

References

1. Clyde A. Hutchison, III *et al.*, [Design and synthesis of a minimal bacterial genome](#). *Science* 351,aad6253(2016).DOI:10.1126/science.aad6253
2. Eghbalsaid, S., Lawler, C., Petersen, B. et al. CRISPR/Cas9-mediated base editors and their prospects for mitochondrial genome engineering. *Gene Ther* 31, 209–223 (2024). <https://doi.org/10.1038/s41434-023-00434-w>
3. Greg Schuette et al. ,ChromoGen: Diffusion model predicts single-cell chromatin conformations.*Sci. Adv.*11,eadr8265(2025).DOI:10.1126/sciadv.adr8265
4. DaSilva LF, Senan S, Patel ZM, et al. DNA-Diffusion: Leveraging Generative Models for Controlling Chromatin Accessibility and Gene Expression via Synthetic Regulatory Elements. Preprint. bioRxiv. 2024;2024.02.01.578352. Published 2024 Feb 1. doi:10.1101/2024.02.01.578352
5. Jinek M, Chylinski K, Fonfara I, Hauer M, Doudna JA, Charpentier E. A programmable dual-RNA-guided DNA endonuclease in adaptive bacterial immunity. *Science*. 2012;337(6096):816-821. doi:10.1126/science.1225829
6. Yang, Y., DeWeese, M. R., Otazu, G. H. & Zador, A. M. Millisecond-scale differences in neural activity in auditory cortex can drive decisions. *Nat. Neurosci.* 11, 1262–1263 (2008).
7. von Bartheld CS. Myths and truths about the cellular composition of the human brain: A review of influential concepts. *J Chem Neuroanat.* 2018 Nov;93:2-15. doi: 10.1016/j.jchemneu.2017.08.004. Epub 2017 Sep 2. PMID: 28873338; PMCID: PMC5834348.
8. Kaposzta Z, Stylianou O, Mukli P, Eke A, Racz FS. Decreased connection density and modularity of functional brain networks during n-back working memory paradigm. *Brain Behav.* 2021;11(1):e01932. doi:10.1002/brb3.1932
9. Tomasi D, Volkow ND. Functional connectivity density mapping. *Proc Natl Acad Sci U S A.* 2010;107(21):9885-9890. doi:10.1073/pnas.1001414107
10. Stanley S. Biological nanoparticles and their influence on organisms. *Curr Opin Biotechnol.* 2014;28:69-74. doi:10.1016/j.copbio.2013.11.014
11. Herculano-Houzel S. [The human brain in numbers: a linearly scaled-up primate brain](#). *Front Hum Neurosci.* 2009;3:31. Published 2009 Nov 9. doi:10.3389/neuro.09.031.2009

12. Wheeler, M., Smith, C., Ottolini, M. et al. Genetically targeted magnetic control of the nervous system. *Nat Neurosci* 19, 756–761 (2016). <https://doi.org/10.1038/nn.4265>
13. Zhao C, Wang Y, Nie X, et al. Evaluation of the effects of sequence length and microsatellite instability on single-guide RNA activity and specificity. *Int J Biol Sci*. 2019;15(12):2641-2653. Published 2019 Oct 3. doi:10.7150/ijbs.37152
14. Klinshov VV, Teramae JN, Nekorkin VI, Fukai T. Dense neuron clustering explains connectivity statistics in cortical microcircuits. *PLoS One*. 2014;9(4):e94292. Published 2014 Apr 14. doi:10.1371/journal.pone.0094292
15. Kolb HC, Finn MG, Sharpless KB. Click Chemistry: Diverse Chemical Function from a Few Good Reactions. *Angew Chem Int Ed Engl*. 2001;40(11):2004-2021. doi:10.1002/1521-3773(20010601)40:11<2004::AID-ANIE2004>3.0.CO;2-5
16. Scinto SL, Bilodeau DA, Hincapie R, et al. Bioorthogonal chemistry. *Nat Rev Methods Primers*. 2021;1:30. doi:10.1038/s43586-021-00028-z
17. Mitry, M. M., Greco, F., & Osborn, H. M. (2023). In vivo applications of bioorthogonal reactions: chemistry and targeting mechanisms. *Chemistry—A European Journal*, 29(20), e202203942.
18. Jiang, T., Henderson, J.M., Coote, K. et al. Chemical modifications of adenine base editor mRNA and guide RNA expand its application scope. *Nat Commun* 11, 1979 (2020). <https://doi.org/10.1038/s41467-020-15892-8>
19. Lin SW, Nguyen VQ, Lin S. Preparation of Cas9 Ribonucleoproteins for Genome Editing. *Bio Protoc*. 2022;12(10):e4420. Published 2022 May 20. doi:10.21769/BioProtoc.4420
20. Cheng H, Zhang F, Ding Y. CRISPR/Cas9 Delivery System Engineering for Genome Editing in Therapeutic Applications. *Pharmaceutics*. 2021;13(10):1649. Published 2021 Oct 9. doi:10.3390/pharmaceutics13101649
21. Le Duigou C, Simonnet J, Teleńczuk MT, Fricker D, Miles R. Recurrent synapses and circuits in the CA3 region of the hippocampus: an associative network. *Front Cell Neurosci*. 2014;7:262. Published 2014 Jan 8. doi:10.3389/fncel.2013.00262

