. (1999). Operant test battery performance in children: Correlation with IQ. *Neurotoxicology and Teratology*, 21:223-230.
 55. Buffalo, E.A., Reber, P.J., and Squire, L.R. (1998). The human perirhinal cortex and recognition memory. *Hippocampus*, 8:330-339.
 56. Buffalo, E.A., Stefanacci, L., Squire, L.R., and Zola, S.M. (1998). A reexamination of the concurrent discrimination learning task: The importance of inferotemporal cortical area TE. *Behavioral Neuroscience*, 112:3-14.
 57. Buffalo, B., Gaffan, D., Murray, E.A. (1994). A primacy effect in monkeys when list position is relevant. *The Quarterly Journal of Experimental Psychology*, 47:353-369.
 58. Buffalo, E.A., Gillam, M.P., Allen, R.R., and Paule, M.G. (1994). Acute behavioral effects of MK-801 in rhesus monkeys: Assessment using an operant test battery. *Pharmacology Biochemistry and Behavior*, 48:935-40.
 59. Buffalo, E.A., Gillam, M.P., Allen, R.R., and Paule, M.G. (1993). Acute effects of caffeine on several operant behaviors in rhesus monkeys. *Pharmacology Biochemistry and Behavior*, 46:733-7.

Book Chapters

1. M. Meister and E.A. Buffalo (2015). Memory in *Translational Neuroscience*, M. Conn, ed. Elsevier: New York.
2. E.A. Buffalo and L.R. Squire (2014). Declarative Memory, Neural Basis of, in *The International Encyclopedia of Social and Behavioral Sciences 2E*, J. Wright, ed., Elsevier: New York.
3. E.A. Buffalo and J. Manns (2013). Learning and Memory: Brain Systems, in *Fundamental Neuroscience*, 4th Edition, L.R. Squire, D. Berg, F.E. Bloom, S. du Lac, A. Ghosh, and N.C. Spitzer, eds., Elsevier: New York, pp. 1029-1052.
4. E.A. Buffalo and R. Desimone (2002). Multiple Neuronal Mechanisms for Memory in the Anterior Inferior Temporal Cortex of Monkeys, in *Neuropsychology of Memory*, 3rd Edition, L.R. Squire and D. Schacter, eds., Guilford: New York, pp. 311-325.