22. Sammons RP, Vezir M, Moreno-Velasquez L, et al. Structure and function of the hippocampal CA3 module. *Proc Natl Acad Sci U S A*. 2024;121(6):e2312281120. doi:10.1073/pnas.2312281120
23. Hunt, D.L., Linaro, D., Si, B. *et al.* A novel pyramidal cell type promotes sharp-wave synchronization in the hippocampus. *Nat Neurosci* 21, 985–995 (2018). <https://doi.org/10.1038/s41593-018-0172-7>
24. Wiera G, Mozrzymas JW. Extracellular proteolysis in structural and functional plasticity of mossy fiber synapses in hippocampus. *Front Cell Neurosci*. 2015;9:427. Published 2015 Nov 4. doi:10.3389/fncel.2015.00427
25. Fujise, K., Mishra, J., Rosenfeld, M.S. et al. Synaptic vesicle characterization of iPSC-derived dopaminergic neurons provides insight into distinct secretory vesicle pools. *npj Parkinsons Dis*. 11, 16 (2025). <https://doi.org/10.1038/s41531-024-00862-4>
26. Lee B, White KI, Socolich M, et al. Direct visualization of electric-field-stimulated ion conduction in a potassium channel. *Cell*. 2025;188(1):77-88.e15. doi:10.1016/j.cell.2024.12.006
27. Alonso, N., Krichmar, J.L. A sparse quantized hopfield network for online-continual memory. *Nat Commun* 15, 3722 (2024). <https://doi.org/10.1038/s41467-024-46976-4>
28. Predictive Sequence Learning in the Hippocampal Formation. Chen Y, Zhang H, Cameron M, Sejnowski T. *bioRxiv* 2022.05.19.492731; doi: <https://doi.org/10.1101/2022.05.19.492731>
29. Alonso, N., Krichmar, J.L. A sparse quantized hopfield network for online-continual memory. *Nat Commun* 15, 3722 (2024). <https://doi.org/10.1038/s41467-024-46976-4>
30. Insel N, Takehara-Nishiuchi K. The cortical structure of consolidated memory: a hypothesis on the role of the cingulate-entorhinal cortical connection. *Neurobiol Learn Mem*. 2013;106:343-350. doi:10.1016/j.nlm.2013.07.019
31. Woolnough O, Donos C, Rollo PS, et al. Spatiotemporal dynamics of orthographic and lexical processing in the ventral visual pathway. *Nat Hum Behav*. 2021;5(3):389-398. doi:10.1038/s41562-020-00982-w
32. Kong, X., Kong, R., Orban, C. et al. Sensory-motor cortices shape functional connectivity dynamics in the human brain. *Nat Commun* 12, 6373 (2021). <https://doi.org/10.1038/s41467-021-26704-y>
33. Ponce-Alvarez, A., Deco, G. The Hopf whole-brain model and its linear approximation. *Sci Rep* 14, 2615 (2024). <https://doi.org/10.1038/s41598-024-53105-0>
34. Cooray GK, Cooray V, Friston K. A cortical field theory - dynamics and symmetries. *J Comput Neurosci*. 2024;52(4):267-284. doi:10.1007/s10827-024-00878-y

35. Rădulescu, A., Herron, J., Kennedy, C. et al. Global and local excitation and inhibition shape the dynamics of the cortico-striatal-thalamo-cortical pathway. *Sci Rep* 7, 7608 (2017). <https://doi.org/10.1038/s41598-017-07527-8>
36. Rueda-Castro V, Azofeifa JD, Chacon J, Caratozzolo P. Bridging minds and machines in Industry 5.0: neurobiological approach. *Front Hum Neurosci*. 2024;18:1427512. Published 2024 Aug 27. doi:10.3389/fnhum.2024.1427512
37. Vaz AP, Wittig JH Jr, Inati SK, Zaghoul KA. Replay of cortical spiking sequences during human memory retrieval. *Science*. 2020;367(6482):1131-1134. doi:10.1126/science.aba0672
38. R.B. Yaffe, M.S.D. Kerr, S. Damara, S.V. Sarma, S.K. Inati, K.A. Zaghoul, Reinstatement of distributed cortical oscillations occurs with precise spatiotemporal dynamics during successful memory retrieval, *Proc. Natl. Acad. Sci. U.S.A.* 111 (52) 18727-18732, <https://doi.org/10.1073/pnas.1417017112> (2014).
39. Yaffe, R. B., Shaikhouni, A., Arai, J., Inati, S. K., & Zaghoul, K. A. (2017). Cued Memory Retrieval Exhibits Reinstatement of High Gamma Power on a Faster Timescale in the Left Temporal Lobe and Prefrontal Cortex. *The Journal of neuroscience : the official journal of the Society for Neuroscience*, 37(17), 4472–4480.
40. Davidson, T. J., Kloosterman, F., & Wilson, M. A. (2009). Hippocampal replay of extended experience. *Neuron*, 63(4), 497–507. <https://doi.org/10.1016/j.neuron.2009.07.027>
41. Huelin Gorriz, M., Takigawa, M. & Bendor, D. The role of experience in prioritizing hippocampal replay. *Nat Commun* 14, 8157 (2023). <https://doi.org/10.1038/s41467-023-43939-z>
42. Graham Findlay, Giulio Tononi, Chiara Cirelli, The evolving view of replay and its functions in wake and sleep, *SLEEP Advances*, Volume 1, Issue 1, 2020, zpab002, <https://doi.org/10.1093/sleepadvances/zpab002>

Additional References:

1. Jinek M, Chylinski K, Fonfara I, Hauer M, Doudna JA, Charpentier E. A programmable dual-RNA-guided DNA endonuclease in adaptive bacterial immunity. *Science*. 2012 Aug 17;337(6096):816-21. doi: 10.1126/science.1225829. Epub 2012 Jun 28. PMID: 22745249; PMCID: PMC6286148.
2. Nature news | Wi-Fi for neurons: first map of wireless nerve signals unveiled in worms: <https://www.nature.com/articles/d41586-023-03619-w>
3. Insanally, M.N., Albanna, B.F., Toth, J. *et al.* [Contributions of cortical neuron firing patterns, synaptic connectivity, and plasticity to task performance](#). *Nat Commun* 15, 6023 (2024). <https://doi.org/10.1038/s41467-024-49895-6>
4. “Human Brain cellular composition (demythd)”: von Bartheld CS. [Myths and truths about the cellular composition of the human brain: A review of influential concepts](#). *J Chem Neuroanat*. 2018 Nov;93:2-15. doi: 10.1016/j.jchemneu.2017.08.004. Epub 2017 Sep 2. PMID: 28873338; PMCID: PMC5834348.
5. “Measure the absorbance of Cas9 protein at 280 nm using a NanoDrop Lite spectrophotometer.”
<https://pmc.ncbi.nlm.nih.gov/articles/PMC9183966/>
6. Stanley S. [Biological nanoparticles and their influence on organisms](#). *Curr Opin Biotechnol*. 2014 Aug;28:69-74. doi: 10.1016/j.copbio.2013.11.014. Epub 2014 Jan 8. PMID: 24832077.
<https://www.sciencedirect.com/science/article/abs/pii/S0958166913007155>
7. Kaposzta Z, Stylianou O, Mukli P, Eke A, Racz FS. Decreased connection density and modularity of functional brain networks during n-back working memory paradigm. *Brain Behav*. 2021 Jan;11(1):e01932. doi: 10.1002/brb3.1932. Epub 2020 Nov 13. PMID: 33185986; PMCID: PMC7821619.
8. <https://pubmed.ncbi.nlm.nih.gov/24732632/>
9. <https://www.nature.com/articles/s41467-019-09515-0>
10. <https://www.sciencedirect.com/science/article/pii/S2211124722004296>
11. <https://biologicalsciences.uchicago.edu/news/simple-model-brain-cells-connect#:~:text=Understanding%20how%20neurons%20connect,are%20much%20stronger%20than%20most>.
12. <https://www.nature.com/subjects/cellular-neuroscience>
13. <https://www.nature.com/subjects/neural-circuit>
14. <https://www.nature.com/articles/s41467-024-52171-2>
15. Biological nanoparticles and their influence on organisms, science direct:
<https://www.sciencedirect.com/science/article/abs/pii/S0958166913007155>

16. Ferritin nanocages: A biological platform for drug delivery, imaging and theranostics in cancer
17. Recent progress in targeted delivery vectors based on biomimetic nanoparticles | Signal Transduction and Targeted Therapy, <https://www.nature.com/articles/s41392-021-00631-2>
18. Wheeler, M., Smith, C., Ottolini, M. *et al.* Genetically targeted magnetic control of the nervous system. *Nat Neurosci* 19, 756–761 (2016). <https://doi.org/10.1038/nn.4265>
19. Nature Signal Transduction and Targeted Therapy: <https://www.nature.com/sigtrans/>
20. Tomasi D, Volkow ND. Functional connectivity density mapping. *Proc Natl Acad Sci U S A*. 2010;107(21):9885-9890. doi:10.1073/pnas.1001414107
21. Micrometer figure: <https://pubmed.ncbi.nlm.nih.gov/38723085/#&gid=article-figures&pid=figure-5-uid-4>
22. Brain Maps at nanoscale | PubMed | <https://pubmed.ncbi.nlm.nih.gov/30872818/>
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 - Nanoscale friction and wear maps., Tambe NS, Bhushan B., *Philos Trans A Math Phys Eng Sci.* 2008 Apr 28;366(1869):1405-24. doi: 10.1098/rsta.2007.2165., PMID: 18156128
 - In situ nanoscale mapping of the chemical composition of surfaces and 3D nanostructures by photoelectron spectromicroscopy., Ratto F, Heun S, Moutanabbir O, Rosei F., *Nanotechnology.* 2008 Jul 2;19(26):265703. doi: 10.1088/0957-4484/19/26/265703. Epub 2008 May 20., PMID: 21828691
 - Global order and local disorder in brain maps., Rothschild G, Mizrahi A., *Annu Rev Neurosci.* 2015 Jul 8;38:247-68. doi: 10.1146/annurev-neuro-071013-014038. Epub 2015 Apr 9., PMID: 25897872 Review.
 - Self-organizing maps for internal representations., Ritter H., *Psychol Res.* 1990;52(2-3):128-36. doi: 10.1007/BF00877520., PMID: 2281125 Review.
 - Borah BJ, Sun CK. A rapid denoised contrast enhancement method digitally mimicking an adaptive illumination in submicron-resolution

neuronal imaging. *iScience*. 2022;25(2):103773. Published 2022 Jan 15.
doi:10.1016/j.isci.2022.103773

- Hancock, F., Rosas, F.E., Luppi, A.I. *et al*. Metastability demystified — the foundational past, the pragmatic present and the promising future. *Nat. Rev. Neurosci.* 26, 82–100 (2025).
<https://doi.org/10.1038/s41583-024-00883-1>
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- Immune evasion through mitochondrial transfer in the tumour microenvironment. *Nature* (2025)
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